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

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

August 2008

COVER SHEET

ENVIRONMENTAL STEWARDSHIP PLAN
FOR THE CONSTRUCTION, OPERATION, AND MAINTENANCE
OF TACTICAL INFRASTRUCTURE
U.S. BORDER PATROL MARFA 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: United States Section, International Boundary and Water Commission (USIBWC), and U.S. Fish and Wildlife Service (USFWS).

Affected Location: U.S./Mexico international border in Hudspeth and Presidio counties, Texas.

Project Description: The Project includes the construction, operation, and maintenance of tactical infrastructure to include primary pedestrian fencing, patrol and access roads, and lights along approximately 11 miles of the U.S./Mexico international border in the USBP Marfa Sector, Texas. The Project will be implemented in three discrete sections. The three sections will be approximately 2.9, 3.3, and 4.8 miles in length.

Report Designation: Environmental Stewardship Plan (ESP).

Abstract: CBP plans to construct, operate, and maintain approximately 11 miles of tactical infrastructure, including pedestrian fencing, patrol roads, access roads, and lights, along the U.S./Mexico international border in Hudspeth and Presidio counties, Texas.

The Project includes the construction of tactical infrastructure in three discrete sections. Two tactical infrastructure sections in Presidio County will be approximately 3.3 and 2.9 miles in length, and the section in Hudspeth County will be approximately 4.8 miles in length. For much of its length, the tactical infrastructure sections will follow the USIBWC levee. Some portions of the tactical infrastructure will encroach on parcels of privately owned land. The infrastructure will cross predominantly rural and agricultural land.

This ESP analyzes and documents potential 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, 1300 Pennsylvania Ave, NW, Suite 7.2C, 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 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 CBP no longer has any specific legal obligations under the laws that are included in the waiver, the Secretary committed DHS to continue responsible environmental stewardship of valuable natural and cultural resources. CBP strongly supports the Secretary's commitment to responsible environmental stewardship. To that end, CBP has prepared this ESP, which analyzes the potential environmental impacts associated with construction of tactical infrastructure in the USBP's Marfa 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, U.S. Customs and Border Protection (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 Project will provide USBP agents with the tools necessary to strengthen their control of the U.S. borders between ports of entry (POEs) in the USBP Marfa Sector. The Project will help to deter illegal entries within the USBP Marfa 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 Marfa Sector has identified three discrete areas along the border that experience high levels of illegal entry. Illegal cross-border activity typically occurs in areas that are remote and 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.

The Project is being carried out pursuant to Section 102 of IIRIRA, 8 United States Code (U.S.C.) § 1103 note. In Section 102(b) of IIRIRA, Congress called for the installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwestern border. This total includes certain priority miles of fencing that are to be completed by December of 2008. Section 102(b) further specifies that these priority miles are to be constructed in areas where it would be practical and effective in deterring smugglers and aliens attempting to gain illegal entry into the United States.

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 Assessment (EA) was prepared previous to issuance of the waiver, copies were mailed to interested parties, it was posted on a public Web site, and a 30-day public review and comment period was announced. A public open house was advertised and held at The Hotel Paisano in Marfa, Texas, on January 23, 2008. The open house was attended by approximately 150 people. 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 EA will also be provided on the *www.BorderFencePlanning.com* Web site. Analysis from the Draft EA has been used to develop this ESP.

Description of the Project

CBP plans to construct, operate, and maintain approximately 11 miles of tactical infrastructure in three discrete sections along the U.S./Mexico international border in the USBP Marfa Sector, Texas. The tactical infrastructure will consist of primary pedestrian fence, lighting, and patrol and access roads. The tactical infrastructure will be constructed in areas of the border that are not currently fenced. Locations are based on the USBP Marfa Sector's 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). The three sections will be approximately 2.9, 3.3, and 4.8 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 **11** 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 route that will minimize impacts, consulting with Federal and state agencies and other stakeholders to avoid or minimize adverse environmental impacts, and developing appropriate BMPs to continue responsible stewardship of natural and cultural resources. Potential effects, including physical disturbance and construction of solid barriers on wetlands, riparian areas, streambeds, and floodplains, will be avoided or mitigated whenever possible. BMPs will include implementation of a Storm Water Pollution Prevention Plan (SWPPP), Spill Prevention Control and Countermeasures (SPCC) Plan, and Unanticipated Discovery Plan to continue responsible environmental stewardship of natural and cultural resources.

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	BMPs/Mitigation
Air Quality	Short-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 and Visual Resources	Short- and long-term minor to moderate adverse impacts will be expected.	None required.

Resource Area	Effects of the Project	BMPs/Mitigation
Geology and Soils	Short- and long-term negligible to minor adverse impacts will be expected.	Construction related vehicles will remain on established roads while areas with highly erodible soils will be avoided when possible. Gravel or topsoil will be obtained from developed or previously used sources.
Water Use and Quality		
Hydrology and Groundwater	Grading and contouring will result in short- and long-term negligible to minor adverse impacts.	Revegetating the area with native vegetation following construction to abate runoff and wind erosion. BMPs will be developed as part of the SWPPPs to manage storm water both during and after construction.
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 possible, stream crossings will not be located at bends to protect channel stability. Equipment maintenance, staging, laydown, or fuel dispensing will occur on upland to the maximum extent practicable to prevent runoff. Re-vegetating areas with native vegetation to abate runoff.. Fence types will allow conveyance of water.
Floodplains	Short- and long-term minor adverse impacts will be expected.	None required.

Resource Area	Effects of the Project	BMPs/Mitigation
Biological Resources		
Vegetation	Short- and long-term minor to moderate adverse impacts will be expected.	Construction equipment will be cleaned to minimize spread of non-native species. Removal of brush in Federally protected areas will be limited to smallest amount possible. Invasive plants that appear on project area will be removed. Fill material, if required, will be weed-free to the maximum extent practicable.
Wildlife and Aquatic Species	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.

Resource Area	Effects of the Project	BMPs/Mitigation
Special Status Species	No impacts will be expected.	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.
Cultural Resources	No impacts will be expected (17 sites were identified within the impact corridor but none will be affected by construction).	Any unanticipated archeological resources discovered will halt construction until authorized to proceed by a qualified archaeologist. Avoid impacts to the Dupuy POE building and canopy.
Socioeconomic Resources and Safety	Short-term minor 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.
Roadways and Traffic	Short-term minor adverse impacts are expected.	None required.

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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 the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA), 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 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 responsible environmental stewardship of valuable natural and cultural resources. CBP strongly supports the Secretary's commitment to responsible environmental stewardship. To that end, CBP has prepared this ESP, which analyzes the potential environmental impacts associated with construction of tactical infrastructure in the U.S. Border Patrol (USBP) Marfa 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 14 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 and visual resources, geology and soils, water use and quality, biological resources (i.e., vegetation, wildlife and aquatic species, special status species), cultural resources, socioeconomics, utilities and infrastructure, and roadways and traffic. Some environmental resources were not included in this ESP because they were not relevant to the analysis. These potential resource areas include hazardous materials and wastes (omitted because the Project will not affect hazardous materials or wastes), sustainability (omitted because the Project will use minimal amounts of resources during construction and maintenance), and human health and 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).

Appendix A presents the Secretary's published waiver pursuant to IIRIRA. **Appendix B** provides information on primary pedestrian and vehicle fence designs. **Appendix C** provides air quality emissions calculations. **Appendix D** presents the Biological Survey Report and **Appendix E** presents the Listed Species/Habitat No Effect Determination. **Appendix F** contains detailed maps of fence sections showing land use and water 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 practicable. Consulting with Federal and state agencies and other stakeholders has augmented efforts to avoid or minimize adverse environmental impacts. Developing appropriate BMPs to continue responsible stewardship of natural and cultural resources will be utilized to the extent possible. BMPs will include implementation of a Construction Mitigation and Restoration (CM&R) Plan, Spill Prevention Control and Countermeasure (SPCC) Plan, Storm Water Pollution Prevention Plan (SWPPP), Environmental Protection Plans (EPPs), Dust Control Plan, Fire Prevention and Suppression Plan, and Unanticipated Discovery Plan.

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, USBP is charged with establishing and maintaining effective control of the border of the United States. USBP's mission strategy consists of the following 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 Marfa Sector is responsible for more than 135,000 square miles encompassing 118 counties in Texas and Oklahoma, and 420 miles of the Rio Grande border (CBP 2006). Within the USBP Marfa 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 Project will provide USBP agents with the tools necessary to strengthen their control of the U.S. borders between ports of entry (POEs) in the USBP Marfa Sector. The Project will help to deter illegal entries within the USBP Marfa 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 Marfa Sector has identified three discrete areas along the border that experience high levels of illegal entry. Illegal cross-border activity typically occurs in areas that are remote and 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.

The Project is being carried out pursuant to Section 102 of IIRIRA, 8 United States Code (U.S.C.) § 1103 note. In Section 102(b) of IIRIRA, Congress called for the installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwestern border. This total includes certain priority miles of fencing that are to be completed by December of 2008. Section 102(b) further specifies that these priority miles are to be constructed in areas where it would be practical and effective in deterring smugglers and aliens attempting to gain illegal entry into the United States.

1.4 DESCRIPTION OF THE PROJECT

CBP plans to construct, operate, and maintain approximately 11 miles of tactical infrastructure in three discrete sections along the U.S./Mexico international border in the USBP Marfa Sector, Texas. The tactical infrastructure will consist of primary pedestrian fence, lighting, and patrol and access roads. The tactical infrastructure will be constructed in areas of the border that are not currently fenced. Locations are based on the USBP Marfa Sector's assessment of local operational requirements where such infrastructure will assist USBP agents in reducing illegal cross-border activities. The three sections will be approximately 2.9, 3.3, and 4.8 miles in length.

The tactical infrastructure will be constructed in three discrete sections along the border within the Marfa Sector in Hudspeth and Presidio counties, Texas. These sections of tactical infrastructure are designated as Sections L-1, L-1A, and L-1B on **Figures 1-1** and **1-2**. **Table 1-1** presents general information for each of the three sections. The two sections in Presidio County are Sections L-1A and L-1B. The third section (Section L-1) will be in Hudspeth County.

Table 1-1. Tactical Infrastructure Sections for USBP Marfa Sector

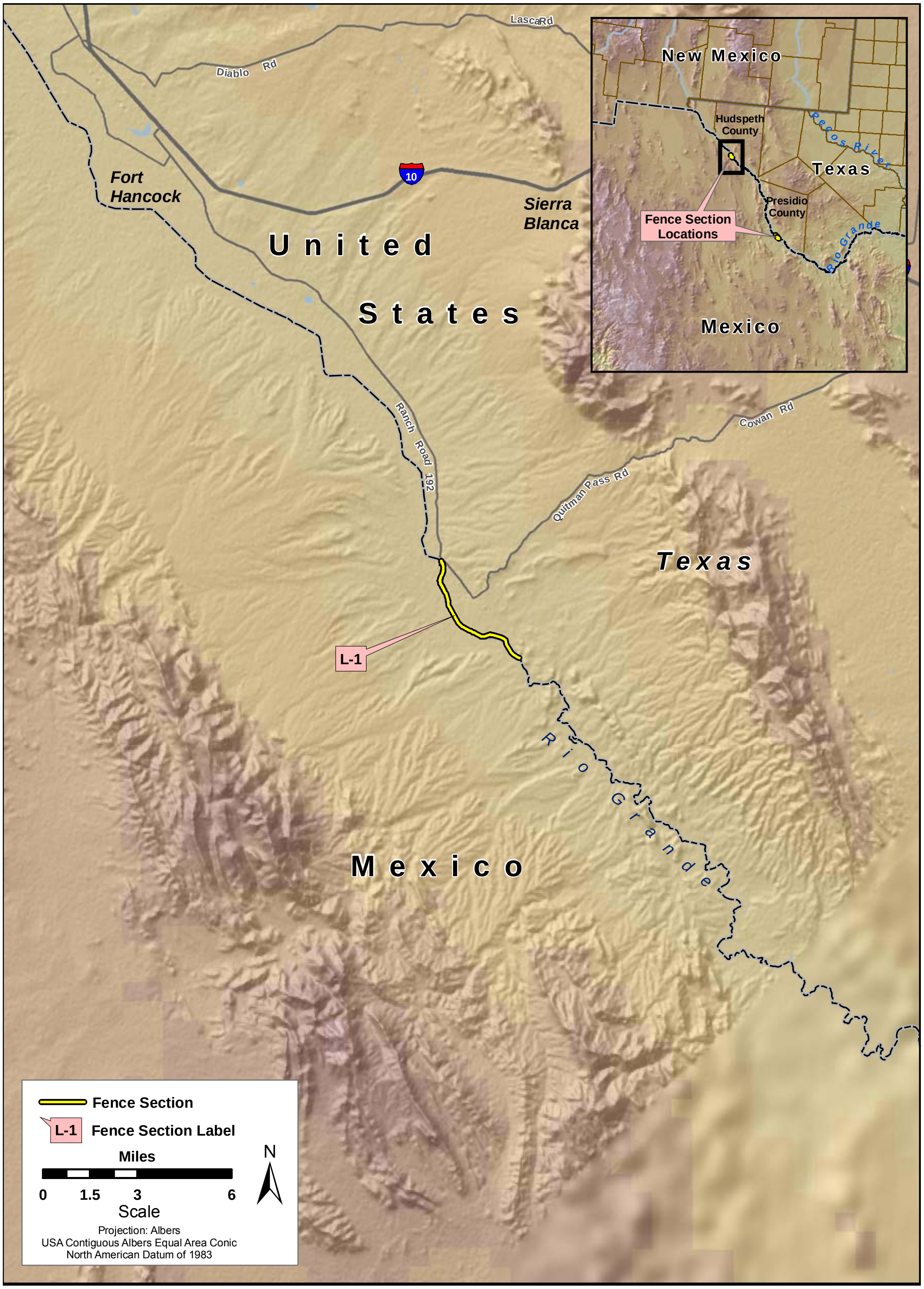
Section Number	Associated USBP Station	General Location	Land Ownership	Length of Section (miles)
L-1	Sierra Blanca	Neely's Crossing	Public (USIBWC)	4.8
L-1A	Presidio	Rio Grande East of POE	Public (USIBWC) and private	3.3
L-1B	Presidio	Rio Grande West of POE	Public (USIBWC) and private	2.9
			Total	**11.0**

Note: USIBWC – United States Section, International Boundary and Water Commission

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

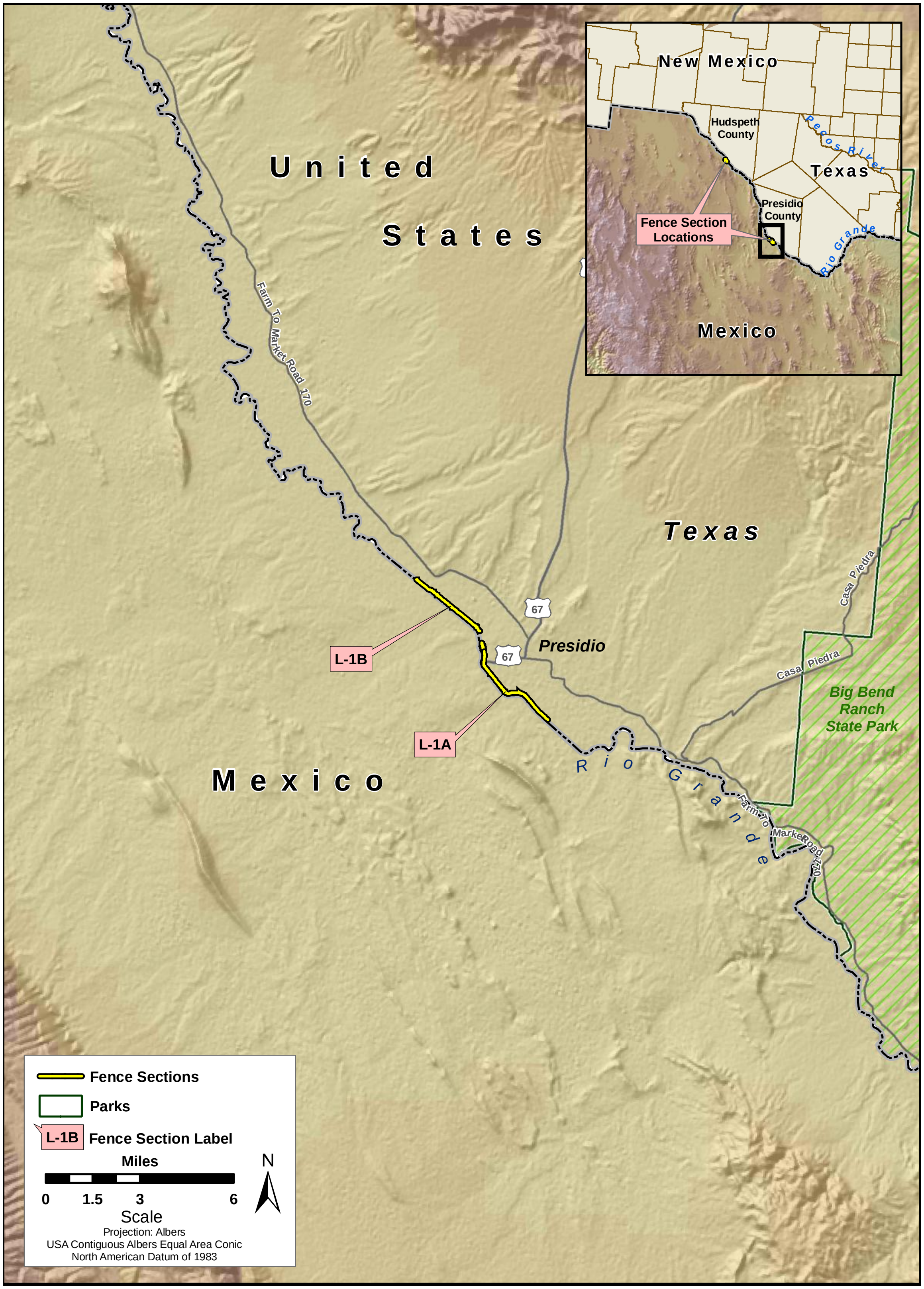
- Built 15 to 18 feet high and extend below ground
- Capable of withstanding a crash of a 10,000-pound (gross weight) vehicle traveling at 40 miles per hour
- Capable of withstanding vandalism, cutting, or various types of penetration
- Semi-transparent, as dictated by operational need
- Designed to 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 (USIBWC 2007). Examples of primary pedestrian fence are included in **Appendix B**.



Source: ESRI StreetMap USA 2005

Figure 1-1. Locations of the Tactical Infrastructure, Section L-1



Source: ESRI StreetMap USA 2005

Figure 1-2. Locations of the Tactical Infrastructure, Sections L-1A and L-1B

The alignment of the Project infrastructure was identified by the USBP Marfa Sector as meeting its operational requirements and developed through coordination with Federal and state agencies. The tactical infrastructure will follow the USIBWC levee system for the majority of its length. Section L-1, in Hudspeth County, will be constructed as a "bollard floating fence" and placed atop the levee (see **Figure 1-3**). Bollard floating fence consists of standard bollard fencing (see **Appendix B**) embedded in a concrete base that allows for a freestanding structure. This configuration will allow the majority of the infrastructure to be placed on property owned by the USIBWC without impacting levee integrity and avoiding major disturbance to current USIBWC operations or USBP patrol roads.

Sections L-1A and L-1B, in Presidio County, will be constructed along the USIBWC levee as new 15 to 18 foot levee retaining walls on the side of the levee facing the Rio Grande (see **Figure 1-4**). Design and construction of the new retaining wall will allow for the wall to be heightened at some future date, by an additional 4 feet, to accommodate the USIBWC proposal to increase the height of the levee. There will be a break in Section L-1B where the fence will encounter Cibolo Creek. A patrol road will be constructed around the perimeter of the creek crossing at a suitable point upstream. CBP is planning to construct and operate permanent lighting in both Presidio sections (L-1A and L-1B). Each light pole will be placed approximately every 50 yards apart.

There are several sections along the levee that the USIBWC does not own but has the rights-of-way (ROW), which will require new agreements or the acquisition of land. In addition, ROWs or land acquisition will be required for access roads and construction staging areas. The tactical infrastructure in the three fence sections will also encroach on privately owned land parcels.

The tactical infrastructure will impact an approximate 60-foot-wide corridor for fences and patrol roads (see **Figure 1-5**). Vegetation within the corridor will be cleared and grading will occur where needed. The area that will be permanently impacted by the construction of tactical infrastructure will total approximately 78.1 acres. Unavoidable impacts on jurisdictional waters of the United States, including wetlands, will be mitigated. 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 Marfa 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 that builds up against the fence and brush will also be removed

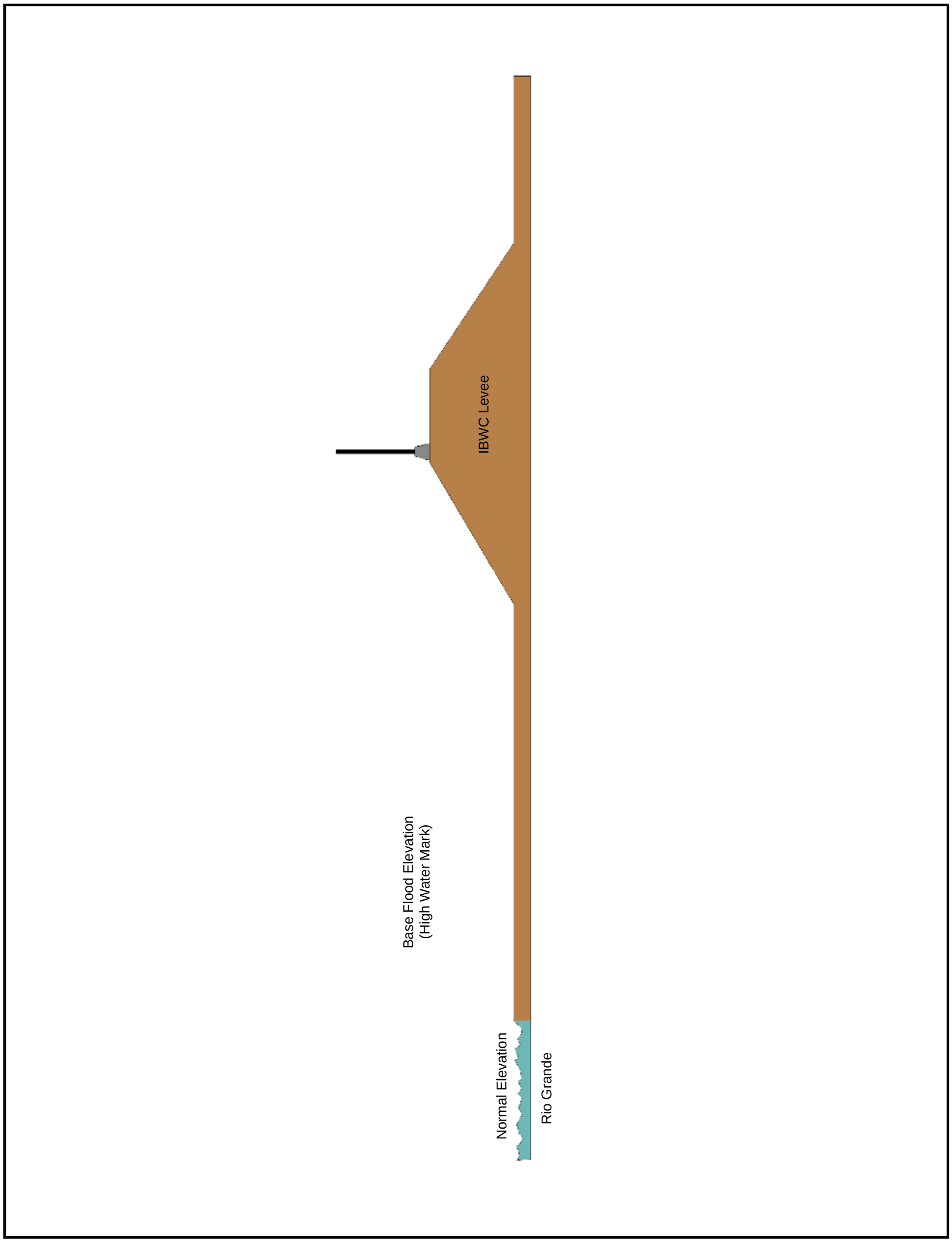


Figure 1-3. Fence Schematic for Section L-1

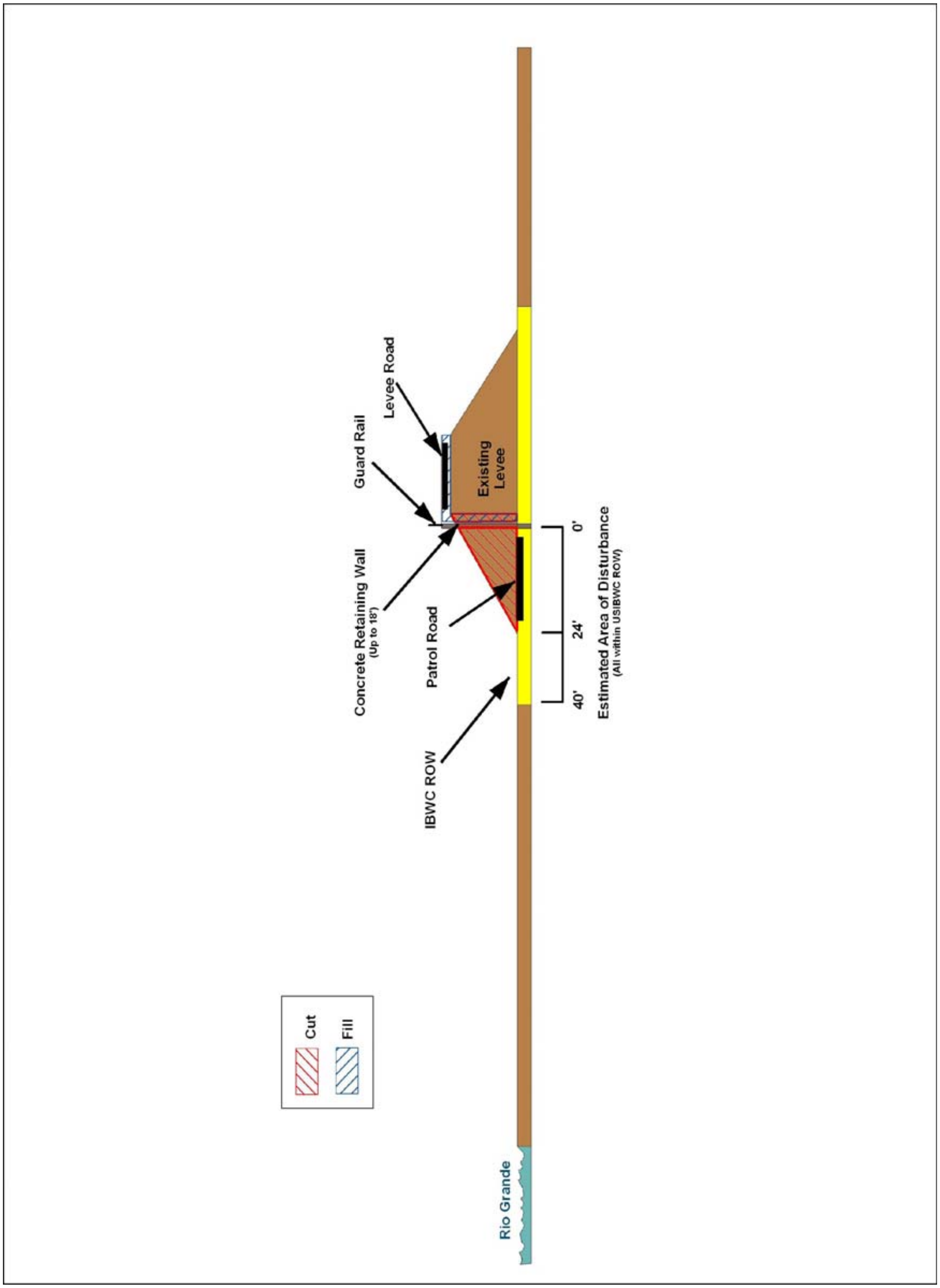


Figure 1-4. Fence Schematic for Section L-1A and L-1B

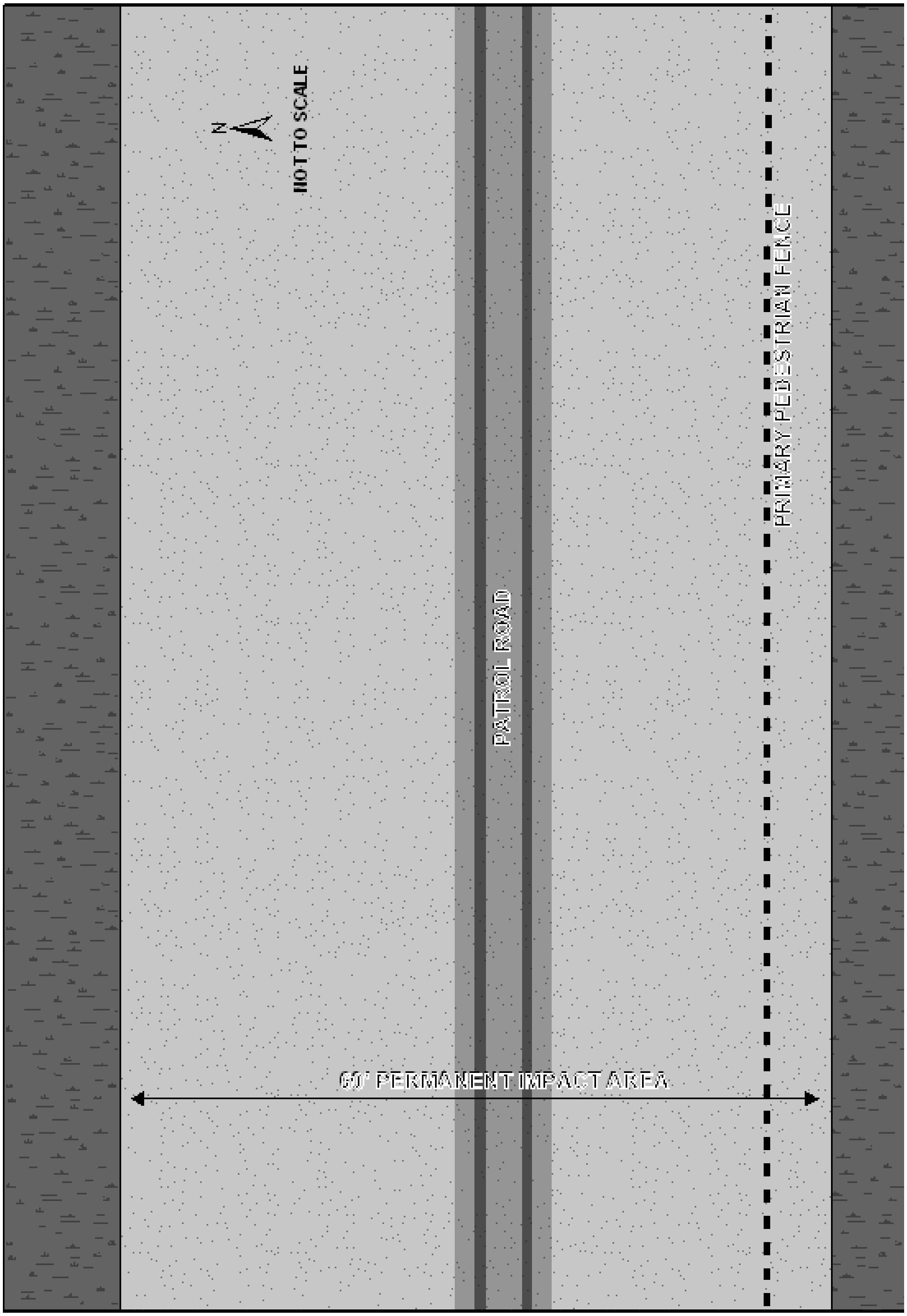


Figure 1-5. Schematic of Project Corridor

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.

Construction of other tactical infrastructure may be required in the future as mission and operational requirements are continually reassessed. To the extent that other current and future actions in the study area are known, they are discussed in **Chapter 12**, Related Projects and Potential Effects.

1.5 PUBLIC OUTREACH AND COORDINATION

CBP notified relevant Federal, state, and local agencies of the Project and requested input on potential 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 Assessment (EA) was prepared, copies were mailed to interested parties, it was posted on a public Web site, and a 30-day public review and comment period was announced. A public open house was advertised and held at The Hotel Paisano in Marfa, Texas, on January 23, 2008. The open house was attended by approximately 150 people. 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 EA will also be provided on the *www.BorderFencePlanning.com* Web site. Analyses from the Draft EA have been used to develop this ESP.

In accordance with the wishes of the Secretary in relation to the waiver, 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.

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.

- 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, Albuquerque 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. CBP has coordinated extensively with USFWS to identify listed species that have the potential to occur in the project area.

1.6 BMPS AND MITIGATION PLAN

CBP applied various design criteria to reduce adverse environmental impacts associated with the Project, including selecting a route that will avoid or minimize effects on environmental and cultural resources. Nonetheless, CBP has determined that construction, operation, and maintenance of tactical infrastructure in USBP Marfa Sector will result in adverse environmental impacts. These impacts will be most adverse during construction. Mitigation resources 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.
- CBP will continue to consult with the USFWS, the Texas Parks and Wildlife Department (TPWD), Texas Commission on Environmental Quality (TCEQ), the SHPO, and Native American tribes as necessary.

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 concentrations 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 Clean Air Act (CAA) directed USEPA to develop National Ambient Air Quality Standards (NAAQS), for pollutants that have been determined to affect human health and the environment. 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 particulates equal to or less than 10 microns in diameter [PM_{10}] and particulates equal to or less than 2.5 microns in diameter [$PM_{2.5}$]), and lead (Pb). The primary NAAQS are ambient air quality standards to protect the public health; secondary NAAQS specify levels of air quality to protect the public welfare such as effects on vegetation, crops, wildlife, economic values, and visibility.

Table 2-1 presents the primary and secondary USEPA NAAQS that apply to the air quality in the State of Texas.

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 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 attainment.

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

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.

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 landmark environment law.

Many gases exhibit these "greenhouse" properties. The majority of greenhouse gases are created by natural sources but are also contributed to by human activity.

2.2 AFFECTED ENVIRONMENT

The Project is within Hudspeth County and Presidio County, Texas, within the El Paso-Las Cruces-Alamogordo Interstate Air Quality Control Region (EPLCAI AQCR). The EPLCAI AQCR is composed of six counties in western Texas and four counties in New Mexico. The EPLCAI AQCR is classified as being in attainment/unclassified for all criteria pollutants.

2.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

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 and portable lights. BMPs include a Dust Control Plan.

Construction Projects. The Project will result in minor, short-term, adverse impacts on 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 in 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 be of a temporary nature. 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 emission coefficients reported by the Energy Information Administration (EIA 2007).

For purposes of this analysis, the Project duration and affected project area that will be disturbed 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 NAAQS pollutants is not high, will not contribute to the deterioration of the air quality in the region, and does not exceed 10 percent of the regional values.

Table 2-2. Estimates of Total Construction Emissions from the Project in Tons Per Year

Description	NO_x	VOC	CO	CO_2	SO_x	PM_{10}
Construction Emissions	11.333	1.689	12.239	23.40	0.227	0.380
Construction Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	96.098
Maintenance Emissions	0.042	0.005	0.021	0.20	0.010	0.005
Generator Emissions	22.78	1.859	4.907	368.9	1.498	1.601
Total Project Emissions	**34.153**	**3.554**	**18.167**	**392.50**	**1.735**	**98.084**
Federal *de minimis* Threshold	NA	NA	NA	NA	NA	NA
EPLCAI AQCR Regional Emissions	54,477	43,267	347,384	995,000	4,569	149,894
Project Percent of EPLCAI AQCR Regional Emissions	**0.63 %**	**0.008%**	**0.005%**	**0.037%**	**0.038%**	**0.065%**

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 oxides (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.

Operations and Maintenance Activities. The primary pedestrian fence and patrol road will require 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 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.

It is anticipated that future maintenance of tactical infrastructure will be conducted by contractors or USBP personnel, and will primarily consist of welding and fence section replacements, as needed. Maintenance activities will result in criteria pollutant air emissions well below the *de minimis* thresholds and will have a negligible contribution to the overall air quality. Negligible long-term adverse impacts on air quality are expected.

After construction is completed, USBP Marfa Sector will begin patrols along Sections L-1, L-1A, and L-1B. The vehicles used for surveillance of the existing border area are currently generating criteria pollutants and will not introduce new pollutant sources. Therefore, no net increase of criteria pollutant emissions will be expected from these USBP operations.

Generators. Project 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 120 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 tons of CO_2 are associated with the EPLCAI AQCR regions. Therefore construction emissions of CO_2 represent less than 10 percent of the regional emissions (USEPA 2007c).

Normal border patrol activities will continue. 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 the Project. Therefore, no net increase of greenhouse emissions will be expected. Emissions factors, calculations, and estimates of emissions are shown in detail in **Appendix C**.

Summary. The air emissions from the Project, as presented in **Table 2-2**, will be minor adverse and much less than 10 percent of the emissions inventory for EPLCAI AQCR (USEPA 2007b). Within the EPLCAI AQCR, the estimated annual CO_2 emissions of power plants is 775,000 tons, while vehicles add another estimated 220,000 tons. Therefore, negligible adverse impacts on regional or local air quality are anticipated from implementation of the Project.

According to 40 CFR Part 81, there are no Class I areas in the vicinity of the Project. In summary, no significant 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 EPLCAI AQCR 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

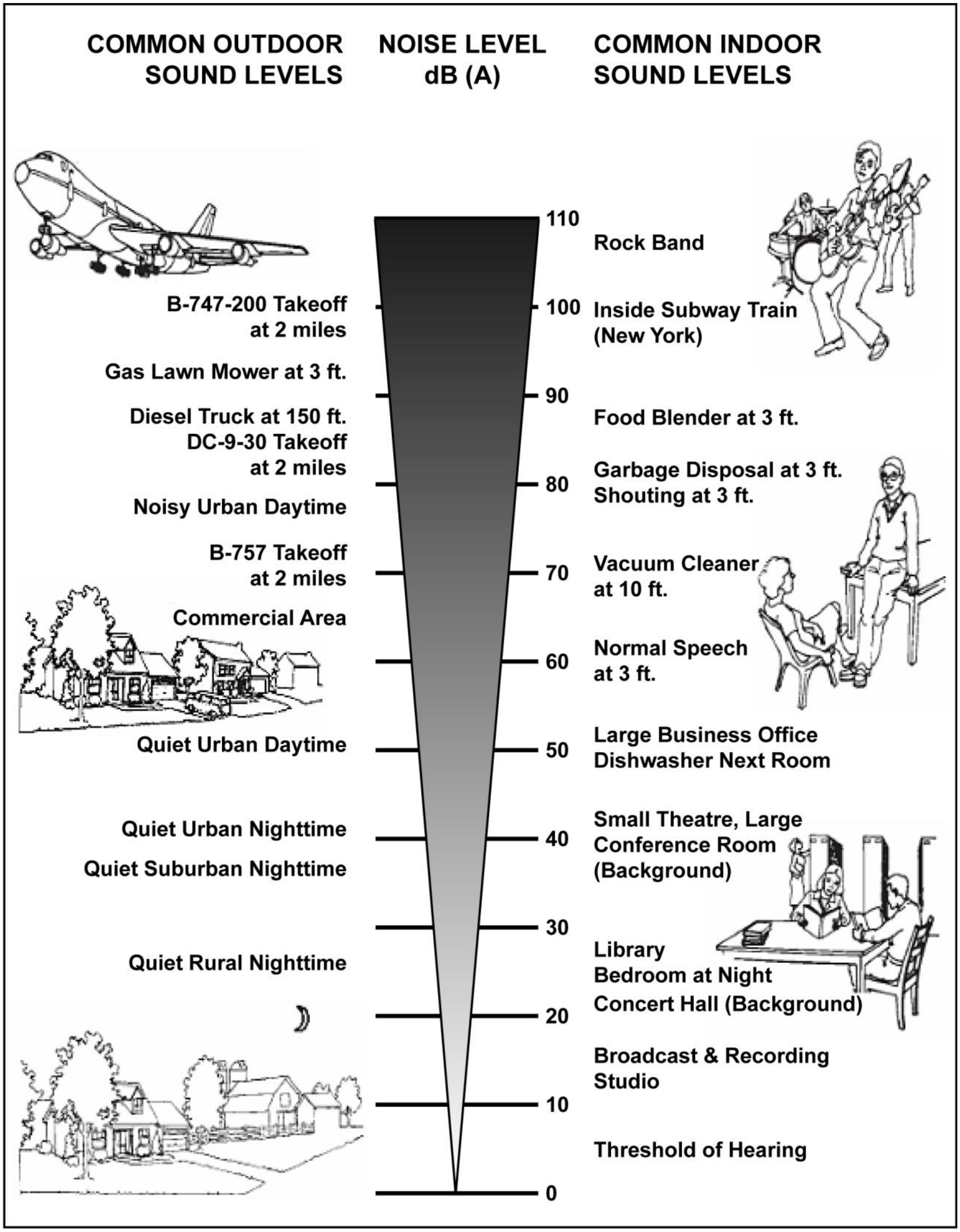
Although the Secretary's waiver means that CBP no longer has any specific legal obligations relative to noise for the tactical infrastructure sections addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports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

Noise and sound share the same physical aspects, but noise is considered a disturbance while sound is defined as an auditory effect. Sound is defined as a particular auditory effect produced by a given source, for example the sound resulting from rain hitting a metal roof. Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying. Sound or noise (depending on one's perception) 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 an annoying noise. Affected receptors are specific (e.g., schools, churches, or hospitals) or broad (e.g., nature preserves or designated districts) in which occasional or persistent sensitivity to noise above ambient levels exists.

Sound is measured with instruments that record instantaneous sound levels in decibels. A-weighted decibels (dBA) are sound level measurements used to characterize sound levels that can be sensed by the human ear. "A-weighted" denotes the adjustment of the frequency content of a sound-producing event to represent the way in which the average human ear responds to the audible event. Noise levels associated with construction equipment, vehicle operations, and aircraft operations are analyzed using dBA.

Noise levels in residential areas vary depending on the housing density, location, and surrounding use. As shown in **Figure 3-1**, a quiet urban area in the daytime is about 50 dBA, however, noise increases to 65 dBA for a commercial area, and 80 dBA for a noisy urban daytime area.

Construction activities 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



Source: Landrum & Brown 2002

Figure 3-1. Common Noise Levels

Table 3-1. Noise Levels for Construction Equipment

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

Source: USEPA 1971

types of construction equipment that are likely to be used under 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.

In general, 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. Pile driving will exceed ambient sound levels by approximately 25 to 35 dBA in an urban environment and 35 to 45 dBA in a quiet suburban area.

3.2 AFFECTED ENVIRONMENT

The border fence for the vicinity of Sierra Blanca and Presidio, Texas, passes through areas with different acoustical environments. Sierra Blanca is in a remote section of the U.S./Mexico international border. Due to the distance from Sierra Blanca, the ambient acoustical environment in the vicinity of Section L-1 is not impacted by urban activities in that town. Presidio, Texas, is a larger community, and directly abuts the U.S./Mexico international border. The ambient acoustical environment near Presidio is primarily impacted by vehicular traffic, industrial noise sources, railroad, and agricultural equipment.

Major transportation routes in the vicinity of Presidio include State Route (SR) 67 and Ranch Road 170. SR 67 passes through the northern side of Presidio and abuts several residential communities. Ranch Road 170 passes by several residential areas on the southeastern, eastern, and northern sections of the city. It is anticipated that there is a high volume of traffic on border crossing roads. Traffic along these roads contributes to the ambient acoustical environment in the vicinity of Presidio.

Industrial and commercial noise sources in the vicinity of Presidio originate from both sides of the border. Industrial noise sources in Presidio are mainly relegated to the central areas of the city. Several industrial facilities exist directly south of Presidio on the Mexican side of the Rio Grande. Noise from these sources contributes to the ambient acoustical environment in the vicinity of Presidio.

Texas-Pacifico Transportation, LTD owns and operates a rail line passing south of the town of Presidio. Transportation of goods and services along this line by rail car will impact the ambient acoustical environment in the vicinity of Presidio. However, no details on the amount of traffic along this rail line were found, and frequency of rail traffic on the line is anticipated to be low. Noise from traffic along the rail line contributes little to the ambient acoustical environment to the areas west of Presidio.

Agricultural activities are prominent south of Presidio along the U.S./Mexico international border. The noise levels from agricultural equipment can reach up to 100 dBA for the operator (OSU 2007). While farms are generally spread out, noise from agricultural activities is likely to extend past the farm boundaries. Irrigation activities occurring at these farm sites will contribute slightly to the ambient acoustical environment at times when they are in operation.

3.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Short-term, moderate, adverse effects are expected due to construction of the primary pedestrian fence and other tactical infrastructure. Temporary sources of noise will include operation of construction equipment and noise from construction vehicles. Noise effects on wildlife are described in **Chapter 7.2.3**.

The construction of the fence sections and related tactical infrastructure will result in noise effects on populations in the vicinity of the sites. Populations that could be affected by construction noise include adjacent residents, people visiting the adjacent recreation areas, or patrons and employees in nearby office, retail, or commercial buildings.

Noise from construction activities varies depending on the type of construction equipment being used, the area that the Project will occur in, and the distance from the source. To predict how these activities will impact adjacent populations, noise from the probable construction was estimated. For example, as shown on **Table 3-1**, construction usually involves several pieces of equipment (e.g., a backhoe and haul truck) that can be used simultaneously. Under the Project, the cumulative noise from the construction equipment during the busiest day was estimated to determine the total impact of noise from building activities at a given distance. Since noise attenuates over distance, a gradual decrease in noise level occurs the farther a receptor is away from the source of noise. Examples of expected construction noise are as follows.

- The closest residence to Section L-1 in Sierra Blanca is approximately 18 miles. At this distance, noise from construction of the tactical infrastructure will be approximately 26 dBA.
- The closest residence to Section L-1A in Presidio is approximately 350 feet. At this distance, noise from construction of the tactical infrastructure will be approximately 75 dBA.
- The closest residence to Section L-1B in Presidio is approximately 2,600 feet. At this distance, noise from construction of the tactical infrastructure will be approximately 57 dBA.

Implementation of the Project will have temporary adverse effects on the noise environment from the use of heavy equipment during construction activities. Increased noise levels from construction activities will affect residences as well as populations using recreational facilities and park areas. In general, users of recreational and park areas anticipate a quiet environment. Noise from construction will affect the ambient acoustical environment around these sites but will be temporary.

Noise impacts from increased construction traffic will also be temporary in nature and will last only as long as the construction activities are ongoing. Most of the major roadways in the vicinity of the Project 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 SR 67 and Ranch Road 170.

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4. LAND USE AND VISUAL RESOURCES

4.1 LAND USE

4.1.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific legal obligations relative to land use for the tactical infrastructure sections 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 resources.

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. Compatibility among land uses fosters the societal interest of obtaining the highest and best uses of real property. Tools supporting land use planning include written master plans/management plans and zoning regulations. In appropriate cases, the location and extent of a project needs to be evaluated for its potential effects on a project site and adjacent land uses. The Project was evaluated in terms of land use and its compatibility with any applicable land use or zoning regulations. Other relevant factors include matters such as existing land use at the impact corridor, the types of land uses on adjacent properties and their proximity to a project, the duration of a project, and its "permanence."

Recreational resources are both natural and improved lands designated by Federal, state, and local planning entities to offer visitors and residents diverse opportunities to enjoy leisure activities. Natural recreational resources are those places or amenities set aside as parklands, trails (e.g., hiking, bicycling, equestrian), open spaces, aesthetically pleasing landscapes, and a variety of other locales. Man-made recreational resources can include parks, man-made lakes, recreational fields, or sport or recreational venues. National, state, and local jurisdictions typically have designated land areas with defined boundaries for recreation. Other less-structured activities like hunting are performed in broad, less-defined locales. A recreational setting might consist of natural or man-made landscapes and can vary in size from a roadside monument to a multimillion-acre wilderness area.

4.1.2 Affected Environment

Major land uses within the impact corridor include agriculture, rangeland, and urban (see **Appendix F**). Specific land uses in each classification are described below (USACE 1994).

- *Agriculture* – Specific land uses within this classification include highly developed croplands, pasture, small grains, forage crops, hay production, and orchards. The land can be irrigated or nonirrigated.
- *Rangeland* – Specific land use includes the grazing of cattle, horses, sheep, goats, and other domestic animals. This is based on the presence of naturally occurring grasses, grasslike plants and forbs, or shrubs suitable for grazing and browsing. This classification will include natural grasslands, savannas, some wetlands, and other areas with the potential to support certain forb and shrub communities under prudent and normally accepted land management practices.
- *Urban* – Specific land uses within this classification include residential, industrial, transportation, commercial, educational, medical, recreational, open space for environmental protection (i.e., floodway, utility easements, and ROW), and underdeveloped land within political boundaries (i.e., cities, towns, and villages).

The existing land use in the USBP Marfa Sector for the impact corridor ranges from well-developed urban centers of commerce to areas of intensive agricultural activities to extensive areas designated for recreation and wildlife management activities. The following is a brief description of the existing land use in Hudspeth and Presidio counties (USACE 1994):

- *Hudspeth County* – The major land use is rangeland (96 percent). Rangeland is used for production of beef cattle. Agricultural land use (2 percent) is used for the production of cotton, alfalfa, and vegetables. Approximately 40,000 acres (56 percent) of agricultural land is irrigated. There is a limited amount of mining (e.g., primarily talc, stone, and gypsum). The major recreational area is Guadalupe Mountains National Park. The park contains unique plant life, scenic canyons, scenic drives, hot springs, salt basins, white sands, and other geological formations. The leasing of rangeland for hunting is an important secondary and seasonal land use. Urban land use (less than 1 percent) is in Sierra Blanca (population 700 est.), the county seat and principal center of trade and commerce.
- *Presidio County* – Rangeland (99 percent) is the major land use. Rangeland is used to raise cattle and goats. Agricultural land use (1 percent) is limited to the production of cantaloupes, lettuce, watermelons, onions, and alfalfa. Limited irrigation of agricultural land occurs, mostly along the Rio Grande. Major secondary land uses involve hunting and tourism. Most tourism occurs within the Big Bend Ranch

State Natural Area and on adjacent land. Marfa (population 2,689) is the county seat; it and Presidio make up the two urban areas in Presidio County.

Figures 1-1 and **1-2** present detailed maps of the areas surrounding the fence sections.

4.1.3 Direct and Indirect Effects of the Project

Constructing the tactical infrastructure will result in long-term minor adverse impacts on land use. The severity of the impact will vary depending on the need for rezoning to accommodate the fence sections, patrol roads, and lighting. Short-term minor adverse impacts will occur from construction. Impacts on land use due to potential changes in land use designation, and the land use of adjacent properties are expected to be negligible.

For the purposes of this ESP, a land use analysis was conducted using the National Land Cover Dataset. The National Land Cover Dataset is the first land cover mapping project with a national (conterminous) scope. It is likely the most widely used land cover data set in the United States and no other national land cover mapping program has ever been undertaken. The National Land Cover Dataset provides 21 land cover classes for the lower 48 states. The 21 land cover classes were generalized into the following 4 categories: agricultural, urban, rangeland, and water. The impact corridor is classified by approximately 4.6 percent agricultural, 8.9 percent urban, and 86.5 percent rangeland.

Table 4-1 outlines by tactical infrastructure section the existing communities within or adjacent to the Project that will potentially be affected by the tactical infrastructure.

Table 4-1. Communities Potentially Affected by the Project

Section Number	Community Affected
L-1	Sierra Blanca
L-1A	Presidio
L-1B	Presidio

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 borders of the United States (8 U.S.C. 1103(b)).

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 easements, ROWs, or outright purchase.

For those tactical infrastructure sections that are on Federal lands, the most likely means of acquisition will be a ROW obtained from the relevant Federal land manager. On private land, the government will likely purchase the land or some interest in land from the relevant landowner. Acquisition from private landowners is a negotiable process that is carried out between the government and the landowner on a case-by-case basis. The government also has the statutory authority to acquire such interests through eminent domain.

As necessary, gates will be installed to allow landowners to access other portions of their property to reduce potential inconvenience. USIBWC will require gated access for the purposes of routine mowing and other maintenance activities. Farmers may require access for maintenance of irrigation lines and pumps.

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

4.2 VISUAL RESOURCES

4.2.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure sections 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.

CBP does not have a standard methodology for the 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 ESP. Methodologies reviewed included those developed by the National Park Service (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 following discussion 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 impact corridor, 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 assessments 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 4.1.1**. Land cover is those features (e.g., water, vegetation, type of man-made development) that dominate the land within a given parcel. Examples of land cover would 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 occur throughout a region can be considered landscape types. To provide a framework for assessing 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 the impact corridor involves identification 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., National Historic Landmarks (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 in residential, recreational, and industrial areas. 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 Project 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.

4.2.2 Affected Environment

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.

***Visual Environment*.** Based on the Physiographic Map of Texas (University of Texas 2006), the impact corridor lies within the Basin and Range Province. The Basin and Range Province contains eight mountain peaks that are higher than 8,000 feet. Mountain ranges generally trend nearly north-south and rise abruptly from barren rocky plains. Plateaus in which the rocks are nearly horizontal and less deformed commonly flank the mountains. Large flows of volcanic ash and thick deposits of volcanic debris flank the slopes of most former volcanoes. Eroded craters, where the cores of volcanoes collapsed and subsided, are abundant. Gray oak, pinyon pine, and alligator juniper parks drape the highest elevations. Creosote bush and lechuguilla shrubs sparsely populate plateaus and intermediate elevations. Tobosa black grama grassland occupies the low basins.

Primary landform types present within the APEs include the narrow Rio Grande channel and floodplain, cutoff meander loops (most still containing water), arroyos, and gentle ridges and swales within the floodplain. The City of Presidio lies on the toeslope of an alluvial fan. The levee (man-made landform) is almost invisible at Neely's Crossing, but is a substantive linear feature in Sections L-1A and L-1B.

Land cover overlying these landforms can be simplified into three primary types: agriculture, developed, and undeveloped. For the most part, these land cover types parallel the Rio Grande, with developed lands situated farthest from the river channel, and developed and undeveloped lands alternating next to the river channel. The primary encroachment of one land cover type into another is at the Presidio POE, where development intersects the river channel. There are also certain features that cross-cut or link land cover 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 Basin and Range province 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:

- Rural land unit. This unit includes the floodplain of the Rio Grande and the intersecting arroyos 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 4-1**). Typical features include field breaks, irrigation features, unpaved roads, occasional farmsteads or ranches, occasional water towers, and larger metal utility towers.

Figure 4-1. Photograph View of Typical Rural Land Unit (Section L-1)

- Urban/Industrial land unit. This unit includes the floodplain of the Rio Grande and the toeslope of the adjacent alluvial fan in Sections L-1A and L-1B where they are overlain by the City of Presidio (see **Figure 4-2**). 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 Presidio POE; industrial and commercial areas; overhead utility lines on poles; elevated roadways and overpasses; and elevated signage.

Character and Quality of Visual Resources. **Tables 4-2** and **4-3** provide summaries of the visual character and quality, respectively, of visual resources observed within the land units within the Marfa Sector. Values reflect visual character and visual quality of resources seen from distances of 50 feet to 1,000 feet (see **Figure 4-3**). Within Section L-1, where the levee is only a few feet high, the Rio Grande channel can be seen from a distance, except where it is obscured by vegetation. In Sections L-1A and L-1B, the levee typically obscures the view of the Rio Grande channel except at the Presidio POE, although the greater elevations within the city center might allow residents and businesses to see over the levee in places. Additionally, the amount of visual clutter between the viewer and the impact corridor increases with distance.

Figure 4-2. Photograph View of Presidio (Section L-1B)

Table 4-2. Character of Visual Resources within Typical Marfa Sector Land Units (Current Conditions)

	Rural	Urban/Industrial
Line	Primarily horizontal lines (fields, roads, canals), with occasional vertical elements (water towers, utility towers, tree lines, buildings)	Vertical lines more prominent than horizontal
Color	Earthy colors (bare earth and crops, open ground, sparse vegetation)	Often a high variety of colors associated with buildings, signs, green spaces
Form	Mixture of angled and curved forms (roads and buildings vs. rolling hills and meandering river)	Primarily rectilinear forms but can be punctuated by curves from more elaborate architecture or organic shapes of natural elements
Texture	Relatively subtle variations in texture (mostly bare earth or crops)	Variety of textures related to different building materials against natural textures in green spaces

Table 4-3. Quality of Visual Resources within Typical Marfa Sector Land Units (Current Conditions)

	Vividness	Intactness	Unity	Rating
Rural	Moderate/High	Moderate/High	Moderate/High	Moderate/High
Urban/Industrial	Low to High	Moderate	Low to High	Moderate

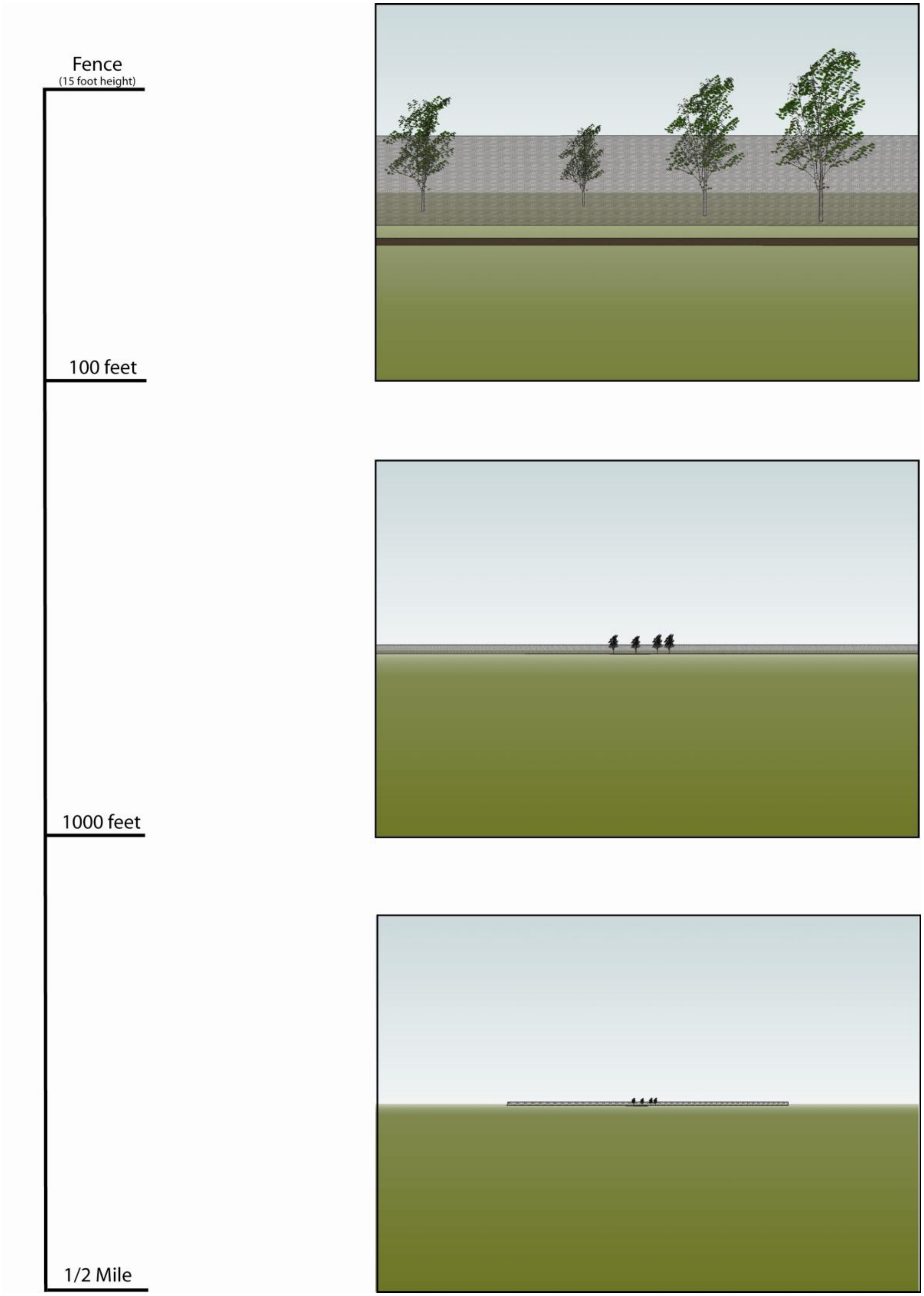

Figure 4-3. Schematic Showing Visibility of Fencing at Various Distances

In terms of visual quality, this 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. 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:

- Neely Ranch
- Neely Arroyo
- La Junta de los Rios Archaeological District
- Mimbrosa Arroyo
- Marfa Lights
- Presidio.

Viewer Response. The pool of viewers making up the affected environment includes single individuals, such as rural landowners on whose property the fence would be constructed, and groups of individuals such as residents and business owners within the City of Presidio, 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. 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
  - Urban residents
- Commercial viewers
  - Rural farms, ranches, and isolated businesses
  - Urban businesses
- Industrial viewers
  - Rural industries (e.g., pump stations, pipeline monitors)
  - Urban industries

- Recreational viewers
  - 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, Texas Historical Commission [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 Rio Grande from the highway as they pass through the region will have a different viewer response relative to that resource than a viewer that regularly walks along the levee overlooking the river.

4.2.3 Direct and Indirect Effects of the Project

The Project will adversely impact visual resources both directly and indirectly. Construction of tactical infrastructure will result in the introduction of new temporary (e.g., heavy equipment, supplies) and permanent (e.g., fencing and patrol roads) visual elements into existing viewsheds. Clearing and grading of the landscape during construction, as well as demolition of buildings and structures within the impact corridor, will result in the removal of visual elements from existing viewsheds. Finally, the fence sections will create a physical barrier potentially preventing access to some visual resources.

Impacts on aesthetic and visual resources will include short-term impacts associated with the construction phase of the Project and use of staging areas, recurring impacts associated with monitoring and maintenance, and long-term impacts associated with the completed Project. Impacts can range from minor, such as the impacts on visual resources adjacent to the impact corridor when seen from a distance or when views of fences are obstructed by intervening elements (e.g., trees, buildings) to major, such as the intrusion of fence sections into high-quality views of the Rio Grande. The nature of the impacts would range from neutral for those land units containing lower quality views or few regular viewers, to adverse, for those land units containing high-quality views, important cultural or natural resources, or viewers who would have constant exposure to the fence at close distances. Beneficial impacts are also possible (e.g., addition of the fence increases the unity or dramatic impact of a view, removal of visual clutter within the impact corridor can clarify a view, or a viewer positively associates the fence with a feeling of greater security), but are considered to be less common.

The primary introduced visual elements associated with the Project in Section L-1 are the single line of fencing, gates, patrol roads, access roads, and construction clutter (e.g.,stockpiles of supplies and heavy equipment during construction), and lighting (Sections L-1A and L-1B). The Project will also potentially remove existing visual elements, such as buildings, vegetation, and portions of landforms (e.g., straightening of the levee face for construction of the retaining wall in Sections L-1A and L-1B) that occur within the 60-foot permanent impact area. Finally, the fence 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 in Section L-1, 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 (width, height, materials, color), the patrol road (paved or unpaved, width), and the access roads (number, paved or unpaved, width).

Removal of existing visual elements in Section L-1 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 would 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 would 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.

In Sections L-1A and L-1B, the tactical infrastructure will consist of a retaining wall on the river side of the existing levee, topped with a typical guard rail. The patrol road will be the existing road on top of the levee. Apart from the guard rail, the only new addition to the corridor will be lighting poles, placed at approximately 50-foot intervals along the top of the levee in each of these sections. No clearing or removal of visual elements is anticipated in Sections L-1A and L-1B.

Visual Resource Concerns. In **Section 4.2.2**, **Tables 4-2** and **4-3** provide a summary of the character and quality associated with visual resources currently present within the impact corridor. **Tables 4-4** and **4-5** list how implementation of the Project will likely alter the character and quality of existing visual resources within each land unit. **Figures 4-4** and **4-5** provide examples of typical impacts; these images illustrate the impacts associated with the addition of a fence constructed using a type of primary 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 rural land units in Section L-1, the fence will add an additional linear feature, but will generally be taller than any existing feature in the immediate viewshed. Accordingly, the impact in Section L-1 will be negative to the owners of Neely Ranch and to casual viewers of this section of the Rio Grande that use Rancho Road. In the rural land units within Sections L-1A and L-1B, the version of the fence that would be used (retaining wall behind levee and guard rail) will typically be lost from view once the viewer moves more than a few hundred feet from the guard rail. Even in relatively close proximity, the impact on the views from on top of the levee will be minor and typically neutral.

The lighting associated with the patrol road is likely to be the most visually intrusive element of the Project, with the degree of impact during daylight hours tied to the number and height of lighting poles, and the degree of impact during night hours tied to the brightness and extent of illumination created by the lights. From the vantage point of the City of Presidio, which is set back several hundred or more feet from the levee, except at the Presidio POE, the addition of a guard rail along the top of the levee will hardly be visible. The impact will be greater for those residences and businesses closest to the river or at high points within the city, and less for those lying further inside the city, as there will be greater screening of the lights and lighted areas from other buildings and visual elements of the urban landscape. For this land unit, therefore, impacts will range from minor to major, and neutral to adverse.

Finally, with respect to the impacts on the specific visual resources listed in **Chapter 4.2.1**, implementation of the Project will likely have short- or long-term adverse impacts on the settings of those resources. The greater the distance between the resource and intrusive visual elements (primarily the fence), and the more intervening visual elements between them, the less severe of an impact. For example, construction of the fence at a distance of 60 feet from an 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.

Table 4-4. Impact on the Character of Visual Resources within Typical Marfa Sector Land Units

	Rural	Urban/Industrial
Line	In Section L-1, the horizontal line of the fence will blend to some extent with other linear features; however, due to its height, the fence will become the dominant linear element in the viewshed. In Sections L-1A and L-1B, the guard rail will blend with the levee even at short distances; however, the lights will contrast with the generally horizontal lines in these areas except where they co-occur with other vertical features such as electric poles. The patrol road and access roads also should blend, both at short and long distances.	For viewers in the City of Presidio that have a clear view of the levee or the Rio Grande, the addition of the guard rail will blend with the linear feature of the levee. The lighting poles might be discordant except where they co-occur with other vertical linear features.
Color	The current fence design parameters call for fencing to be natural (grey/black weathering to brown through oxidation) in Section L-1. The height and massive quality of the fence will be completely discordant with the other colors in Section L-1. In Sections L-1A and L-1B, the color of the guard should have no impact. For rural landowners, the same comments regarding lighting noted for urban/industrial viewers are also valid.	The "color" parameter of most importance in the urban/industrial land unit is that of the pool of light created by the lights in the corridor between dusk and dawn. Although the POE has lights, most of the area towards the river is rural and any pools of light will contrast with the normal nighttime views in that direction.
Form	The fence and patrol road are rectilinear in form and will result in greater domination of rectilinear forms compared to organic forms in Section L-1. In Sections L-1A and L-1B, the form of the guard rail will be lost against that of the more dominant levee.	In Sections L-1A and L-1B, the form of the guard rail will be lost against that of the more dominant levee.
Texture	As a man-made, synthetic element, the fence would contrast with the dominant textures of this land unit in Section L-1. In Sections L-1A and L-1B, the guard rail also represents a contrast, but will contrast no more than similar existing features such as the POE bridge and the levee.	Because this land unit contains a variety of textures, the texture of the guard rail, lights, and patrol road are more likely to blend with the textures of this land unit at least at a distance.

Table 4-5. Quality of Visual Resources within Typical Marfa Sector Land Units after Construction

Land Units	Vividness	Intactness	Unity	Rating
Rural	Moderate	Moderate/High	Moderate	Moderate
Urban/Industrial	Low to High	Low/Moderate	Low to High	Moderate

Figure 4-4. Typical Views Towards Construction Corridor, Section L-1

Figure 4-5. Typical Views Towards Impact Corridor, Sections L-1A and L-1B

With respect to the potential impacts on viewing of the phenomenon known as the Marfa Lights, the primary element of the Project that has the potential to negatively impact the viewer experience is lighting. CBP is working with the University of Texas to identify lighting configurations that will minimize the ambient glow of the lights onto the patrol road and fence, including use of down-lights and shielding.

Viewer Response Concerns. In **Chapter 4.2.1**, 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).

In many respects, the principle of "not in my backyard" has a strong correlation with the responses of viewers for whom view of the tactical infrastructure 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 it will represent a major adverse impact on visual resources visible from their property. In the case of the properties in Presidio, however, the use of a retaining wall and short guard rail on the back of the existing levee might be considered less of an impact than the lighting and poles used to illuminate the patrol road. 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, particularly in the case of Sections L-1A and L-1B where the primary visual element will be a guard rail and light poles, unless the fence obscures a visual resource considered to be of high quality or of cultural importance (e.g., a view of the Rio Grande in Section L-1). 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 observe the tactical infrastructure on a less regular basis (i.e., recreational viewers, special interest viewers, intermittent viewers), viewer responses will be tied to perception of how the tactical infrastructure has altered their access (i.e., impede existing views or impede physical access to views) to valued visual resources. Although any of these groups might 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.

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 fence 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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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 relative to geological and soil resources for the tactical infrastructure sections 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 a 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 act also ensures that Federal programs are administered in a manner that, to the extent practicable, will be compatible with private, state, and local government programs and policies to protect farmland.

The FPPA and Natural Resources Conservation Service (NRCS) pertain to activities on prime and unique farmland, as well as farmland of statewide and local importance (see 7 CFR Part 658, 5 July 1984). Determination of whether an area is considered prime or unique farmland and potential impacts associated with a project is 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 658).

5.2 AFFECTED ENVIRONMENT

Physiography and Topography. The USBP Marfa Sector occurs in the Trans-Pecos Region of the Basin and Range Physiographic Province in Texas, which is bordered on the west by the Rio Grande and on the east by northwest-to-southeast-trending mountain ranges that rise above open rocky plains. This region is characterized by the highest peaks in Texas, with eight mountain peaks higher than 8,000 feet, and relatively narrow river valleys that have formed on the plains by eroding basin fill deposits or the older underlying rock. Plateaus of nearly horizontal and less-deformed rocks commonly flank the mountains. The interiors of mountain ranges are composed of strongly folded and faulted sedimentary, volcanic, or granitic rocks. Most peaks are ancient, formerly active volcanoes that have accumulated thick deposits of volcanic ash and debris on their flanks. These volcanoes were explosive in nature but successive lava flows were uncommon. Calderas, where the cores of volcanoes collapsed or subsided, are abundant. The topographic profile of the USBP Marfa Sector impact corridor range is relatively level as it follows the USIBWC levee system for the majority of its length with elevations ranging from approximately 3,500 feet above mean sea level (MSL) along Section L-1 to approximately 2,500 feet above MSL along Sections L-1A and l-1B (TopoZone.com 2007).

Geology. The USBP Marfa Sector occurs within the Trans-Pecos Region of the Basin and Range geomorphic province. The surface geology of the Trans-Pecos Region consists of Lower Paleozoic rocks to Quaternary unconsolidated materials, formed during a diverse and complex structural history spanning approximately 400 million years. At least two major series of tectonic episodes have shaped this region. The first series of episodes resulted in contorted

Permian sedimentary rocks that were then eroded to a flat plain. Cretaceous seas then deposited carbonate sediments on this unconformity and formed what is now known as the limestones of the Comanche Series. In a second series of tectonic episodes, this unconformity was then deformed by a combination of overthrusting and extensive intrusive and extrusive igneous activity. This area then ceased to be volcanically active and much of the surface topography began to be transformed through erosion and alluvial deposition during the Quaternary period, as is the case with the Upper Rio Grande Basin. Currently, most of the Cretaceous deposits have been removed by erosion (USACE 1994).

Soils. Generally the soils of the USBP Marfa Sector consist of desertic soils with some undulating to hilly calcareous soils over limestone and limy earths of the Grande Prairie and Edwards Plateau (USACE 1994). The majority of the soils in Section L-1 in Hudspeth County were unmapped by the NRCS as shown in **Appendix G**. However, the eastern portion Section L-1 occurred in the Nickel-Delnorte-Canutio-Badland and Tigua-Harkey-Glendale-Gila soil associations as shown in **Appendix G**. The Nickel-Delnorte-Canutio-Badland soil association consists of well-drained, moderately to moderately rapid permeable, very gravelly and fine sandy loams that occur on alluvial fans, fan piedmonts, hilly uplands, and on valley floors of wide arroyos in mountainous areas (0 to 35 percent slopes). The Tigua-Harkey-Glendale-Gila soil association consists of moderately well-drained to well-drained, moderately to moderately slowly to very slowly permeable, fine sandy to silty clay loams and silty clays that occur on alluvial fans, floodplains, bajadas, stream terraces, and piedmont slopes (0 to 5 percent slopes). Neither of these soil associations is designated as farmland of importance in Hudspeth County (NRCS 2007).

The majority of the soils in Section L-1B in Presidio County were mapped as occurring within the Nickel-Delnorte-Canutio-Badland soil association by the NRCS as shown in **Appendix G**, Map 3. A small portion of Section L-1B at its western extent was unmapped. The Nickel-Delnorte-Canutio-Badland soil association consists of well-drained, moderately to moderately rapid permeable, very gravelly and fine sandy loams that occur on alluvial fans, fan piedmonts, hilly uplands, and on valley floors of wide arroyos in mountainous areas (0 to 35 percent slopes). The majority of the soils in Section L-1A in Presidio County were unmapped by the NRCS as shown in **Appendix G,** Map 4. However, a small western portion of Section L-1A occurred in the Nickel-Delnorte-Canutio-Badland soil association. This soil association is not designated as farmland of importance in Presidio County (NRCS 2007).

In Hudspeth County, soils of the Tigua, Harkey, Glendale, and Gila series occur within the eastern portion of the Section L-1 impact corridor and are classified as partially hydric (the mapping units have inclusions of hydric soils that are too small to map as individual units). The mapped soil associations that occur within Sections L-1B and L-1A impact corridors are not classified as partially or fully hydric in Presidio County. Hydric soils are soils that are saturated, flooded, or have ponding sufficiently long during the growing season to develop anaerobic (oxygen-deficient) conditions in upper horizons. The presence of hydric soil is one of the three criteria (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).

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 78 acres, which could 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 level agricultural fields for irrigation. Any additional topographic alterations associated with the installation of the tactical infrastructure are expected to be minor. The impact corridor will be regraded and contoured following tactical infrastructure installation. This will minimize modifications to existing flood-flow characteristics.

The Storm Water Pollution Prevention Plans (SWPPPs) should be developed and 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 will be 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 adverse impacts on geologic resources could occur at locations if bedrock is at the surface and blasting is necessary to grade for fence placement or patrol road development. 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 due to the lack of available information on soils in the fence sections. In most cases, it is expected that Project design and engineering practices could be implemented to mitigate geologic limitations to site development.

Soils. Short-term minor direct adverse impacts on soils are expected as a result of implementing the Project. Soil surveys will need to be conducted to determine the soil associations and engineering limitations in the unmapped areas of the impact corridor. Soil disturbance and compaction due to grading, contouring, and trenching associated with the installation of the fence, patrol roads, and other tactical infrastructure for all three fence sections, and building of the new levee retaining walls in Section L-1B and L-1A will impact approximately 78.1 acres. Short- and long-term minor to moderate adverse impacts will be expected on the approximately 13 acres of the permanent soil disturbance as a result of grading, contouring, trenching, and compaction associated with the installation of the fence. However, the majority of soils within the impact corridor have been previously disturbed by levee development, agricultural activities, and other land uses prior to this Project. 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 by implementing BMPs as established during the development of the SWPPP. Implementing these BMPs will minimize soil erosion impacts in areas of steep slopes, especially in Section L-1. 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 expected to directly impact the existing soils as a result of grading, excavating, placement of fill, compaction, and mixing or augmentation necessary to prepare the sites for development of the fence sections and patrol roads and associated utility lines will also be avoided by the proper implementation of the BMPs. Due to the semiarid 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.

The construction activities will be expected to result in an increase in soil erosion in areas of steep slopes, especially in Section L-1. 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. Sediments washed from construction sites will be carried to and deposited in the Rio Grande. In addition, wind erosion has the potential to impact disturbed soils where vegetation has been removed due to the semiarid climate of the region. Construction activities are expected to directly impact the existing soils as a result of grading, excavating, placement of fill, compaction, and mixing or augmentation necessary to prepare the site for development of the fence, patrol and access roads, and associated utility lines. 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.

The SWPPP 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 SWPPP will list BMPs that the discharger will use to address storm water runoff along with the locations of those BMPs. Additionally, the SWPPP 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.

None of the mapped soil associations were listed as prime farmland soils or appear to be associated with farmland of local, unique, or statewide importance in Hudspeth and Presidio counties. No significant adverse impacts on prime farmland soils will be expected.

6. WATER USE AND QUALTITY

6.1 HYDROLOGY AND GROUNDWATER

6.1.1 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 relates to the quantity and quality of the water resource and its demand for various human purposes. Hydrology addresses the properties, distribution, and circulation of water on and below the earth's surface and in the atmosphere, and is expressed as water occurrence, distribution, movement and balances in the ecosystem. Hydrologic characteristics are affected primarily by temperature and total precipitation, evapotranspiration rates, topography which determines rate and direction of flow, and soil and geologic properties which determine the rate of subsurface flow and recharge to the groundwater reservoir. Groundwater consists of subsurface hydrologic resources. It is an essential resource that functions to recharge surface water and is used for drinking, 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.

The Safe Drinking Water Act (SDWA) of 1974 (42 U.S.C. 2011-300) establishes a Federal program to monitor and increase the safety of all commercially and publicly supplied drinking water. The Project has no potential to affect public drinking water supplies.

6.1.2 Affected Environment

The impact corridor is in the Upper Rio Grande drainage basin, which is part of the much larger Rio Grande drainage basin, which includes an area of approximately 355,500 square miles. This area is characterized by a semiarid climate due to low annual precipitation (8 inches in Hudspeth County and 15 inches in Presidio County). Due to the semiarid climate, vegetation is sparse. Reduced groundcover along with steep slopes due to local topography can lead to heavy runoff and high erosion potential during precipitation events. In the impact corridor, surface runoff generally flows from higher elevations to the north of the Rio Grande which flows west to east to the south of the fence sections. Much of the Upper Rio Grande drainage basin is composed of rural, undeveloped land used primarily for ranching. Water development projects in the

Upper Rio Grande Valley have disrupted natural flow regimes, including structures such as Riverside Diversion Dam and International Dam to the west of the impact corridor and the Amistad Reservoir, to the east. Substantial quantities of surface water are diverted from the Rio Grande to meet municipal, industrial, and agricultural demands in Texas and Mexico. A significant portion of the Rio Grande flow is used in the Upper Rio Grande Valley for municipal (public and domestic), manufacturing (industrial), steam-electric power, mining (recovery of crude petroleum), irrigation, and livestock. Most of the water diverted in the Upper Rio Grande Valley is returned as treated, partially treated, or untreated municipal and industrial wastewater that eventually flows back into the Rio Grande (USACE 1994).

The major aquifer underlying the impact corridor occurs in the Alluvium and Bolson deposits, which are found in several isolated areas. This aquifer is an important source for irrigation and public water supply. It is an unconfined system consisting of sand, gravel, silt, and clay that ranges in depth from 100 to 1,000 feet, but can extend to depths of more than 3,000 feet. Large capacity wells yield from 500 to 900 gallons per minute with maximum yields exceeding 2,500 gallons per minute. Groundwater is the primary source of drinking water in the impact corridor. Groundwater assessments of the Alluvium and Bolson deposits aquifer in the impact corridor indicate that the most common sources for potential contamination include the following: (1) increased chloride/sulfate concentrations along the Rio Grande that exceed Secondary Drinking Water Standards, (2) higher levels of total dissolved solids with levels exceeding 3,000 to 10,000 milligrams per liter (mg/L), (3) natural/man-made levels of nitrate (41 to 60 percent) in the counties of Presidio and Hudspeth, and (4) fluoride (0 to 3 percent) that continually exceeds the Federal drinking water standards. In general, Hudspeth and Presidio counties have been determined by the Texas Natural Resource Conservation Commission (TNRCC) to have low to moderately high potential for groundwater contamination. Sources of potential groundwater contaminants include areas of radioactive anomalies or occurrences of radioactive minerals (radium) in Hudspeth and Presidio counties and feedlots and animal wastes (nitrogen, phosphates, salts, and infectious agents) in Presidio County. Other potential pollution sources result from inadequate treatment facilities for wastewater and industrial/hazardous wastes which might pose a risk in some regions of the U.S./Mexico international border. Discharges from these facilities could impact waters which cross the border or flow into rivers that form the international boundary. Within the impact corridor, the sister cities of Ojinaga and Presidio are considered major contributors of waste discharges into the Rio Grande (USACE 1994).

6.1.3 Direct and Indirect Effects of the Project

Short- and long-term negligible adverse impacts on the hydrology of the Rio Grande will be expected to occur as a result of grading and contouring in the impact corridor. Grading and contouring will be expected to alter the topography and remove vegetation on approximately 78 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 SWPPPs to manage storm water both during and after construction. Therefore, effects will be expected to be negligible.

Short-term, minor, direct, adverse construction-related impacts on groundwater resources in Hudspeth and Presidio counties are also expected. During construction, water will be required for pouring concrete, watering of road and ground surfaces for dust suppression during construction, and for washing construction vehicles. Water use for construction will be temporary, and the volume of water used for construction will be minor when compared to the amount used annually in the area for municipal, agricultural, and industrial purposes.

The potential for short-term negligible adverse effects 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.

6.2 SURFACE WATERS OF THE UNITED STATES

6.2.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific obligation under the 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 surface waters 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 or locale.

Waters of the United States are defined within the Clean Water Act (CWA), as amended, and jurisdiction is addressed by the USEPA and the U.S. Army Corps of Engineers (USACE). These agencies 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 (e.g., typically 3 months), and (4) wetlands that directly abut such tributaries.

Wetlands and riparian habitats represent some of the most ecologically important and rare vegetation communities on desert landscapes. They provide keystone habitat for a wide array of plant and animal species including resident and migrating birds, amphibian and fish species, mammals, and insects. Vegetation production and diversity are usually very high in and around these mesic to aquatic sites, with many plant species adapted only to these unique environments. In addition, wetlands and riparian zones provide a variety of hydrologic functions vital to ecosystem integrity. These include water filtration of sediment, groundwater recharge, and nutrient/chemical capture (USFS 1995). Development and conversion of wetlands and riparian zones affect wildlife diversity, carrying capacity, and hydrologic regime. Changes to and removal of wetlands can cause effects that are proportionally greater than elsewhere in an ecosystem (Graber 1996).

Wetlands have been defined by agencies responsible for their management. The term “wetland” used herein, is defined using USACE conventions. The USACE has jurisdiction to protect wetlands under Section 404 of the 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 CFR 328.3[b]). Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands have three diagnostic characteristics that include: (1) over 50 percent 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, or saturated to the surface at some time during the growing season of the prevalent vegetation (USACE 1987).

Wetlands are protected as 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).

6.2.2 Affected Environment

The predominant surface water feature in the impact corridor is the Rio Grande (called the Rio Bravo in Mexico). The Rio Grande is one of the longest rivers in North America, and its basin is important to both the United States and Mexico. The allocation of Rio Grande water between the two countries is governed by a treaty that was signed in 1944.

The fence sections follow the International Boundary Water Commission (IBWC) levee system of the Rio Grande for the majority of their lengths. There are no permanent surface water features occurring within the impact corridors. Surface water features occurring adjacent to the impact corridors include the Rio Grande and open water components of resacas (bancos) that occur to the north of Sections L-1 and L-1A. The fence alignments cross several ephemeral washes within the impact corridors and numerous washes cross under the access road to the north of Section L-1.

The 2004 USEPA CWA §303[d] list indicates the waters of the Rio Grande-Fort Quitman, within the Section L-1 impact corridor, are impaired as a result of arachlor, bacteria, chlorides, and total dissolved solids. No approved total maximum daily loads (TMDLs) have been reported to the USEPA by the State of Texas at this time (USEPA 2008).

The waters upstream of Amistad Dam, within the impact corridor of the L-1B and L-1A fence sections, were identified on the 2000 State of Texas CWA §303(d) lists as "partially supporting" aquatic life uses due to ambient toxicity of water downstream of Del Rio, Texas. The recorded flow rates for waters upstream of Amistad Dam (Segment 2306 of the Rio Grande) during the 2001 and 2002 sampling events were below the levels necessary for water quality standards to be applicable. Sample testing revealed several occurrences of total suspended solids and chlorine and one instance of mercury detected above acceptable levels. Testing revealed no lethal toxicity to fathead minnow (*Pimephales promelas*) and water flea (*Ceriodaphnia dubia*) in lab tests. Some sublethal effects were observed in the study but were determined inconclusive since aquatic life uses will not be applicable during extremely low flows. Toxicity Identification Evaluations were not conducted due to the ambiguous results from the toxicity tests. Although it was recommended that Segment 2306 remain on the 303(d) list, additional testing was determined to be necessary to fully assess the presence and causes of toxicity prior to the establishment of TMDLs (TCEQ 2003). The 2004 USEPA CWA §303(d) list indicates the waters upstream of Amistad Dam are impaired as a result of bacteria and chronic toxicity. No approved TMDLs have been reported to the USEPA by the State of Texas at this time (USEPA 2008).

Jurisdictional Wetlands and Other Waters of the United States within the Project Areas. Field surveys were conducted in Sections L-1, L-1A, and L-1B on January 28 and 29, 2008, to delineate jurisdictional wetlands and other waters of the United States within the project areas. Delineations were also conducted along access roads and staging areas associated with the fence alignments. Formal delineations were conducted within a 150-foot corridor associated with the fence alignments, 60 feet to either side of access roads, and within staging areas.

Determination of the occurrence and extent of jurisdictional wetlands and other waters of the United States was based on the application of procedures established in the USACE *Wetlands Delineation Manual*, Technical Report Y–87–1 (USACE 1987), and the *Interim Regional Supplement to the Corps of*

Engineers Wetland Delineation Manual: Arid West Region, Technical Report ERDC/EL TR-06-16 (USACE 2006). Determination of the occurrence of jurisdictional wetlands was based on the presence or absence of hydrophytic (wetland) vegetation, hydric (wetland) soils, and wetland hydrology. The presence of all three of the criteria is necessary for an area to be designated as a jurisdictional wetland under normal conditions.

Determination of the extent of jurisdictional washes (arroyos) and other Waters of the United States in the project areas was based on characterization of the landward extent of the ordinary high water mark (OHM). Indicators used to determine the occurrence and extent of jurisdictional washes included the presence of developed channels, typically 2 feet or greater in width; the occurrence of an OHM; the absence of fine sediments along flow paths; distinct changes in the vegetative assemblage or larger or more dense vegetation than surrounding areas; the presence of cut banks; the presence of litter, debris, or rack lines; occurrence of desiccation cracks or other indicators of hydrology; and other indicators of the occurrence of intermittent water flow regimes.

Table 6-1 provides the fence section numbers, wetland or other Waters of the United States types, and the acreage of each identified wetland or other Waters of the United States within a impact corridor. The 60-foot impact corridor is considered the maximum width of potential impact associated with implementing the Project. Maps showing the locations and boundaries of delineated wetlands and other Waters of the United States in the Project assessment areas are provided in Attachment D of the Biological Survey Report (see **Appendix D**).

Based on the field surveys, 14 wetlands or other Waters of the United States (WL1 through WL14) occur within the assessment area. Wetlands WL1 through WL9 occur in Section L-1, WL11 and WL12 occur in Section L-1B, and WL13 and WL14 occur in Section L-1A. The following text provides brief descriptions of the delineated wetlands.

<u>Section L-1</u>

WL1. Wetland 1 is palustrine forested wetland associated with a resaca (banco). Vegetation in the wetland is characterized by a near monotypic cover of *Tamarisk ramosissima*.

WL2. Wetland 2 is the eastern component of WL1. It is separated from WL1 by a road. Vegetation in WL2 is characterized by *Tamarisk ramosissima*.

WL3. Wetland 3 is a palustrine emergent and scrub shrub habitat characterized by *Distichlis spicata* and cut *Tamarisk ramosissima*. An approximately 3-foot-high berm separates the emergent and scrub shrub component of WL3 from adjacent open water habitat to the north.

Table 6-1. Wetlands and Other Waters of the United States and Acreages within the Project Assessment Areas in Sections L-1, L-1A, and L-1B

Identification of Wetland or Other Waters of the United States	Section Number	Types of Wetland or Other Waters of the United States	Acreage Within 60-Foot Impact Corridor
WL1	L-1	Palustrine forested wetland associated with a resaca	0.17 acres
WL2	L-1	Palustrine forested wetland associated with a resaca	0.25 acres
WL3	L-1	Palustrine emergent/scrub shrub	0.0 acres
WL4	L-1	Palustrine scrub shrub/emergent with open water components	0.47 acres
WL5	L-1	Palustrine emergent bordering a palustrine forested/scrub shrub	0.0 acres
WL6	L-1	Wash	0.02 acres
WL7	L-1	Wash	0.02 acres
WL8	L-1	Wash	0.04 acres
WL9	L-1	Palustrine forested associated with a playa	0.08 acres
WL10	L-1B	Wash tributary to Cibolo Wash	0.08 acres
WL11	L-1B	Cibolo Wash – northern channel	0.47 acres
WL12	L-1B	Cibolo Wash – southern channel	0.08 acres
WL13	L-1A	Palustrine emergent associated with a resaca	0.0 acres
WL14	L-1A	Palustrine emergent associated with a resaca	0.0 acres

WL4. Wetland 4 is a palustrine scrub shrub and emergent habitat bordering open water habitat. Vegetation in the wetland is characterized by *Distichlis spicata* and *Tamarisk ramosissima*. WL4 is connected to the open water component adjacent to WL3.

WL5. Wetland 5 is a palustrine emergent wetland bordering palustrine forested and emergent habitat. Vegetation in the wetland is characterized by *Distichlis spicata* and *Tamarisk ramosissima*.

WL6. Wetland 6 is an ephemeral drainage channel that drains directly to the Rio Grande. The channel narrows down and then ends approximately 250 feet upstream of the access road. The channel is approximately 8 to 10 feet wide at the road crossing.

WL7. Wetland 7 is an ephemeral wash that drains directly to the Rio Grande. The channel narrows down and then ends approximately 75 feet upstream of the access road. The channel is approximately 2 to 8 feet wide upstream of the access road, and 4 to 5 feet wide downstream of the road.

WL8. Wetland 8 is a wide shallow ephemeral wash that drains directly into the Rio Grande. The wash channel ranges from approximately 10 to 20 feet in width in proximity to the road crossing. It narrows down to 8 feet approximately 150 feet downstream of the road crossing.

WL9. Wetland 9 is characterized by a palustrine forested habitat bordering open water. Vegetation in the wetland is characterized by a near monotypic cover of *Tamarisk ramosissima*. Much of the open water component of WL9 had dried down at the time of the delineation.

Section L-1B

WL10. Wetland 10 is an ephemeral tributary channel to the Cibolo Wash.

WL11. Wetland 11 is a wide ephemeral wash channel on the west side of Cibolo Wash.

WL12. Wetland 12 is a wide ephemeral wash channel on the east side of Cibolo Wash.

Section L-1A

WL13. Wetland 13 is a palustrine emergent wetland associated with a resaca (banco). The wetland is characterized by a near monotypic stand of *Phragmites australis*.

WL14. Wetland 14 is a palustrine emergent wetland associated with a resaca (banco). The wetland is characterized by a near monotypic stand of *Phragmites australis* bordered on the upland edge by a dense coverage of *Salsola tragus*.

6.2.3 Direct and Indirect Effects of the Project

Minor short- and long-term impacts on wetlands and washes in Section L-1 will be expected. The tactical infrastructure for Section L-1 will consist of a primary pedestrian fence, patrol road, access road, and staging areas. The access road that connects to the north end of Section L-1 crosses numerous washes. The access road is currently a hard-top county road with established wash crossing. No impacts on washes crossing under the planned access road will be expected.

Wetlands WL1, WL2, WL3, and WL9 extend within the 60-foot impact corridor (see **Table 6.2-1**) in Section L1. In addition, three ephemeral washes (WL6, WL7, and WL8) cross the tactical infrastructure alignment. Placing tactical infrastructure adjacent to wetlands and across wash channels will result in potential short-term impacts on the wetlands and washes as a result of land disturbance and associated erosion and sedimentation. Erosion and sediment controls and storm water management practices (discussed below) will be implemented during construction to minimize the potential for adverse effects on wetlands adjacent to the tactical infrastructure alignment and to the washes crossed by the alignment. Long-term effects will occur as a result of the placement of fill associated with construction of the fence, new patrol roads, or upgrades to existing patrol roads. Impacts on the wetlands and washes will be avoided to the maximum extent practicable.

No impacts on wetlands or other Waters of the United States will be expected in Section L-1A. Two palustrine emergent wetlands (WL13 and WL14) associated with resacas were identified within the 150-foot impact corridor associated with the tactical infrastructure alignment in Section L-1A. Neither wetland extends into the 60-foot impact corridor (see **Table 6.2-1**) in Section L-1A. Erosion and sediment controls and storm water management practices (discussed below) will be implemented during construction to minimize the potential for adverse effects on these wetlands.

Minor short- and long-term impacts on Cibolo Wash will be expected in association with access road maintenance. Three wash channels associated with Cibolo Wash occur in Section L-1B. A planned access road follows an existing unimproved road that crosses a tributary channel to Cibolo Wash (WL10), the southern channel of Cibolo Wash (WL12), and follows along the northern bank of the northern channel of Cibolo Wash (WL11). Short-term impacts could occur as a result of potential grading necessary to maintain the existing unimproved road. Long-term impacts could occur if placement of fill were necessary to maintain the road. Any impacts will be expected to be minor because the access road alignment follows an existing unimproved road, and Cibolo Wash along the eastern access road alignment has been disturbed as a result of ongoing sand and gravel quarrying activities. Any impacts on the wash will be avoided to the maximum extent practicable. No wetlands or other Waters of the United States were identified within the impact corridors or within the staging areas in Section L-1B.

The Project is expected to have minor short-term, adverse effects on surface water quality as a result of potential erosion and associated transport of sediments into adjacent surface waters. Development of SWPPPs will aid in controlling water pollution, and would include designing BMPs including erosion and sediment controls that the discharger will use to protect storm water runoff. Proper engineering practices, erosion and sediment controls, and storm water BMPs will be implemented during and after construction.

If wetland impacts cannot be avoided, CBP would develop, submit, and implement a wetlands identification, mitigation, and restoration plan to avoid or minimize impacts and compensate for unavoidable impacts. The plan would outline BMPs from pre-construction to post-construction activities to reduce impacts on wetlands and water bodies.

6.3 FLOODPLAINS

6.3.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific obligation under the 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 on floodplains.

Floodplains are areas of low-level ground and alluvium adjacent to 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.

6.3.2 Affected Environment

Section L-1 is depicted as occurring in the 100-year floodplain of the Rio Grande, as identified on the November 1, 1985, FEMA FIRM Panel No. 4803611050B for Hudspeth County, Texas. This area is designated as Zone A, an area within the 100-year floodplain where base flood elevations and flood hazard factors were not determined (FEMA 1985). Low USIBWC levees of undetermined effectiveness run the length of the impact corridor and it remains uncertain as to their designation as a floodplain edge.

Sections L-1A and L-1B are depicted as occurring in the 100-year floodplain of the Rio Grande, as identified on the July 3, 1985, FEMA FIRM Panel No. 4805300700B for Presidio County, Texas. This area is also designated as Zone A. Well-defined levees exist and are considered the floodplain edge throughout.

6.3.3 Direct and Indirect Effects of the Project

Short- and long-term minor impacts on wetlands and washes in Section L-1 will be expected. The tactical infrastructure for Section L-1 will consist of a primary pedestrian fence, patrol and access roads, and staging areas. The access road that connects to the north end of Section L-1 crosses numerous washes. The access road is currently a hard-top county road with established wash crossing. No impacts on washes crossing under the access road are expected. Wetlands WL1, WL2, WL3, and WL9 extend within the 60-foot impact corridor in Section L1 (see **Table 6-1**). In addition, three ephemeral washes (WL6, WL7, and WL8) cross the tactical infrastructure alignment. Placing tactical infrastructure adjacent to wetlands and across wash channels will result in potential short-term impacts on the wetlands and washes as a result of land disturbance and associated erosion and sedimentation. Erosion and sediment controls and storm water management practices (discussed below) will be implemented during construction to minimize the potential for adverse effects on wetlands adjacent to the tactical infrastructure alignment and to the washes crossed by the alignment. Long-term effects will occur as a result of the placement of fill associated with construction of the fence, new patrol roads, or upgrades to existing patrol roads. Impacts on the wetlands and washes will be avoided to the maximum extent practicable.

No impacts on wetlands or other Waters of the United States will be expected in Section L-1A. Two palustrine emergent wetlands (WL13 and WL14) associated with resacas were identified within the 150-foot assessment corridor associated with Section L-1A. Neither wetland extends into the 60-foot impact corridor in Section L-1A (see **Table 6.2-1**). Erosion and sediment controls and storm water management practices (discussed below) will be implemented during construction to minimize the potential for adverse effects on these wetlands.

Minor short- and long-term impacts on Cibolo Wash are expected in association with access road maintenance. Three wash channels associated with Cibolo Wash occur in Section L-1B. A planned access road follows an existing unimproved road that crosses a tributary channel to Cibolo Wash (WL10), the south channel of Cibolo Wash (WL12), and follows along the north bank of the north channel of Cibolo Wash (WL11). Short-term impacts could occur as a result of potential grading necessary to maintain the existing unimproved road. Long-term impacts could occur if placement of fill were necessary to maintain the road. Any impacts are expected to be minor because the access road alignment follows an existing unimproved road, and Cibolo Wash along the eastern access road alignment has been disturbed as a result of ongoing sand and gravel quarrying activities. Any impacts on the wash will be avoided to the maximum extent practicable. No wetlands or other Waters of the United States were identified within the impact corridors or within the staging areas in Section L-1B.

Implementation of the Project will be expected to have minor short-term, adverse effects on surface water quality as a result of potential erosion and associated transport of sediments into adjacent surface waters. Development of an SWPPP will aid in controlling water pollution, and would involve designing BMPs, including erosion and sediment controls that the discharger will use to protect storm water runoff. Proper engineering practices, erosion and sediment controls, and storm water BMPs will be implemented during and after construction, reducing the potential for adverse impacts on water quality associated with erosion and sedimentation during and following implementation of the Project.

Adverse effects on jurisdictional wetlands, washes, and other Waters of the United States will be avoided and minimized to the maximum extent practicable. A wetlands mitigation and restoration plan to compensate for unavoidable impacts will be developed by the applicant and submitted to the USACE Albuquerque District Regulatory Branch. Appropriate mitigation will be developed to compensate for unavoidable impacts. As a result, impacts on wetlands and other Waters of the United States associated with implementation of the Project will be expected to be minor.

Short- and long-term minor adverse effects on floodplain resources will occur as a result of constructing and operating the tactical infrastructure. Approximately 78 acres of floodplains will be affected. Impacts associated with floodplains will be avoided to the maximum extent practicable. The concrete retention wall in Sections L-1B and L-1A will not increase the volume of fill on the river side of the current levees. Therefore it is not anticipated that construction will impact levels of flow within the floodplain, adversely affect flood storage and conveyance, or otherwise impact USIBWC operations. Hydraulic studies and modeling will be conducted to confirm this assessment. Increased impervious areas and loss of vegetation associated with the tactical infrastructure will have minor adverse impacts on groundwater recharge, nutrient cycling, and water quality.

Erosion and sediment control and storm water management practices during and after construction will be implemented consistent with the SWPPP developed. Based on these mitigation efforts, adverse effects on floodplain resources will be minimized.

CBP has determined that Sections L-1, L-1B, and L-1A cannot be practicably located outside the floodplain since the floodplain extends northward several miles. To minimize adverse effects on the floodplain Section L-1 will be a “bollard floating fence” and placed atop the levee to minimize the disturbance to current USIBWC operations. Present operations consist of the periodic mowing of vegetation between the levee and the river. Placement of floating fence on top of the levee avoids obstacles to routine maintenance whilst avoiding impacts to the integrity of the levee. The increase in impervious surface associated with Sections L-1, L-1B, and L-1A will have no effect on the USIBWC international drainage. CBP will mitigate unavoidable impacts associated with floodplains using planning guidance developed by the USACE.

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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 relative vegetation resources for the tactical infrastructure sections 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 plants and serve as habitat for a variety of animal species. Collectively the vegetation represents an important portion of the wildlife habitat for the project area, providing forage and hiding cover in particular. More detailed information on vegetation resources, including descriptions of vegetation classifications, species observed, and the survey methodology is contained in the Biological Survey Report (see **Appendix D**).

7.1.2 Affected Environment

The impact corridor climate is Subtropical Arid within the Modified Marine climatic type (e.g., summers are long and hot and winters are short, dry, and mild) (Larkin and Bomar 1983, Bailey 1995). The average annual precipitation of the Trans-Pecos region recorded in Presidio is 9.6 inches. The distribution of rainfall is irregular but occurs predominantly during the summer months. A long growing season is experienced for the region, more than 300 days. The evaporation rate during the summer season is high, about twice the amount of precipitation.

The vegetation of the west-Texas deserts has generally been classified under the Dry Domain, Tropical/Subtropical Desert Division of Bailey (1995). The impact corridor is more finely classified as the Chihuahuan Desert Province. The 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 impact corridor in the Chihuahuan Biotic Province, Trans Pecos Natural Region, and the Level III Ecoregion of the Chihuahuan Desert.

In higher elevations, vegetative communities are characterized by trees such as gray oak (*Quercus grisea*), Texas pinyon (*Pinus remota*), and alligator juniper (*Juniperus deppiana*). Intermediate elevations and plateaus support sparse shrub communities of creosote bush (*Larrea tridentata*) and lechuguilla (*Agave angustifolia*). The low-lying plains are characterized by tobosa-black grama grassland communities of blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*), hairy grama (*Bouteloua hirsuta*), burrograss

(*Schleropogon brevifolius*), bush muhly (*Muhlenbergia porteri*), Arizona cottontop (*Digitaria californica*), Warnock's javelina bush (*Condalia warnockii*), creosote bush, butterflybush (*Buddleja* sp.), palmella (*Yucca elata*), whitethorn acacia (*Acacia constricta*), cholla (*Cylindropuntia* sp.), broom snakeweed (*Gutierrezia sarothrae*), and rough menodora (*Menodora scabra*) (Wermund 2007).

The existing vegetation types of Sections L-1, L-1A, and L-1B (see **Appendix D**) were examined in October 2007. Plant species recorded for the Sections L-1 (Sierra Blanca), L-1A (Presidio), and L-1B (Presidio) and their wetland indicator status (NRCS 2007), when appropriate, are included in **Table 7-1**.

Table 7-1. Plant Species Observed in Sections L-1, L-1A, and L-1B

Scientific Name/ Common Name	Section			Wetland Indictor Status
	L-1	L-1A	L-1B	
Allionia incarnata/Hierba de la Hormiga, Umbrellawort		X	X	---
Amaranthus retroflexus/Rough Pigweed	X	X		FACU-
Aster sp./Aster	X		X	---
Atriplex canescens/Fourwing Saltbush	X	X	X	UPL
Baccharis glutinosa/Mule's Fat, Seepwillow	X	X	X	FACW
Bothriochloa laguroides/Silver Bluestem	X		X	---
Bouteloua adscencionis/Six-weeks Grama	X			---
Bouteloua hirsute/Hairy Grama	X			---
Cercidium texanum/Paloverde	X			---
Chloris cucullata/Hooded Windmillgrass	X		X	---
Clematis drummondii/Barbas de Chivato, Old Man's Beard	X	X	X	---
Condalia sp./Condalia	X	X		---
Cynodon dactylon/Pato de Gallo, Bermuda Grass	X	X	X	FACU+
Cyperus sp./Flat Sedge	X			---
Dyssodia sp./Dogweed	X			---
Echinocereus triglochidiatus/Hedgehog Cactus	X			---
Ephedra sp./Jointfir		X		---
Ericameria triantha/Rabbitbrush	X			---
Fouquieria splendens/Ocotillo	X			---
Gaura parviflora/Butterfly-weed	X			NI
Gutierrezia (Xanthocephalum) microcephala/Snakeweed	X			---

Scientific Name/ Common Name	Section			Wetland Indictor Status
	L-1	L-1A	L-1B	
Helianthus annuus/Annual Sunflower	X	X	X	FAC
Heliotropium curassivicum/Heliotrope			X	FACW
Heterotheca villosa/Hairy Golden-aster	X		X	---
Larrea tridentata/Creosotebush	X		X	---
Leucelene ericoides/White Aster	X		X	---
Lygodesmia sp./Skeletonweed	X	X		---
Medicago sativa/Alfalfa	X	X		---
Mentzelia sp./Stick-leaf	X			---
Nicotiana glauca/Tree Tobacco	X		X	FAC
Nicotiana longiflora/Annual Tobacco			X	---
Opuntia imbricata/Cane Cholla			X	---
Opuntia leptocaulis/Tasajillo, Christmas Cactus			X	---
Opuntia phaeacantha/Prickly pear	X		X	---
Opuntia violaceae/Prickly pear	X			---
Panicum virgatum/Switchgrass	X			---
Parkinsonia aculeata/Retama	X	X	X	FACW-
Parkinsonia texana/Paloverde, Texas Paloverde	X			---
Paspalum dissectum/Mudbank Crowngrass	X			OBL
Pennisetum ciliare (Cenchrus ciliaris)/ Buffelgrass	X	X	X	---
Phoradendron tomentosum/Mistletoe	X	X	X	---
Phragmites australis/Common Reed	X	X	X	FACW
Phyla nodiflora/Frog Fruit		X		FACW
Pluchea (Tessaria) sericea/Arrowweed			X	NI
Polygonum pensylvanicum/Smartweed	X			FACW-
Populus deltoides/Eastern Cottonwood			X	FAC
Portulaca oleracea/Common Purslane	X			---
Prosopis glandulosa/Mesquite, Honey Mesquite	X	X	X	---
Salsola australis/Russian-thistle	X	X	X	FACU
Setaria geniculata/Bristlegrass	X			---
Solanum elaeagnifolium/Trompillo, Silverleaf Nightshade	X			---

Scientific Name/ Common Name	Section			Wetland Indictor Status
	L-1	L-1A	L-1B	
Sorghum halepense/Johnsongrass	X	X		FACU
Sphaeralcea angustifolia/Narrow-leaved Globe-mallow	X	X		---
Sporobolus airoides/Alkali Sacaton	X			FAC
Sporobolus cryptandrus/Whorled Dropseed	X			FACU-
Sporobolus flexuosus/Mesa Dropseed	X			FAC-
Suaeda depressa/Seepweed	X		X	FACW
Suaeda suffrutescens/Desert Seepweed	X			FACW
Tamarix aphylla/Athel Tamarisk		X		FACW
Tamarix chinensis/Salt Cedar	X	X	X	FACW
Tridens pulchellus/Fluffgrass	X			---
Typha domingensis/Tule, Narrow-leaf Cattail	X	X		OBL
Verbesina encelioides/Cowpen Daisy		X	X	FAC
*Xanthium strumarium/*Cocklebur	X			FAC-
Total number of species in each Section	**53**	**24**	**29**	
Total number of FACW to OBL species per Section	**21**	**14**	**14**	

Source: NRCS 2007
Notes:
Facultative Upland (FACU) – usually occurs in non-wetlands, but occasionally found in wetlands.
Facultative (FAC) – equally likely to occur in wetlands or nonwetlands.
Facultative Wetland (FACW) – usually occurs in wetlands but occasionally found in nonwetlands.
Obligate Wetland (OBL) – occurs almost always under natural conditions in wetlands.
Obligate Upland (UPL) – occurs almost always under natural conditions in nonwetlands.
No Indicator (NI) – insufficient information was available to determine an indicator status.
(*) = tentative assignments based on limited information.
(-) = less frequently found in wetlands.

Vegetation in Sections L-1, L-1A, and L-1B impact corridors consists of native creosotebush and honey mesquite shrublands; native and nonnative forblands, grasslands, shrublands, and woodlands; and agricultural crops and weedy fallow fields. Emergent and shrub scrub wetland communities occur rarely within the corridor. Project-related impacts on wetlands are discussed in **Chapter 6.3.3**.

7.1.3 Direct and Indirect Effects of the Project

Approximately 79.1 acres of vegetation will be cleared to accommodate the construction of the tactical infrastructure (including fences, access and patrol roads, lights, and construction staging areas). The impact corridor will be maintained following construction to support long-term maintenance, sight distance, and USBP and USIBWC activities. During construction, lay-down areas for materials and equipment will be identified within the impact corridor.

In Section L-1, construction grading will occur atop the short levee resulting in approximately 35 acres of vegetation clearing and removal. Vegetation clearing and removal within this section will result in minor to moderate, short- and long-term, adverse impacts on mostly nonnative shrub, grass, and forb communities dominated by salt-cedar, rabbitbrush, seepweed, arrowweed, Bermuda grass, and Russian-thistle. In Sections L-1A and L-1B, construction clearing will occur south of and adjacent to the tall levee resulting in approximately 44 acres of vegetation clearing and removal. Vegetation clearing and removal within this section will result in minor to moderate, short- and long-term, adverse impacts on mostly nonnative tree, shrub, grass, and forb communities dominated by salt-cedar, honey mesquite, Bermuda grass, and Russian-thistle. The removal of certain of the nonnative species, such as salt-cedar and noxious weed species, will be considered a short- and long-term beneficial impact. In Sections L-1A and L-1B, in particular, the completed fence will capture Russian-thistle tumbleweeds common in the area and that represent a fire hazard, resulting in low, short- and long-term, adverse impacts on areawide vegetation from wildfire should captured tumbleweeds become ignited and the fires spread. CBP will make reasonable efforts to reduce the potential for fire through the removal of tumbleweeds during maintenance activities. Dust generated by a variety of agency vehicles traveling on access roads during maintenance activities will result in negligible to minor short- and long-term, adverse impacts on downwind vegetation due to interference with pollination and photosynthesis.

CBP will make reasonable efforts to reduce the potential to spread noxious weeds and soil pests by implementing such measures as prohibiting the disposal of soil and plant materials from nonnative areas to native areas, washing all construction equipment before beginning work on the Project, using gravel or fill material from weed-free sources for relatively weed-free areas, and implementing post-construction monitoring and treatment of invasive weeds. In addition, the impact corridor would be revegetated with native species, to the maximum extent practicable.

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. Identification of the species potentially occurring in the project area was accomplished through literature reviews, coordination with appropriate Federal and state resource managers, other knowledgeable experts, and field surveys.

The Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703–712) as amended, implements various treaties for the protection of migratory birds. Under Executive Order (EO) 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, the USFWS has the responsibility to administer, oversee, and enforce the conservation provisions of the MBTA, which include responsibility for population management (e.g., monitoring), habitat protection (e.g., acquisition, enhancement, and modification), international coordination, and regulations development and enforcement. The MBTA defines a migratory bird as any bird listed in 50 CFR 10.13, which includes nearly every native bird in North America.

7.2.2 Affected Environment

Wildlife. Hudspeth and Presidio counties are located in far west Texas in the Trans-Pecos Ecoregion of the Chihuahuan Desert (USIBWC 2005). During the October 2007 survey, the following habitats were observed: desert scrub, riparian forest and woodland communities, and nonnative grasslands and forblands (see **Appendix D**). Most of the impact corridor has been heavily disturbed by agriculture and grazing with high cover of nonnative tree, shrub, grass, and forb species; however, some high-quality habitat was identified. Unique habitat includes wetlands, riparian woodlands, and desert shrublands.

Common reptiles of Hudspeth and Presidio counties are Texas-banded gecko (*Coleonyx brevis*), reticulated gecko *(Coleonyx switaki)*, greater earless lizard *(Cophosaurus texanus),* several species of spiny lizards (*Sceloporus* spp.), fringe-footed lizard *(Uma inornata),* little striped *(Cnemidophorus inornatus*) and marbled whiptails (*Aspidoscelis tigris*), Trans-Pecos ratsnake (*Bogertophis subocularis*), western hooknose snake (*Gyalopion canum*), Texas black-headed snake (*Tantilla cucullata*), whipsnake (*Masticophis* spp.), western diamondback rattlesnake (*Crotalus atrox*), and Bolson tortoise *(Gopherus flavomarginatus*) (USIBWC 2005).

Typical mammals found along the USBP Marfa Sector include desert pocket gopher (*Geomys arenarius*), yellow-faced pocket gopher *(Cratogeomys castanops),* Nelson's kangaroo rat, Nelson's pocket mouse, southern grasshopper mouse *(Onychomys torridus),* Goldman's woodrat (*Neotoma goldmani)*, Texas antelope squirrel *(Ammospermophilus interpres),* desert pocket mouse *(Perognathus longimembris),* desert *shrew (Notiosorex crawfordi),* desert mule deer *(Odocoileus hemionus crooki*), pronghorn (*Antilocapra Americana),* desert bighorn sheep *(Ovis canadensis spp.),* merriam's kangaroo rat *(Dipodomys merriami),* and desert cottontail (*Sylvilagus audubonii*) (USIBWC 2005).

Bird species that inhabit the riparian areas and shrublands along the levee include scaled quail (*Callipepla squamata*) and white-necked raven (*Corvus cryptoleucus*). Other birds include mourning dove (*Zenaida macroura*), roadrunner (*Geococcyx californianus*), lesser nighthawk (*Chordeiles acutipennis*), Scott's oriole (*Icterus parisorum)*, cactus wren (*Campylorhynchus brunneicapillus***)**, curve-billed thrasher (*Toxostoma curvirostre***)**, and black-throated sparrow (*Amphispiza bilineata*) (USIBWC 2005).

Wildlife species observed during the field surveys are listed in the survey report presented in **Appendix D**. The October 2007 survey recorded 37 species of vertebrates, including 32 bird species, 4 mammal species, and 1 reptile species. The monarch butterfly (*Danaus plexippus*) was the only insect recorded during the wildlife survey.

***Aquatic Resources*.** The Rio Grande from El Paso to Presidio contains 22 native fish species and 4 introduced fish species. Common fish include gars, herrings, carps, minnows, suckers, characins, bullhead catfishes, pupfishes, livebearers, and silversides (USIBWC 2005).

A survey of the Rio Grande done by the USIBWC in 1977 for Hudspeth and Presidio counties found the following fish species: red shiner (*Notropis lutrensis*), common carp, gizzard shad, mosquitofish, and green sunfish. The most common fish was the red shiner. Catfish, sunfish, and white bass were also observed. The section of the Rio Grande near Presidio, Texas, had low diversity and density of fish species likely due to the high salinity of the Rio Grande and periodic drought conditions that influenced river flows (USIBWC 2005).

A 1978 invertebrate study of Hudspeth and Presidio counties found 10 species of aquatic snails, 4 species of mollusks, and 1 species of terrestrial crustacean. Along the Rio Grande floodplains, 9 species of xeric land snails were observed. The study observed that the Rio Grande in Hudspeth and Presidio counties has low diversity of aquatic invertebrates possibly for the same reasons that fish diversity is low (USIBWC 2005).

7.2.3 Direct and Indirect Effects of the Project

Wildlife. Potential adverse impacts on wildlife along the USBP Marfa Sector include barrier to movement, interruption of corridors, increased human activity, impacts of lights on nocturnal species, and loss of habitat. Some wildlife deaths, particularly reptiles and amphibians could increase due to the improved accessibility of the area and increased vehicle traffic. Although some loss of wildlife could occur, wildlife populations within the impact corridor will not be substantially impacted by implementation of the Project.

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 spaces provided in the concrete bases of the bollard-style floating fence planned for L-1, and gated ramps in fence sections L-1A and L-1B. Although larger species, such as ungulates and carnivores, might not be able to pass through the fence or over the retaining wall, such species tend to be more mobile, have larger home ranges, and will be able to move between fence sections.

Noise created during construction will be anticipated to result in short-term, moderate, adverse impacts on wildlife. 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, resulting with intense pulses of noise associated with blasting during construction, could 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 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 impact corridors during construction periods.

CBP has included plans to use lighting, cameras, and other technology to support its efforts. Lighting an area will have an effect on the behaviors of diurnal and nocturnal species, and likely a direct or indirect effect on crepuscular species in the area. The height of the lights, direction of lighting, power source, and wattage will be assessed by USFWS prior to installation and use. Lights will operate from dusk to dawn. Light poles adjacent to USIBWC levees will be coordinated with and approved by the USIBWC. The final placement and direction of lighting has been and will continue to be coordinated with the USFWS to minimize adverse impacts to the maximum extent practicable. USBP has used lighting and other means for several years in many sectors. In general, lighting an area so that it has the least effect on wildlife includes the following:

- Producing a certain type of light (e.g., using low pressure sodium lighting)
- Establishing the height of the lamp based on the height of surrounding vegetation
- Providing high-intensity light shields on the top and sides of the light
- Using the least intensive lighting necessary for an area.

Artificial lighting will influence the behavior of most species, including mammals, birds, and amphibians. These behavior changes have been observed as changes in foraging patterns, the location of nesting sites, territorial singing, and migration routes. Other influences that might occur include disorientation, an attraction to artificial lighting, increased predation or prey, and an overall change to the ecological structure of an area. A comparison of lighting sources provides a better understanding (see **Table 7-2**).

Table 7-2. Light Source Intensity

Source	Illumination (lux)
Full sunlight	103,000
Cloudy day	1,000–10,000
Most homes	100–300
Lighted parking lot	10
Full moon under clear conditions	0.1–0.3
Clear starry night	0.001

Source: Rich and Longcore 2006

Many factors contribute to the analysis of lighting effects, including ambient conditions, the intensity of surrounding urban lighting, lighting intensity, and weather conditions, to name a few. The following are effects of artificial lighting on wildlife found in various studies conducted by researchers:

- Many usually diurnal birds and reptiles have been found to forage under (and become dependent upon) artificial lighting.
- The northern mockingbird (*Mimus polyglottos*) male typically sings at night before mating, yet under the effect of artificial lighting was found to sing only at night after mating had occurred. Other behavior changes were unknown.
- Nocturnally migrating birds have been disoriented by artificial lighting.
- Nest sites were observed to be selected so that they were farther away from artificial lighting.
- Many believe an increase in predation risk on open habitats occurs under bright moonlight, and will therefore occur under artificial lighting as well. Although no field study conclusively confirms or refutes this explanation, circumstantial evidence supports this idea (Longcore and Rich 2004).
- Bat foraging studies conducted at streetlights found a decrease in the attraction of moths to streetlights when lamps were changed from mercury vapor to high-pressure sodium vapor lamps (Rich and Longcore 2006).

Other studies, however, reflect different long-term findings. For example, studies have shown that within several weeks under constant lighting, migratory birds and mammals will quickly stabilize and reset their circadian rhythms back to their original schedules (when returned to normal lighting conditions).

The greatest impacts on wildlife from lighting will probably be to birds and insects that will be affected by the lights while migrating, causing them to alter their course or schedule. The tendency for nocturnal birds and other wildlife species (e.g., bats) to congregate around the lights to feed on insects attracted by the lights could also increase. This change in behavior will make these species more vulnerable to predation or injury (USACE 2003).

As such, lights will have minor to moderate, adverse and beneficial impacts on nocturnal wildlife depending on the species examined.

The 35 acres of vegetation removed in Section L-1 are dominated by nonnative shrub, grass, and forb communities dominated by salt-cedar, rabbitbrush, seepweed, arrowweed, Bermuda grass, and Russian-thistle. This vegetation removal will result in short- and long-term, minor adverse impacts on wildlife due to loss of habitat.

The 44 acres of vegetation removed in Sections L-1A and L-1B are dominated by salt-cedar, honey mesquite, Bermuda grass, and Russian-thistle. This vegetation removal will result in short- and long-term, minor adverse impacts on wildlife due to loss of habitat.

Impacts on migratory birds could be substantial and is highly dependent upon the timing of fence construction. Implementing a series of BMPs to avoid or minimize adverse impacts could markedly reduce their intensity. A standard BMP to reduce or avoid adverse effects on migratory birds will include the following:

- Any groundbreaking construction activities should be performed before migratory birds return to the area (approximately 1 February) or after all young have fledged (approximately 31 July) to avoid incidental take.
- If construction is scheduled to start during the period in which migratory bird species are present, steps should be taken to prevent migratory birds from establishing nests in the potential impact area. These steps could include covering equipment and structures, and use of various excluders (e.g., noise). Birds can be harassed to prevent them from nesting on the site. Once a nest is established, they cannot be harassed until all young have fledged and left the nest site.
- If construction is scheduled to start during the period when migratory birds are present, a supplemental site-specific survey for nesting migratory birds should be performed immediately prior to site clearing.
- If nesting birds are found during the supplemental survey, construction should be deferred until the birds have left the nest. Confirmation that all young have fledged should be made by a qualified biologist.

Assuming implementation of the above BMP to the fullest extent feasible, adverse impacts of the Project on migratory birds is anticipated to be short- and long-term, and minor due to construction disturbance and associated loss of habitat. Long-term, minor, beneficial impacts will occur due to the reduction of foot traffic through migratory bird habitat north of the impact corridor.

Aquatic Resources. 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. The impacts will be considered minor due to the implementation of BMPs identified in the Project's SWPPP. Furthermore, most construction will occur more than 200 feet from the river's bank, further reducing the likelihood of high levels of siltation.

7.3 THREATENED AND ENDANGERED 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.

Impacts on Federal and state threatened and endangered species are addressed in this ESP. 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 which 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 that the Executive Director of the TPWD has named as being "threatened with statewide extinction." Threatened species are those species that the TPWD has determined are likely to become endangered in the future (TPWD 2007).

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 2007).

7.3.2 Affected Environment

Six species listed as federally threatened or endangered have the potential to occur within the impact corridor (see **Table 7-3**). An additional eight species that are listed by the State of Texas as threatened or endangered have the potential to be present (see **Table 7-3**). Brief habitat descriptions for each species are provided in **Table 7-3**. Further information on the natural history of the federally listed species is presented in **Appendix D**.

Primary pedestrian surveys to document biological resources within the potential impact corridors were conducted in November 2007. No state- or Federal-listed species were observed during these surveys. Additionally, potential habitat for state- and Federal-listed species was determined to be absent from the survey corridors.

7.3.3 Direct and Indirect Effects of the Project

CBP coordinated with the USFWS regarding the Project's potential to affect federally listed species or designated critical habitat. The USFWS provided critical feedback on the location and design of fence sections to avoid, minimize, or mitigate potential impacts on listed species or designated critical habitat. Due to the lack of suitable habitat within the impact corridor, the Project will have no effect to federally listed species in Hudspeth or Presidio counties. A Listed Species/Habitat No Effect Determination is included in **Appendix E**.

Potential impacts on state- and Federal-listed species would be due to direct mortality during construction and operation, and loss of habitat (quality or quantity).

Under the Project, approximately 79.1 acres of vegetation will be cleared to accommodate the construction of the tactical infrastructure (including fences, access and patrol roads, lights, and construction staging areas). In Section L-1, construction grading will occur atop the short levee resulting in approximately 35 acres of vegetation clearing and removal. In Sections L-1A and L-1B, construction clearing will occur south of and adjacent to the tall levee resulting in approximately 44 acres of vegetation clearing and removal. Vegetation clearing and removal within these sections is anticipated to have no impact on state- and Federal-listed species and their habitats. Lighting in Sections L-1A and L-1B are not anticipated to have impacts on any state and Federal-listed species. No direct mortality of listed species is anticipated.

Table 7-3. Federal- and State-Listed Species Potentially Occurring in the Impact Corridor

Common Name	Scientific Name	County	Federal Status	State Status	Habitat
PLANTS					
Hinckley oak	*Quercus hinckleyi*	P	T	T	Arid limestone slopes at mid elevations in Chihuahuan Desert.
FISH					
Blue sucker	*Cycleptus elongates*	P		T	Larger portions of major rivers in Texas; usually in channels and flowing pools with a moderate current; bottom type usually of exposed bedrock, perhaps in combination with hard clay, sand, and gravel; adults winter in deep pools and move upstream in spring to spawn on riffles.
Chihuahua shiner	*Notropis Chihuahua*	P		T	Rio Grande basin, Big Bend region; clear, cool water that is often associated with nearby springs; often in pools with slight current or riffles over a gravel or sand bottom where vegetation might be present.
Conchos pupfish	*Cyprinodon eximius*	P		T	Rio Grande and Devils River basins; sloughs, backwaters, and margins of larger streams, channels of creeks, and mouths.
Mexican stoneroller	*Campostoma ornatum*	P		T	In Texas, Big Bend region; clear, fast riffles, chutes, and pools in small- to medium-sized creeks with gravel or sand bottoms.
REPTILES					
Chihuahuan Desert lyre snake	*Trimorphodon vilkinsonii*	H		T	Mostly crevice-dwelling in predominantly limestone-surfaced desert northwest of the Rio Grande from Big Bend to the Franklin Mountains, especially in areas with jumbled boulders and rock faults/fissures.

Common Name	Scientific Name	County	Federal Status	State Status	Habitat
REPTILES (continued)					
Mountain short-horned lizard	*Phrynosoma hernandesi*	H		T	Open, shrubby, or openly wooded areas with sparse vegetation at ground level; soil can vary from rocky to sandy.
Texas horned lizard	*Phrynosoma cornutum*	H		T	Open, arid and semiarid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil can vary in texture from sandy to rocky.
BIRDS					
American peregrine falcon	*Falco peregrines anatum*	H	DL	E	Nests in tall cliff eyries; migratory stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.
Arctic peregrine falcon	*Falco peregrines tundrius*	H	DL	T	Migratory stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.
Interior least tern	*Sterna antillarum athalassos*	H	E	E	Nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (e.g., inland beaches, wastewater treatment plants, gravel mines).
Mexican spotted owl	*Strix occidentalis lucida*	H	T	T	Remote, shaded canyons of coniferous mountain woodlands (pine and fir).
Northern aplomado falcon	*Falco femoralis septentrionalis*	H, P	E	E	Open country, especially savanna and open woodland, and sometimes in very barren areas; grassy plains and valleys with scattered mesquite, yucca, and cactus.
Southwestern willow flycatcher	*Empidonax traillii extimus*	H, P	E		Thickets of willow, cottonwood, mesquite, and other species along desert streams.

Common Name	Scientific Name	County	Federal Status	State Status	Habitat
Yellow-billed cuckoo	*Coccyzus americanus*	H, P	C; NL		Deciduous woodlands with cottonwoods and willows; dense understory foliage is important for nest site selection; nests in willow, mesquite, cottonwood, and hackberry; forages in similar riparian woodlands.
MAMMALS					
Black bear	*Ursus americanus*	H	T/SA;NL	T	Bottomland hardwoods and large tracts of inaccessible forested areas.
Mexican long-nosed bat	*Leptonycteris nivalis*	P	E	E	Cave-dwelling species that usually inhabits deep caverns; nectivorous, with *Agave* spp.

Sources: TPWD 2007, USFWS 2007

Notes: E = Endangered, T = Threatened

C = Candidate, DL = Delisted, NL = Not listed

T/SA = Threatened due to similar appearance

H = Hudspeth County (Section L-1)

P = Presidio County (Section L-1A and L-1B)

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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 (i.e., prehistoric or historic sites where human activity has left physical evidence of that activity), architectural resources (i.e., 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 referent.

The NRHP is the official listing of properties significant in U.S. history, architecture, or prehistory, and includes both publicly and privately owned properties. The list is administered by the NPS on behalf of the Secretary of the Interior. Cultural resources that are listed in or eligible for listing in the NRHP (36 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 NHLs by the Secretary of the Interior.

Buildings, structures, sites, objects, or districts are property types that might be considered 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 or archaeological district. According to the NPS, a 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.

8.2 AFFECTED ENVIRONMENT

The history of the Trans-Pecos Region 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, lithic artifact scatters, pithouses, and the ruins of Spanish missions. Some of these sites are difficult to identify and date because of heavy erosion, shallow soil horizons, and extensive artifact removal by collectors.

The pre-Contact history of Far West Texas can be divided into three general cultural periods:

- The Paleo-Indian period (10000 to 6500 B.C.) represents the first documented human occupation of the region. Evidence of the earliest Paleo-Indian complexes, Clovis and Folsom, has been found throughout West Texas, although most of this evidence is from surface collections of the distinctive fluted points that characterize these complexes. Sites are often found on extinct playa shorelines and creek terraces and are very rare in this area.

- The Archaic period (6500 B.C. to AD 1000) in West 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. Archaic sites include rockshelters, lithic artifact scatters, quarries, hearths, burned rock and ring middens, rock circles, and petroglyphs. 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. 1000 to 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). Maize, squash, beans, and bottle gourds were cultivated and people lived at least part of the year in pithouse communities, and made El Paso brownware ceramics. Early in this period, sites were along the Rio Grande and along ephemeral mountain and foothill drainages, as well as playas and alluvial fans. Later sites are clustered in canyon mouths and alluvial fans.

Previously Identified Resources in the Vicinity of the Project

In the following discussion, archaeological sites, historic districts, and individual properties within 1 mile of the project area are described. These descriptions are based on information contained in the THC's Texas Historic Sites Atlas and the Texas Archaeological Sites Atlas. The latter is a secure Web site with information about past archaeological surveys and known archaeological sites. Access to the Texas Archaeological Sites Atlas is limited to professional archaeologists and only available through formal application to the Texas Archaeological Research Laboratory. Also identified are resources recognized by the THC as Recorded Texas Historic Landmarks and those previously surveyed under their Neighborhood Survey program.

Previously reported resources within 1 mile of the project area include the southern edge of the La Junta de los Rios Archaeological District that is listed on the NRHP. Sites within this district include open campsites, ceramic and lithic scatters, pithouses, and the ruins of Spanish missions. Temporal and cultural affiliations for some of these sites are unclear. Other historic-period resources within 1 mile of the Project include a privately built fort, a railroad trestle, and a former POE facility. Information about these resources was plotted on Project maps, aerial photographs, and topographic maps to identify areas of interest for further identification and evaluation. These resources are discussed by infrastructure section below.

Section L-1. Section L-1 passes near three previously recorded archaeological sites. Two Late Prehistoric open camp sites with hearths and lithic scatters were recorded in 1948. The third site is a lithic scatter also recorded in 1948. Its temporal affiliation is unknown.

Sections L-1A and L-1B. Sections L-1A and L-1B pass near one NRHP-listed archaeological district (La Junta de Los Rios Archaeological District) and 1.92 miles from a NRHP-listed historic property (Fort Leaton 41PS18) (see **Table 8-1**). Within the district there are four prehistoric sites within 1 mile of Sections L-1A and L-1B. One of these sites is a prehistoric open camp and lithic scatter (41PS16), the second is a multi-component site with prehistoric artifacts, as well as ruins of a Spanish mission (41PS15). The remaining two sites are poorly recorded and no information besides location and site number are available on the THC Archaeological Sites Atlas (41PS86, 41PS87). An historic cemetery is also located within 1 mile of the fence corridor.

Table 8-1. NRHP-Listed Properties in the Vicinity of the Impact Corridor

Section	Property	Status
L-1A	Fort Leaton	NRHP-Listed 1973
L-1A and L-1B	La Junta de los Rios Archaeological District	NRHP-Listed 1978

Fort Leaton is situated 1.92 miles northeast of the southern terminus of L-1A. It will not be affected by the Project. Section L-1B passes through or just outside of the La Junta de Los Rios Archaeological District; however, the sites within the district are located almost a mile distant and north of the alignment at the edge of the modern floodplain. These properties are summarized in **Table 8-1**.

Area of Potential Effects

A survey was conducted of cultural resources within the Area of Potential Effect (APE) associated with the Project area. The approach used to define the APE is that outlined at 36 CFR Part 800. The APE is the geographical area within which effects on historic properties might occur if such properties hypothetically exist. The APE for the purposes of the cultural resources survey accounted for both direct and indirect impacts. 36 CFR 800.5(a)(2) provides examples of adverse effects that also were used as the basis for establishing the APE. Examples of adverse effects specifically cited relevant to this Project are damage or destruction of historic properties and changes to the setting of a historic property where the setting contributes to the significance of the property.

The archaeological APE is a 150-foot-wide corridor to encompass the Project to account for grading of vegetation and fence construction. A second, larger APE was delineated to account for visual and other effects on historic-period resources. Topography, type and density of vegetation and intervening development, orientation of streets and properties in relation to the Project, traffic patterns, and surrounding development all are factors considered in the definition of this historic APE for a specific location.

Cultural Resources Surveys

A cultural resources survey of the area affected by the Project in the USBP Marfa Sector has been completed. The survey identified both archaeological (pre-Contact-era) resources and historic-period/architectural resources for all infrastructure sections of the Project. The archaeological survey occurred between December 4 and 6, 2007, and the architectural/historic survey occurred between January 7 and 9, 2008. Preliminary research was performed prior to performing fieldwork. The research focused on developing a historic context for the survey area, determining the environmental nature of the project area, areas of interest, previously recorded sites, and information about historic-period resources such as ownership history, construction dates, and prior uses when available from county and other records. Federally recognized Indian tribes with ancestral ties to lands within the USBP Marfa Sector also were contacted for input into the cultural resources survey.

The archaeological survey examined a 150-foot wide corridor for all tactical infrastructure sections. An architectural/historic resource survey examined the larger APE that accounts for visual and other effects on historic-period resources. Both surveys considered access roads and staging areas. Seventeen historic-period resources and one prehistoric isolated occurrence were identified in Sections L-1, L-1A, and L-1B. One of these resources, the Dupuy POE, has been recommended as eligible for National Register listing and is located in Section L-1A. It is associated with the historic theme of border crossing. **Section 8.3** provides additional information about the resources identified, recommendations regarding NRHP eligibility, and environmental consequences of the Project.

8.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Section L-1. Based on field work conducted to date, no resources are anticipated to be recommended as NRHP-eligible in Section L-1. Consequently, no historic properties will be affected by the Project.

Section L-1A. Section L-1A passes near one historic-period resource recommended as NRHP-eligible, the Dupuy POE. This property will not be affected by the Project. Section L-1A passes within 100 feet of the Dupuy POE Building. The building, constructed between 1955 and 1960, served as the U.S. Customs House/POE for the privately owned and operated Dupuy Bridge. The bridge, no longer extant, was completed in 1926 and served as the only international crossing in the area. The facility was used until 1985 when a new POE was built approximately 500 feet upstream. The POE Building and associated canopy are recommended as eligible for the NRHP for its historical significance associated with the history of border control and trans-national border crossing. The POE Building is north of the levee away from the retaining wall infrastructural location. The property and POE Building have been seized by the U.S. Marshal. The parcel will be used for Project-related purposes, such as a staging area. The portion of the property for staging area use is well removed from all site structures and therefore the building and its associated canopy will be retained and would not be affected by the Project.

Section L-1B. Section L-1B passes through or just outside a southern portion of the La Junta de los Rios Archaeological District. Boundaries of the district in this area are somewhat ambiguous. The National Register nomination (Clark 1975) discusses 12 archaeological sites within the nearly 4,000 acres of the district. An archaeological survey of the APE for the Project identified no archaeological sites or evidence of archaeological remains. Therefore, it can be concluded that the La Junta de los Rios district will not be affected by the Project.

9. SOCIOECONOMIC RESOURCES AND SAFETY

9.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific legal obligations relative to socioeconomic resources for the tactical infrastructure sections 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 environmental justice resources.

Socioeconomics. Socioeconomics is defined as the basic attributes and resources associated with the human environment, particularly characteristics of population and economic activity. Regional birth and death rates and immigration and emigration affect population levels. Economic activity typically encompasses employment, personal income, and industrial or commercial growth. Changes in these two fundamental socioeconomic indicators are typically accompanied by changes in other components, such as housing availability and the provision of public services. Socioeconomic data at county, state, and national levels permit characterization of baseline conditions in the context of regional, state, and national trends.

Data in three areas provide key insights into socioeconomic conditions that might be affected by a Project. Data on employment identify gross numbers of employees, employment by industry or trade, and unemployment trends. Data on personal income in a region can be used to compare the "before" and "after" effects of any jobs created or lost as a result of a Project. Data on industrial or commercial growth or growth in other sectors provide baseline and trend line information about the economic health of a region.

Demographics identify the population levels and changes to population levels of a region. Demographics data might also be obtained to identify, as appropriate to the evaluation of a Project, a region's characteristics in terms of race, ethnicity, poverty status, educational attainment level, and other broad indicators.

Socioeconomic data shown in this chapter are presented at census tract, county, municipality, and state 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. Bureau of Economic Analysis' Regional Economic Information System).

Environmental Justice and Protection of Children. EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* February 11, 1994, addresses the Federal policy of Federal agencies' actions substantially affecting human health or the environment to 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 adverse 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. 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 results from environmental health risks or safety risks.

9.2 AFFECTED ENVIRONMENT

Socioeconomics. The Project includes the construction, operation, and maintenance of tactical infrastructure along the U.S./Mexico international border in Hudspeth County, Texas (Section L-1) and Presidio County, Texas (Sections L-1A and L-1B). Section L-1 is in a rural/undeveloped area approximately 16.5 miles southwest of Sierra Blanca, Texas, while Sections L-1A and L-1B are in the vicinity of Presidio, Texas, and adjacent to Ojinaga, Chihuahua, Mexico, which is characterized by agricultural, residential, and commercial uses. The most current census tract data are from Census 2000. Section L-1 is in Hudspeth County Census Tract 9502, and Sections L-1A and L-1B are in Presidio County Census Tract 9502 (although numbered the same, these are different census tracts). For the purposes of this Project, Census Tracts 9502 in both counties are considered the Region of Influence (ROI).

The largest employment type in Census Tract 9502 (Presidio County), Presidio County, and Texas is educational, health, and social services (23.9, 22.0, and 19.3 percent, respectively) (see **Table 9-1**). The largest employment type in Census Tract 9502 (Hudspeth County) is public administration; agriculture, forestry, fishing, and hunting; retail trade; and educational, health, and social services (U.S. Census Bureau 2002).

In 2006, Hudspeth and Presidio counties had unemployment rates of 7.4 percent and 10.7 percent, respectively, compared to a 4.9 percent unemployment rate for all of Texas (Fedstats 2007a, Fedstats 2007b). **Table 9-2** shows demographic data and economic indicators of the ROI, Hudspeth and Presidio counties, and Texas.

Table 9-1. Employment Type of Residents in Census Tracts, Hudspeth and Presidio Counties, and the State of Texas (Percent)

Economic and Social Indicators	Census Tract 9502 (Hudspeth County)	Hudspeth County	Census Tract 9502 (Presidio County)	Presidio County	State of Texas
Employed Persons in Armed Forces	0.0	0.0	0.0	< 0.001	0.7
Employed Persons in Civilian Labor Force (By Industry)					
Agriculture, forestry, fishing and hunting, and mining	10.5	18.0	11.2	11.4	2.7
Construction	4.8	6.5	13.2	10.1	8.1
Manufacturing	0.6	10.3	2.1	3.4	11.8
Wholesale trade	8.2	3.8	3.5	3.7	3.9
Retail trade	12.7	8.1	12.0	10.4	12.0
Transportation and warehousing, and utilities	1.4	6.6	3.6	5.5	5.8
Information	1.4	2.9	0.7	1.0	3.1
Finance, insurance, real estate, and rental and leasing	3.4	1.6	2.4	3.5	6.8
Professional, scientific, management, administrative, and waste management services	2.3	1.9	2.5	3.2	9.5
Educational, health and social services	12.4	14.3	23.9	22.0	19.3
Arts, entertainment, recreation, accommodation and food services	11.9	6.3	9.9	9.4	7.3
Other services (except public administration)	3.4	4.3	4.4	4.2	5.2
Public administration	27.1	15.5	10.6	12.3	4.5

Source: U.S. Census Bureau 2002

Note: Census 2000 data are the most recent comprehensive employment data for the ROI.

The population of the City of Ojinaga is approximately 30,000; however, Presidio is heavily influenced by Ojinaga and its economy (City of Presidio 2007). Presidio's population has been impacted by sales from Mexican immigrants seeking residency and citizenship in the United States. Similarly, Presidio's economy depends on sales geared toward a Mexican market created by the growing

Table 9-2. Demographic and Economic Characteristics of the Census Tracts, Hudspeth and Presidio Counties, and the State of Texas

	Census Tract 9502 (Hudspeth County)	Hudspeth County	Census Tract 9502 (Presidio County)	Presidio County	Texas
Total Population	772	3,344	4,645	7,304	20,851,820
Percent White	87.8	87.2	81.9	85.0	71.0
Percent Black or African American	0.0	0.3	0.1	0.3	11.5
Percent American Indian Alaska Native	3.0	1.4	0.2	0.3	0.57
Percent Asian	0.1	0.2	0.1	0.1	2.7
Percent Native Hawaiian and Other Pacific Islander	0.0	0.0	<0.1	<0.1	0.07
Percent "Some other race"	4.7	8.8	16.7	13.5	11.7
Percent Reporting 2 or more races	4.4	2.1	1.0	0.9	2.5
Percent Below Poverty	18.2	35.8	43.7	36.4	15.4
Per Capita Income	$13,296	$9,549	$7,166	$9,558	$19,617
Median Household Income	$28,333	$21,045	$17,515	$19,860	$39,927

Source: U.S. Census Bureau 2002

Note: Census 2000 data are the most recent comprehensive economic and demographic data for the ROI.

population of immigrant and other Mexican nationals (City of Presidio 2007). The Presidio POE which connects Ojinaga and Presidio is the only POE along 490 miles of Texas border between El Paso and Del Rio (TxDOT 2007).

Environmental Justice, Protection of Children, and Safety. The affected census tracts are considered to have a disproportionately high percentage of low-income or minority residents under either of two conditions: (1) the percentage of low-income or minority populations within each census tract is greater than its perspective county's minority percentage, or low-income percentage, or (2) the percentage of persons in low-income or minority populations within each census tract is greater than 50 percent.

Census tract 9502 in Presidio County has a higher percentage of minority and low-income populations than the county (see **Table 9-2**). In addition, 43.7 percent of the residents in census tract 9502 (Presidio County) live below the poverty line, as compared to 36.4 percent in the county and 15.4 percent in the

State of Texas. A larger proportion of residents living in Census Tract 9502 (Hudspeth County) also live below the poverty line compared to the statewide average. Therefore, both census tracts will be evaluated further for environmental justice impacts.

9.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Socioeconomics. Short-term, minor, direct, beneficial effects will be expected as a result of construction associated with the Project. The construction activities will occur over CY 2008. Some local materials and supplies will be used, providing a minor beneficial impact on the local economy through new jobs and increased local spending. For example, the Presidio Cement Plant could benefit from supplying the Project with cement to be used during construction. Construction of the tactical infrastructure will require up to 75 workers consisting of one fabrication crew (35 workers) and one installation crew (40 workers) completing 1 mile of tactical infrastructure per month. Based upon U.S. Census data, there are 73 and 227 construction workers in Hudspeth and Presidio counties, respectively. The 75 construction workers required for this Project represent approximately 103 percent and 33 percent of the number of workers required to construct the tactical infrastructure in Hudspeth and Presidio counties, respectively (U.S. Census Bureau 2002). Due to the limited number of construction workers in Hudspeth County, and to a lesser degree in Presidio County, it will be necessary for workers from other locations to participate in the construction activities. The temporary nature of the construction and new employment (up to 75 workers) associated with the Project will cause a temporary influx of construction workers that will create a negligible increase in local population, and a minor, indirect, beneficial effect on local businesses and the local economy.

In addition, long-term, minor, indirect beneficial effects could be expected as a result of the presence of a primary pedestrian fence along Section L-1 where grazing occurs, and along Sections L-1A and L-1B where agricultural operations exist. The decrease of cross-border violators in these areas as a result of the tactical infrastructure is expected reduce the occurrence of littering, trampled vegetation and crops, tampering of gates and buildings, injured or killed cattle, and stolen property, thereby improving the economic outcome of the existing grazing and agricultural operations.

Environmental Justice, Protection of Children, and Safety. Some adverse disproportionate impacts on minority or low-income populations could be expected. Direct beneficial impacts on safety and the protection of children are expected from the projected deterrence of cross-border violators from entering the United States, and therefore providing for safer border communities.

Property owners and residents will be adversely affected by restricted access to the Rio Grande, visual impacts, noise and disruption during construction, and, in some cases, a compensated loss of property. In several locations along

Sections L-1A and L-1B in Presidio, the tactical infrastructure will be located on or immediately adjacent to private property. The affected properties could be owned by minority or low-income residents. If it is determined that it is necessary to acquire property, or if property will be substantially impaired, the adverse impact will be mitigated through reasonable compensation.

The tactical infrastructure will have short- to long-term direct beneficial effects on children and safety in the surrounding areas. The addition of tactical infrastructure could increase the safety of USBP agents in the USBP Marfa Sector. In addition, this Project will help to deter cross-border violators in the immediate area, which could prevent illegal aliens, smugglers, and their contraband from entering.

10. UTILITIES AND INFRASTRUCTURE

10.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific legal obligations relative to utilities and infrastructure resources for the tactical infrastructure sections 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.

10.2 AFFECTED ENVIRONMENT

Utilities. The area surrounding Neely’s Crossing at the Sierra Blanca patrol station (Section L-1) is in an unpopulated area in southwestern Hudspeth County, Texas. No known underground utilities exist in the area.

The area surrounding each side of the Presidio POE (Sections L-1A and L-1B) is in an urban area of Presidio County, Texas. The impact corridor will be located on both USIBWC and private lands. Electrical power for Presidio, Texas, and the surrounding area is provided through aboveground utility lines. Field photographs show utility lines run between Presidio, Texas, and Ojinaga, Mexico, within the impact corridor.

Solid Waste Management. According to TCEQ, there are three active landfills in Hudspeth County, and five active landfills in Presidio County. In Hudspeth County, the closest landfill is in Sierra Blanca. The City of Presidio operates the closest landfill to the impact corridor in Presidio County. Both landfills are permitted to accept arid-exempt municipal solid waste (TCEQ 2007).

Water Supply Systems. Information provided by the USACE indicated one pump for a private landowner, and water access right issues for cattle ranching known to exist in the Section L-1 project area. The impact corridor will be located on USIBWC lands (CBP 2007). The Hudspeth County Water Control and Improvement District does not supply water outside the city limits of Sierra Blanca (Marquez 2007). Therefore, it is assumed that water is supplied by wells and from surface waters from the Rio Grande.

The principal source of water for irrigation and municipal water in the impact corridor for Sections L-1A and L-1B is the Rio Grande. There are several private water pumps within the impact corridor and water access could become an issue for some private landowners (CBP 2007). No underground utilities are known to exist in the impact corridor, and no outfalls were seen during site visits.

Municipal Sanitary Sewer Systems. Municipal water and sanitary sewer systems along the Rio Grande Valley take raw water from the water distribution networks of irrigation districts. Some municipal sanitary sewer systems in the impact corridor discharge into the Rio Grande. However, no known municipal sanitary sewer infrastructure is within the impact corridor.

10.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Utilities. No adverse impacts on the electrical and natural gas systems will be 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.

Solid Waste Management. Short-term minor adverse impacts on solid waste management will be expected. Solid waste generated from the construction activities will consist 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 Hudspeth or Presidio county landfills permitted to take this type of waste. Solid waste generated associated with the Project will be expected to be negligible compared to the solid waste currently generated in these areas, and will not exceed the capacity of any landfill.

Waste Supply Systems. No adverse impacts on the Marfa Sector irrigation and municipal water supply systems will be expected since the impact corridor is not located near irrigation and municipal water supply infrastructure. Private water supply infrastructure will be identified prior to construction, and impacts on these systems will be avoided to the maximum extent practical. Temporary interruptions in irrigation might be experienced when this infrastructure is moved. No long-term impacts will be expected.

No adverse impacts on irrigation and storm water drainage systems will be expected. Adherence to proper engineering practices and the implementation of a SWPPP will reduce storm water runoff-related impacts. Erosion and sedimentation BMPs outlined in the SWPPP will be in place during construction to reduce and control siltation or erosion impacts on areas outside of the construction site. Storm water drainages will be identified prior to construction and impacts on these systems will be minimal.

Municipal Sanitary Sewer Systems. No adverse impacts on municipal sanitary systems will be expected. There is no known infrastructure in the impact corridor. Should infrastructure be identified prior to construction, 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 will be expected.

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11. ROADWAYS AND TRAFFIC

11.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific legal obligations relative to roadways and traffic resources for the tactical infrastructure sections 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 roadways and traffic.

Roadways and traffic consists of the transportation systems and physical structures that enable a population to move through and within a specified area. Similar to nontransportation infrastructure, the availability of transportation infrastructure and its capacity to support growth are generally regarded as essential to the economic growth of an area.

11.2 AFFECTED ENVIRONMENT

The Texas Department of Transportation (TxDOT), in cooperation with local and regional officials, is responsible for planning, designing, building, operating, and maintaining the state's transportation system. CBP intends to use existing roadways to construct, operate, and maintain the infrastructure sections. Unimproved surfaces will be built up as necessary to accommodate construction equipment.

Section L-1 will be situated southwest of Sierra Blanca, Texas. There are two primary roads leading to the impact corridor: Farm-to-Market (FM) 192 and FM 111. FM 192 crosses I-10 between McNary, Texas, and Esperanza, Texas. Traveling west to the Project area from I-10, FM 192 traverses the towns of Ninety, Esperanza, and Fort Quitman. FM 111 crosses I-10 in the City of Sierra Blanca, Texas. From I-10 to the Project area, FM 111 travels south and west where it eventually splits into Quitman Canyon Pass Road and Red Light Draw Road. Quitman Canyon continues southwest to the Impact corridor. There are no roads crossed by FM 111 from Sierra Blanca, Texas, to the impact corridor (Texas Atlas and Gazetteer 2003). Dirt roads and jeep trails also occur along the impact corridor.

Sections L-1B and L-1A will be situated on either side of the Rio Grande East POE west of Presidio, Texas. Presidio is accessed from the north by U.S. Route 67, from Marfa, Texas. State Route 310 divides from U.S. Route 67 directly to Presidio and then meets again south of Presidio just before the U.S./Mexico international border where the name changes to MEX 16. FM 170 travels along the U.S./Mexico international border from Presidio, Texas, northwest to the impact corridor through the town of La Junta, Texas. The South Orient Railroad Company operates the railroad. The line runs from the north to the U.S./Mexico international border (Texas Atlas and Gazetteer 2003, TTMCRO undated). Dirt roads and jeep trails also occur along the impact corridor.

11.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Short-term minor adverse impacts are expected from the temporary increases in traffic volume associated with construction activities. Heavy vehicles are frequently driven on local transportation systems. Therefore, the vehicles necessary for construction are not expected to adversely impact local transportation systems. No road or lane closures are anticipated. However, if roadways or lanes are required to be closed, CBP will coordinate with TxDOT and local municipalities.

No long-term 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 make up 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.

12. 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 projects. 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 socioeconomic resources is much broader and considers more county- or regionwide 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 primary 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 new fence (including the 11 miles addressed in this ESP) are planned for Texas, New Mexico, Arizona, and California.

***Past Actions*.** Past actions are those within the cumulative effects analysis areas that have occurred prior to the development of this ESP. Past actions have shaped the current environmental conditions around the Project. Therefore, the effects of these past actions are now part of the existing environment, and are generally included in the affected environment described in each resource chapter. For example, development of Presidio has altered the natural environment.

***Present Actions*.** Present actions include current or funded construction projects, USBP or other agency operations in close proximity to the fence locations, and current resource management programs and land use activities within the affected areas. Ongoing actions considered in the cumulative effects analysis include the following:

- <u>Texas Department of Transportation</u>. TxDOT has one ongoing road transportation system project in the vicinity of the Project. The area of impacts will tend to be low, as the majority of any potential work will be within existing ROW. The project is the *La Entrada al Pacifico Corridor Feasibility Study*. This corridor was designated a High Priority Corridor on the National Highway System by the Safe, Accountable, Flexible, Efficient, Transportation Equity Act. It is an international project between Mexico and the United States that designates a trade route, thereby increasing the efficiency of transportation of goods and people from the Port of Topolobampo in Sinaloa, Mexico, to Midland-Odessa, Texas. The goal of the feasibility study is to determine the most efficient location for the potential route. The impact corridor will utilize the Presidio POE at the U.S./Mexico international border, and follow U.S. Highway 67 through Presidio, Texas. A Corridor Development Plan is expected to be completed in March 2008 (NADB 2007).

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. Tactical infrastructure such as roads, pedestrian and vehicle fence, and lights would be constructed.
- North American Development Bank (NADB). The NADB is funding several projects in Ojinaga, Chihuahua, Mexico, which is south of the City of Presidio, Texas, across the Rio Grande (NADB 2007), including *Improvements to the Wastewater Collection and Treatment Systems and Construction of a Wastewater Treatment Plant*. Construction of a wastewater treatment plant and force main were completed in October 2006. Construction of one collector is underway, and bidding for additional sewer works is expected to begin in the first quarter of 2008. The improved collection/treatment system will reduce the contamination of local aquifers and land, and ensure that the effluent discharged into the Rio Grande complies with established environmental standards. The construction of this project will overlap temporally with that of the Project.
- South Orient Rail Line. The South Orient line is one of only seven rail gateways between the United States and Mexico, and crosses the U.S./Mexico international border at the City of Presidio. The 391-mile-long line has not had significant rehabilitation since the early 1980s, and has only seen limited use since July 1998 when regular operations over the western end of the line were allowed to be discontinued by the Surface Transportation Board. However, this line is currently being operated by Texas Pacifico Transportation Limited (TXPF), and limited operations over the border at Presidio resumed in March 2005. Increased traffic over the line will contribute to the rapid deterioration of the infrastructure, and a substantial rehabilitation program is necessary to sustain operations along

the entire line. TXPF has begun the rehabilitation of the line to improve service and begin operations to the border, with an initial rehabilitation expenditure of roughly $9 million (TxDOT 2005).

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 12-1** presents the cumulative effects 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.

12.1 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 2.3**, emissions from construction, operation, and maintenance activities will not contribute to or affect local or regional attainment status with the NAAQS, and will be below thresholds established by the USEPA for CAA cumulative impacts analysis. Construction equipment will temporarily increase fugitive dust and operation emissions from combustion fuel sources. Since there will be no substantive change in USBP operations from this project, emissions from vehicles will remain constant and there will be no cumulative impact on air quality.

12.2 NOISE

Minor cumulative impacts on ambient noise are expected from the additive impacts of construction, operation, and maintenance of tactical infrastructure and anticipated development activities and infrastructure improvement projects that will occur near the impact corridor. Noise intensity and duration from construction, operation, and maintenance of tactical infrastructure will be similar to construction activities from other development, or road construction and maintenance. Because noise 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 in urban areas in Presidio. 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.

Table 12-1. Summary of Related Projects and Potential Effects

Resource	Past Actions	Current Background Activities	Project Impacts	Known Future Actions	Cumulative Effects
Air Quality	Attainment criteria for all criteria pollutants.	Existing emissions sources continue to adversely affect regional air quality.	Fugitive dust and combustion emissions generated during construction.	Existing emissions sources continue to adversely affect regional air quality. No new major sources identified in Marfa Sector.	Continued attainment.
Noise	Commercial and residential development, vehicles dominate ambient noise near urban areas.	Commercial and residential development, vehicles dominate ambient noise near urban areas.	Short-term noise from construction equipment and increased traffic.	Commercial and residential development near Presidio contributes to ambient noise.	Existing sources will be the dominant noise source. Negligible cumulative impacts.
Land Use and Visual Resources	Some agricultural lands impacted by development. Past development affected natural viewsheds.	Minor development of open and agricultural lands. Development of natural areas for community and industry infrastructure.	CBP purchase of land or easements to construct tactical infrastructure. Natural areas developed for tactical infrastructure. Constant static visual interruption at fixed points.	La Entrada al Pacifico Corridor might stimulate development and alter land use. Development permanently alters natural areas and agricultural lands. Constant static visual interruption at fixed points.	Minor contribution to change in natural and agricultural land use. Minor to moderate long-term impacts from permanent infrastructure.

Resource	Past Actions	Current Background Activities	Project Impacts	Known Future Actions	Cumulative Effects
Geology and Soils	Installation of infrastructure and other features.	Installation of infrastructure; continued cross-border violator activities adversely affect soils.	Minor grading and recontouring will disturb soils; installation of fence might affect geology.	Installation of infrastructure near Presidio.	Minor long-term impact from construction of additional infrastructure.
Water Use and Quality					
Hydrology and Groundwater	Degradation of aquifers to historical pollution.	Continued degradation of aquifers from pollution.	None.	Improvements to the wastewater collection system should reduce current adverse impacts on water quality.	None.
Surface Water 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, fill of wetlands, and temporary degradation of water quality.	Improvements to the wastewater collection system should reduce current adverse impacts on water quality. Continued development could adversely affect surface waters from erosion and sedimentation.	Moderate impacts from construction activities, including potential impacts on wetlands. Minor short-term impacts from erosion. Mitigation of wetlands and construction BMPs should reduce impacts on insignificant levels.

Resource	Past Actions	Current Background Activities	Project Impacts	Known Future Actions	Cumulative Effects
Floodplains	Permanently altered by development and safety features such as levees and dams.	Various storm water and floodplain management practices when activities are proposed in or near floodplains.	Adverse impacts due to installation of tactical infrastructure in floodplain.	New development could add impervious areas and alter peak flow or floodplain capacity during high-volume storm events.	Minor contribution to cumulative impacts from construction of tactical infrastructure in floodplain.
Biological Resources					
Vegetation	Degraded historic habitat of sensitive and common wildlife species.	Continued minor urbanization results in loss of native species.	Minor loss of native species and habitat.	Development causes minor loss of native species and habitat.	Minor contribution to adverse impacts on native habitats and vegetation.
Wildlife and Aquatic Resources	Urbanization and loss of green corridors impacted habitat and food sources.	Minor loss of green corridor for wildlife.	Minor loss of green corridor and water access for wildlife.	Loss of green corridor for wildlife.	Minor loss of green corridor and water access for wildlife.
Threatened and Endangered Species	Degraded water quality and urbanization impacted sensitive species.	Urbanization and agricultural development degraded habitat for sensitive species.	No direct adverse impact expected. Minor loss of habitat.	Development reduces suitable habitat for sensitive species and degrades water quality.	Current and future activities will continue to delete green corridor and water access for wildlife.

Resource	Past Actions	Current Background Activities	Project Impacts	Known Future Actions	Cumulative Effects
Cultural Resources	Development and infrastructure improvements adversely affected cultural resources.	Development and infrastructure improvements adversely affect cultural resources.	No direct adverse impacts are expected.	Continued development and infrastructure improvements adversely affect cultural resources.	None.
Socioeconomic Resources and Safety	Commercial and residential development around Presidio affected local economies.	Commercial and residential development around Presidio.	Minor, short-term contribution to local construction industry.	Infrastructure development to support future commercial and residential development around Presidio.	Minor stimulation of local economy from construction activities. No adverse impact on environmental justice, children, or human health and safety.
Utilities and Infrastructure	Historical development and maintenance of utilities and infrastructure in area.	Utilities and infrastructure have been upgraded as necessary.	Minor short-term adverse impacts on local utilities and infrastructure during construction.	Continued development and maintenance of utilities and infrastructure in area.	None.
Roadways and Traffic	Construction and maintenance of roadways in area.	Roadways have been upgraded as necessary.	Minor short-term adverse impacts on traffic during construction.	Continued development and maintenance of roadways in area.	None.

12.3 LAND USE AND VISUAL RESOURCES

Construction of tactical infrastructure will result in minor changes to land use. Recent activities that have affected land use the most near the tactical infrastructure are development of agricultural and open lands in the Presidio area. Minor 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 in Presidio. For example, the designation of the La Entrada al Pacifico corridor could spur additional development in Presidio. Residential areas and agricultural lands will be displaced by the Project. Future development of residential areas will further alter the current land use.

Minor to moderate impacts on aesthetics and visual resources are expected from the additive effects of past, present, and reasonably foreseeable future actions. The presence of construction equipment will produce a short-term adverse impact on visual resources. Once installed, the tactical infrastructure 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 and after construction. Other development in Presidio will introduce night illumination into previously open or agricultural lands. Recreational activities such as stargazing will be adversely affected in certain locations by the cumulative impact in night illumination.

12.4 GEOLOGY AND SOILS

Additive effects include minor changes in topography due to grading, contouring, and trenching; minor soil disturbance; and a minor increase in erosion. Construction of the tactical infrastructure will not be in close proximity to other 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.

12.5 WATER USE AND QUALITY

12.5.1 Hydrology and Groundwater

Minor 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.

12.5.2 Surface Waters and Waters of the United States

Minor 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 other development activities have the potential for additional erosion and stream sedimentation and adverse cumulative effects. However, as discussed in **Chapter 6.2.3**, an SWPPP will be used in conjunction with sediment control and storm water BMPs to minimize potential impacts. Past actions, including sewage, agricultural runoff, and industrial discharges have generally degraded the quality of water in the upper Rio Grande and have resulted in long-term direct moderate impacts on water quality. The Rio Grande is a CWA Section 303(d) impaired water. Upgrades to existing wastewater facilities and construction of new facilities in Ojinaga, Mexico, could produce a moderate beneficial effect on water quality of the Rio Grande.

Wetland losses in the United States have resulted from draining, dredging, filling, leveling, and flooding for urban, agricultural, and residential development. According to the NWI database, there is no wetland information available for the impact corridor for any of the three fence sections. However, due to the proximity of the Rio Grande and the identification of irrigation and drainage canals on the topographic quads for these areas, wetlands might be present within all three sections of the impact corridor. Based on the field surveys, 14 wetlands or other Waters of the United States (WL1 through WL14) occur within the assessment area. Impacts on wetlands will be avoided to the maximum extent practicable. CBP will mitigate any loss of wetlands due to the Project. The cumulative impacts on wetlands will be long-term and moderate.

12.5.3 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 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. As discussed in **Chapter 6.3.1**, CBP will follow the FEMA process to floodproof the structures and minimize adverse impacts on floodplain resources from the Project.

12.6 BIOLOGICAL RESOURCES

12.6.1 Vegetation

Minor impacts on native species vegetation and habitat are expected from the additive effects of past, present, and reasonably foreseeable future actions. There has not been much development in the vicinity of the Project in the past and there are very few existing or future projects planned. However, Presidio has seen minor urbanization development, which has directly reduced habitat for sensitive flora species. Indirect impacts from urbanization include changes in floodways, water quality, and the introduction of nonnative species.

Minor development of land for urban use in the Presidio area will continue at an unknown pace resulting in the loss of some farmland and wildlife habitat. Construction of tactical infrastructure will contribute to this development issue. Water rights issues could become important and affect agricultural and urban acreages and planning efforts.

12.6.2 Wildlife and Aquatic Resources

Minor impacts on wildlife and other species are expected from the additive effects of past, present, and reasonably foreseeable future actions. Some urbanization of the Presidio area has effectively reduced green corridor and water access for wildlife. Cumulative impacts will mainly result from loss of habitat as described in **Chapter 7.2.3**, and involve habitat disturbance and degradation, construction traffic, and permanent loss of green corridors. Displaced wildlife will move to adjacent habitat if sufficient habitat exists. Because the development in the Presidio area could increase due to the designation of a trade route, the amount of potentially suitable habit could continue to decrease, producing a long-term, minor to major adverse cumulative effect. Wildlife could also be adversely impacted by noise during construction, lighting, and loss of potential prey species. Species could also be impacted by equipment spills and leaks. The permanent lighting could have minor, adverse cumulative impacts on migration, dispersal, and foraging activities of nocturnal species.

12.6.3 Special Status Species

As discussed in **Chapter 7.3.3**, CBP is in close coordination with the USFWS and analyzed potential impacts on listed species or designated critical habitat. Due to the lack of suitable habitat within the impact corridor, the Project will have no cumulative effect on federally listed species in Hudspeth or Presidio counties. A Listed Species/Habitat No Effect Determination is included in **Appendix E**.

Cumulative, adverse impacts on migratory birds could be substantial due to the potential timing of fence construction. Implementation of BMPs presented in **Chapters 1.7** and **7.3.3** could reduce their intensity. However, past loss of habitat combined with potential construction impacts has the potential for long-term, major, adverse cumulative impacts.

12.7 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 development; improvements to infrastructure such as highway and irrigation projects; and the clearing of land for other development projects in the Presidio area have caused impacts on cultural resources and can be expected to continue to do so. Cultural resources surveys found no properties listed in or eligible for listing in the NRHP that might be affected by the tactical infrastructure. The project is not expected to directly impact cultural resources and therefore will not contribute to cumulative impacts. Recorded cultural resources are outside the immediate Project area and will not be directly or indirectly impacted.

12.8 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 Hudspeth and Presidio counties through a minor increase in tax receipts for the purchase of goods and services. Construction of tactical infrastructure has the potential for beneficial effects from temporary increases in construction jobs and the purchase of goods and services in Hudspeth and Presidio counties. Approximately 315 workers are employed in the construction industry in the two counties, and an increase of 75 construction jobs will represent a temporary 25 percent increase in construction jobs, so the cumulative effect could be moderate. However, since the construction jobs will be temporary, negligible cumulative effects on population growth, income, or other services will be expected.

The construction of a wastewater treatment plant in Presidio, Texas, and the rehabilitation of the South Orient rail line would result in temporary economic benefits for construction companies, their employers and suppliers, and by Hudspeth and Presidio counties through a minor increase in tax receipts for the purchase of goods and services.

The conversion of 78.1 acres to support tactical infrastructure is a minimal cumulative effect because most of the land is publicly owned by the USIBWC. The USIBWC-owned land has restrictions on any development occurring within the USIBWC ROW.

The cumulative impacts of USBP activities to reduce the flow of illegal drugs, illegal cross-border violators, 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 smuggling activities 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.

12.9 UTILITIES AND INFRASTRUCTURE

The construction, operation, and maintenance of tactical infrastructure will have minimal demand for utilities and infrastructure, combining to produce a minimal adverse cumulative impact.

12.10 ROADWAYS AND TRAFFIC

Minor impacts on roadways and traffic are expected from the additive effects of past, present, and reasonably foreseeable future actions.

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14. ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	micrograms per cubic meter
APE	Area of Potential Effect
AQCR	air quality control region
BLM	Bureau of Land Management
BMP	Best Management Practice
CAA	Clean Air Act
CBP	U.S. Customs and Border Protection
CEQ	Council on Environmental Quality
CM&R	Construction Mitigation and Restoration
CO	carbon monoxide
CO_2	carbon dioxide
CWA	Clean Water Act
CY	calendar year
dBA	A-weighted decibels
DHS	U.S. Department of Homeland Security
EA	Environmental Assessment
EO	Executive Order
EPLCAI AQCR	El Paso-Las Cruces-Alamogordo Interstate Air Quality Control Region
ESA	Endangered Species Act
ESP	Environmental Stewardship Plan
FHWA	Federal Highway Administration
FM	Farm-to-Market
FPPA	Farmland Protection Policy Act
FR	Federal Register
FY	fiscal year
hp	horsepower
IBWC	International Boundary and Water Commission
IIRIRA	Illegal Immigration Reform & Immigration Responsibility Act
MBTA	Migratory Bird Treaty Act
mg/L	Milligrams per liter
mg/m^3	milligrams per cubic meter
MMTCE	million metric tons of carbon equivalent
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NADB	North American Development Bank
NHL	National Historic Landmark
NO_2	nitrogen dioxide

NO_x	nitrogen oxide
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O_3	ozone
OSHA	Occupational Safety and Health Administration
OHM	Ordinary high water mark
P.L.	Public Law
Pb	lead
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
ROI	Region of Influence
ROW	right-of-way
SBI	Secure Border Initiative
SDWA	Safe Drinking Water Act
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
SPCC	Spill Prevention Control and Countermeasures
SR	State Route
SWPPP	Storm Water Pollution Prevention Plan
TCEQ	Texas Commission on Environmental Quality
TCP	Traditional Cultural Properties
TxDOT	Texas Department of Transportation
THC	Texas Historical Commission
TMDL	Total Maximum Daily Load
TNRCC	Texas Natural Resource Conservation Commission
TPWD	Texas Parks and Wildlife Department
TXPF	Texas Pacifico Transportation Limited
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	United States Section, International Boundary and Water Commission
VOC	volatile organic compound

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 cross-border violators 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 two fence types that will be constructed for the USBP Marfa Sector include bollard floating fence and levee retaining wall. Bollard fences consist of steel bollards anchored into concrete footings and/or pickets welded to the bollards. Floating fences consist of prefabricated floating fence panels placed on the levee. Floating fences are generally concrete barriers with pickets anchored on top (see **Figure B-1**). Concrete retaining wall consists of prefabricated concrete wall panels sheet-piled into an existing embankment (see **Figure B-2**). Wildlife openings cannot be placed into floating fence, concrete retaining walls, or concrete flood protection structures/concrete fence. Because each discrete tactical infrastructure section represents an individual project that could proceed independently, multiple sections will be under construction simultaneously.

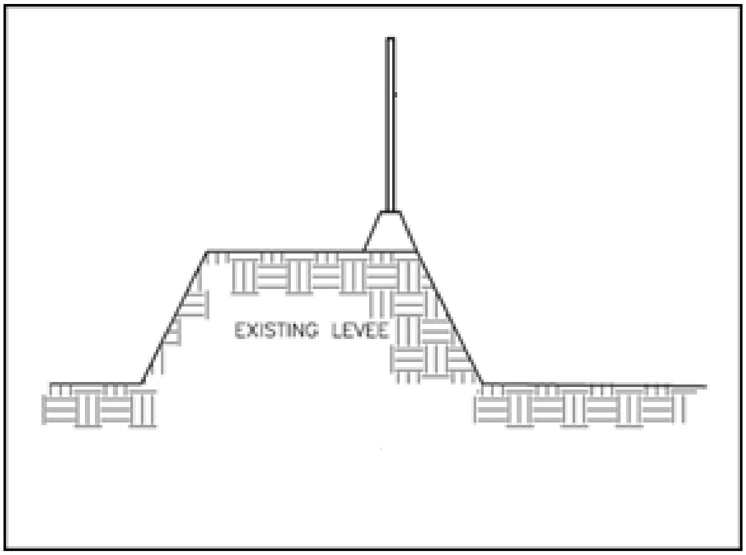


Figure B-1. Cross Section of Typical Floating Fence

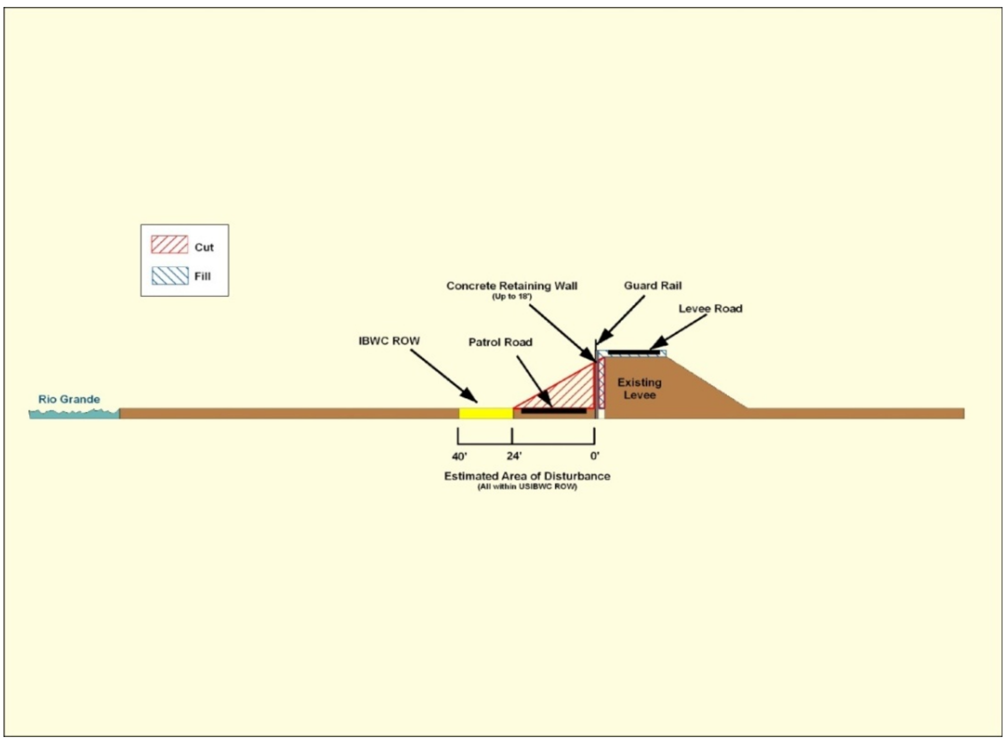


Figure B-2. Cross-Section of Concrete Levee Retaining Wall

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).

Lighting

Two types of lighting (permanent and portable) might be constructed in specific urban locations. Illegal entries are often accomplished by utilizing the cover of darkness, which would be eliminated by lighting. Lighting acts as a deterrent to cross-border violators and as an aid to USBP agents in capturing illegal aliens, smugglers, terrorists, or terrorist weapons after they have entered the U.S. (INS 2001). Lighting locations are determined by USBP based on emergent or projected operational needs of the specific area.

The permanent lighting is stadium-type lights on approximately 30- to 40 ft high poles with two to four lights per pole. Each light would have a range of 400 to 1,000 watts, with lower-wattage bulbs used where feasible. Wooden poles, encased in concrete and steel culvert pipe to prevent them from being cut down, would most often be used, although steel poles with concrete footings might also be used. The poles may be existing poles or they might need to be installed. Electricity would be run in overhead lines unless local regulations required the lines to be underground (DHS 2004). Lights would operate from dusk to dawn. Light poles adjacent to USIBWC levees would be coordinated with and approved by the USIBWC. The final placement and direction of lighting has been and will continue to be coordinated with the USFWS to minimize adverse impacts to the maximum extent practicable.

Portable lights are self-contained units with generators that can be quickly moved to meet USBP operational requirements. Portable lights are powered by a 6-kilowatt self-contained diesel generator. Portable lights would generally operate continuously every night and would require refueling every day prior to the next night's operation. The portable light systems can be towed to the desired location by USBP vehicles, but they are typically spaced approximately 100 to 400 feet apart, depending upon topography and operational needs. Each portable light would have a light fan directed toward the fence to produce an illuminated area of 100 ft^2. The lighting systems would generally have shields placed over the lamps to reduce or eliminate the effects of backlighting. Effects from the lighting would occur along the entire corridor where they could be placed; however, in reality, only part(s) of the fence would be illuminated at a given time since the portable lights would be periodically relocated to provide the most effective deterrent and enforcement strategy (INS 2001).

References

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

DHS 2004 — U.S. Department of Homeland Security (DHS). 2004. *Environmental Impact Statement for Operation Rio Grande*. CBP, Washington D.C. April 2004.

INS 2001 — Immigration and Naturalization Service (INS). 2001. *Final Environmental Assessment, Portable Lights within the Naco Corridor*. Cochise County, Arizona. December 2001.

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

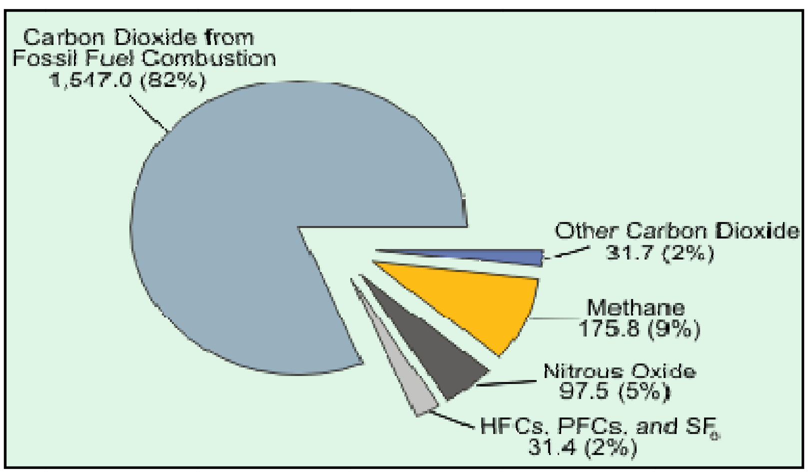
AIR QUALITY EMISSIONS CALCULATIONS

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.

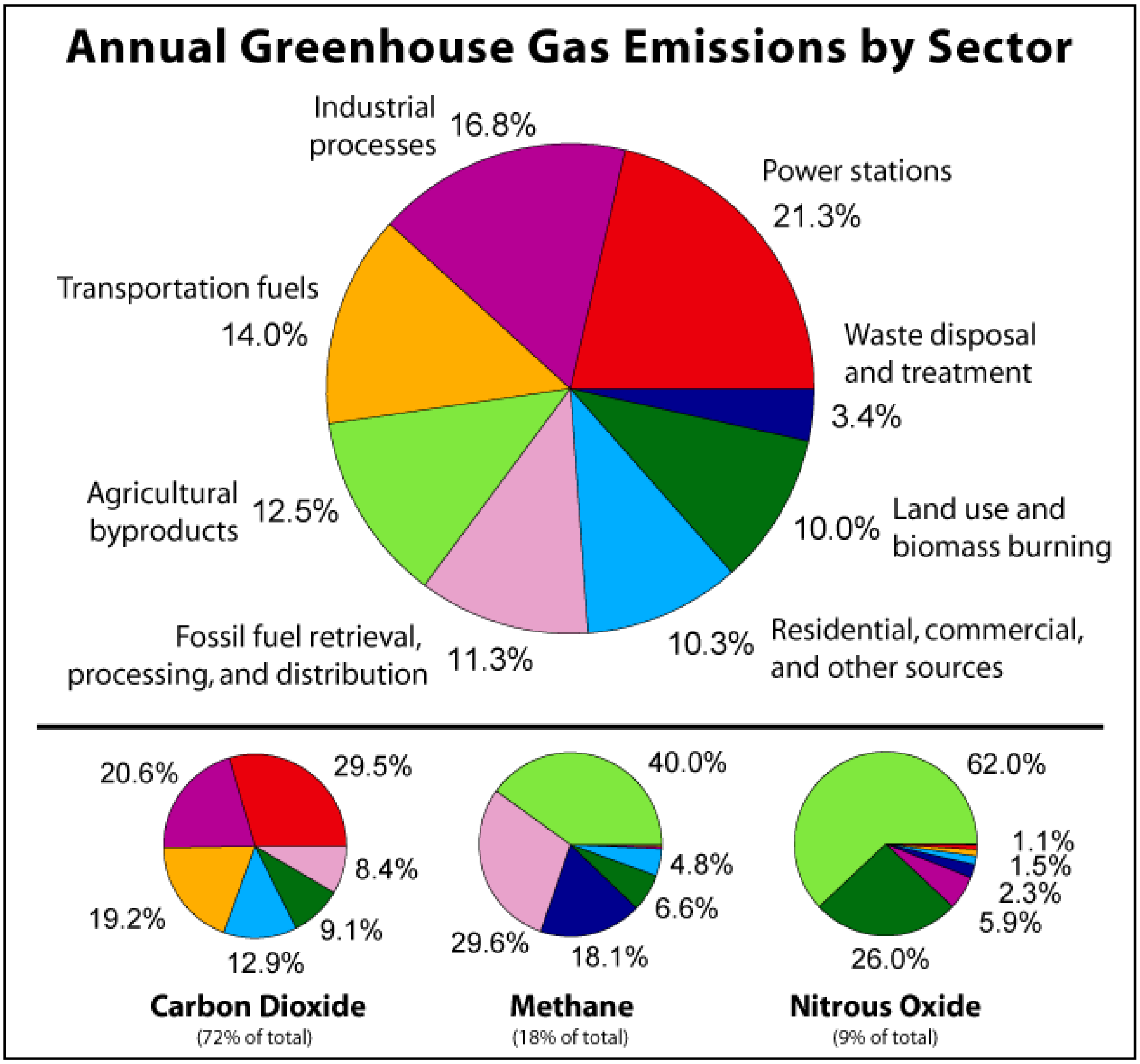
Many gases exhibit these "greenhouse" properties. The sources of the majority of greenhouse gases come mostly from natural sources but are also contributed to by human activity and are shown in **Figure C-1**. It is not possible to state that a specific gas causes a certain percentage of the greenhouse 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 access roads from mowers.
Generator Emissions	Estimates the total emissions from emergency generators to power construction equipment.
AQCR Tier Report	Summarizes total emissions for the El Paso-Las Cruces-Alamogordo Interstate 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	11.333	1.689	13.239	0.227	0.380
	Construction Fugitive Dust	0.000	0.000	0.000	0.000	96.098
	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	34.153	3.554	18.167	1.735	98.084

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.

El Paso-Las Cruces-Alamogordo Interstate AQCR

	Point and Area Sources Combined				
Year	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)
2001	54,477	43,267	347,384	4,569	149,894

Source: USEPA-AirData NET Tier Report (http://www.epa.gov/air/data/geosel.html). Site visited on 13 November 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	54,477	43,267	347,384	4,569	149,894
2008 Emissions	34.153	3.554	18.167	1.735	98.084
Project %	**0.063%**	**0.008%**	**0.005%**	**0.038%**	**0.065%**

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 Fences and Patrol Road	3,399,264	ft^2

Assumptions:

Total ground disturbance for pedestrian fence and patrol road would be 10.73 miles long by 60 feet wide (3,399,264 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 Alternative 2.
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:	3,399,264	ft^2	
Construction Duration:	1.0	year(s)	
Annual Construction Activity:	190	days/yr	

Emission Factors Used for Construction Equipment

Reference: Guide to Air Quality Assessment, SMAQMD, 2004

Emission 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 emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC.

c) The SMAQMD 2004 reference does not provide SO_2 emission 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 emission factor for the mobile equipment (based upon 2002 USAF IERA "Air Emissions Inventory Guidance") and 0.02 times the NOx emission 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 EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	SMAQMD Emission Factors (lb/day)				
		NO_x	VOC	CO	SO_2**	PM_{10}
Grading Equipment	8	3777.584	563.110	4413.112	75.552	126.731
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

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

Example: SMAQMD Emission 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:	3,399,264	78.04	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	22,665.51	3,378.66	26,478.67	453.31	760.39
Paving	-	-	-	-	-
Demolition	-	-	-	-	-
Building Construction	-	-	-	-	-
Architectural Coatings	-	-	-	-	-
Total Emissions (lbs):	**22,665.51**	**3,378.66**	**26,478.67**	**453.31**	**760.39**

Results: Total Project Annual Emission Rates

	NO_x	VOC	CO	SO_2	PM_{10}
Total Project Emissions (lbs)	22,665.51	3,378.66	26,478.67	453.31	760.39
Total Project Emissions (tons)	11.33	1.69	13.24	0.23	0.38

CO2 Emissions

It is assumed that 15 vehicles consisting of bulldozer, grader, forklift, cranes, rollers, and light duty trucks would be used for 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)

15 vehicles x 10 miles/day/vehicle x 190 days working x 1 gal/10 miles x 19.5 lb co2/gal x ton/2000lb = 27.9 tons CO2

Estimate emissions of CO2 for MSAI AQCR region is 1,695,000 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:	78.04	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:	50	%	(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:	17	%	Ave. of wind speed at El Paso, TX (ftp://ftp.wcc.nrcs.usda.gov/downloads/climate/windrose/texas/el_paso/)
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:	23.41	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	0.6	hr/acre	
Bulldozer mileage per acre	1	VMT/acre	(Miles traveled by bulldozer during grading)
Construction VMT per day	117	VMT/day	
Construction VMT per acre	8.4	VMT/acre	(Travel on unpaved surfaces within site)

Equations Used (Corrected for PM10)

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 Emission Factors, Vol. I, USEPA AP-42, Section 11.9 dated 10/98 and Section 13.2 dated 12/03

Calculation of PM_{10} Emission Factors for Each Operation

Operation	Emission Factor (mass/ unit)		Operation Parameter		Emission Factor (lbs/ acre)	
Bulldozing	0.08	lbs/hr	0.6	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 = 6.9 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 = 0.69 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	Emission Factor		Graded Acres/yr	Exposed days/yr	Emissions lbs/yr	Emissions tons/yr
Bulldozing	0.00	lbs/acre	78.04	NA	0	0.000
Grading	0.80	lbs/acre	78.04	NA	62	0.031
Vehicle Traffic	24.00	lbs/acre	78.04	NA	1,873	0.936
Erosion of Soil Piles	0.69	lbs/acre/day	78.04	90	4,846	2.423
Erosion of Graded Surface	26.40	lbs/acre/day	78.04	90	185,414	92.707
TOTAL					192,196	96.10

Soil Disturbance EF: 24.80 lbs/acre
Wind Erosion EF: 27.09 lbs/acre/day

Back calculate to get EF: 440.95 lbs/acre/grading day

Construction (Grading) Schedule for CY 2008

Estimate of time required to grade a specified area.

Input Parameters
Construction area: 78.04 acres/yr (from "CY2008 Combustion" Worksheet)
Qty Equipment: 23.41 (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	78.04	9.75
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	78.04	38.15
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	39.02	39.34
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	39.02	16.14
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	78.04	27.37
TOTAL								130.76

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

(Equip)(day)/yr: 130.76
Qty Equipment: 23.41
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 fenceline and access road would require mowing approximately two times per year to maintain vegetation height and allow enhanced visibility and security.

Assumptions:
Approximately 78.04 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).

Emission Factors Used for Maintenance Equipment

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

				Emission 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 Emission 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)*(Emission 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 Emission 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: Emission 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

The Project would require **30** portable light units to meet USBP operational requirements. These portable lights are powered by a 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 Operational 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 Emission 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: Emission 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)

El Paso-Las Cruces-Alamogordo Interstate 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	Brewster Co	6,795	838	2,697	790	79.6	713	0	0	0	0	0	0
2	TX	Culberson Co	11,856	2,101	1,193	418	107	1,119	90.2	516	0.07	0.07	3.86	8.49
3	TX	El Paso Co	143,118	20,272	13,472	4,093	1,089	19,706	3,753	4,119	519	476	902	1,117
4	TX	Hudspeth Co	18,792	3,409	2,548	680	163	1,394	54.5	315	0	0	0.24	2.92
5	TX	Jeff Davis Co	4,878	1,003	1,564	463	68.2	422	0	0	0	0	0	0
6	TX	Presidio Co	4,880	900	2,518	669	73.6	495	0	0	0	0	0	0
1	NM	Dona Ana Co	83,671	11,398	67,737	11,440	1,211	10,199	790	2,155	112	94.4	151	554
2	NM	Lincoln Co	19,476	2,202	16,984	3,527	207	1,791	65.1	469	0.75	0.75	0.18	100
3	NM	Otero Co	28,647	2,906	31,921	5,873	273	3,472	381	123	132	125	119	167
4	NM	Sierra Co	20,137	1,751	8,300	1,843	121	2,007	0	0	196	110	0	0
Grand Total			342,250	46,780	148,934	29,796	3,392	41,318	5,134	7,697	960	806	1,176	1,949

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 13 November 2007.

El Paso-Las Cruces-Alamogordo Interstate AQCR (40 CFR 81.82):
In the State of Texas: Brewster County, Culberson County, El Paso County, Hudspeth County, Jeff Davis County, and Presidio County
In the State of New Mexico: Dona Ana County, Lincoln County, Otero County, and Sierra County

APPENDIX D

Biological Survey Report

BIOLOGICAL SURVEY REPORT

FOR

CONSTRUCTION, OPERATION, AND MAINTENANCE OF TACTICAL INFRASTRUCTURE

USBP MARFA SECTOR, TEXAS

Prepared for

U.S. DEPARTMENT OF HOMELAND SECURITY
U.S. CUSTOMS AND BORDER PROTECTION
U.S. BORDER PATROL

Prepared by

Solutions Today for a Sustainable Tomorrow

MARCH 2008

ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
BA	Biological Assessment
BMP	Best Management Practice
BO	Biological Opinion
BSR	Biological Survey Report
CBP	U.S. Customs and Border Protection
CFR	Code of Federal Regulations
CWA	Clean Water Act
DHS	U.S. Department of Homeland Security
EA	Environmental Assessment
ESA	Endangered Species Act
IBWC	International Boundary and Water Commission
MBTA	Migratory Bird Treaty Act of 1918, as amended
NEPA	National Environmental Policy Act
POE	Port of Entry
ROE	Right of Entry
SFA	Secure Fence Act
TPWD	Texas Parks and Wildlife Department
USACE	U.S. Army Corps of Engineers
USBP	U.S. Border Patrol
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

BIOLOGICAL SURVEY REPORT

FOR

CONSTRUCTION, OPERATION, AND MAINTENANCE OF TACTICAL INFRASTRUCTURE

USBP MARFA SECTOR, TEXAS

U.S. DEPARTMENT OF HOMELAND SECURITY
U.S. CUSTOMS AND BORDER PROTECTION
U.S. BORDER PATROL

MARCH 2008

BIOLOGICAL SURVEY REPORT
FOR
CONSTRUCTION, OPERATION, AND MAINTENANCE OF TACTICAL INFRASTRUCTURE
USBP MARFA SECTOR, TEXAS

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1. INTRODUCTION

The 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 support information from the Project region, allows evaluation of the potential impacts of the Project on those biological resources within the project corridor by the Environmental Stewardship Plan (ESP), and provides the basis of recommendations for avoidance or reduction of those impacts using mitigation including best management practices (BMPs). Information was gathered from publicly available literature, data provided by relevant land management agencies, review of aerial photography and U.S. Geological Survey (USGS) topographic maps, data from the State of Texas, data from NatureServe, the National Wetlands Inventory (NWI), and corridor field surveys conducted in November 2007.

The BSR analyzes the potential impacts to biological resources resulting from the construction, operation, and maintenance of the Project. The BSR was prepared as an independent document that is an attachment to the ESP developed for this Project.

In general, the project corridor encompasses approximately 11 miles in length and approximately 196 acres within a 150-foot-wide area. In total, approximately 175 acres of nonnative and native vegetation providing wildlife habitat occurs in the project corridor. The remaining area, 30 acres (approximately 15% of the 150-foot-wide corridor) support land use in the form of fallow and irrigated agriculture, rail line, roads and trails, and open water.

Herbaceous vegetation (grasslands, forblands, emergent wetlands) comprises approximately 29 percent of the 150 foot-wide corridor. Shrublands (dwarf, short, and tall) comprise approximately 2 percent of the 150-foot-wide corridor. Woodlands comprise approximately 22 percent of the 150-foot-wide corridor. The vegetation represents a combination of mostly non-native grasses that have become established in dense stands on levee banks, river terraces, in hay fields, and as woodland understory; shrublands that are invading herbaceous vegetation stands or occur on gravelly upland substrates; and riparian woodlands.

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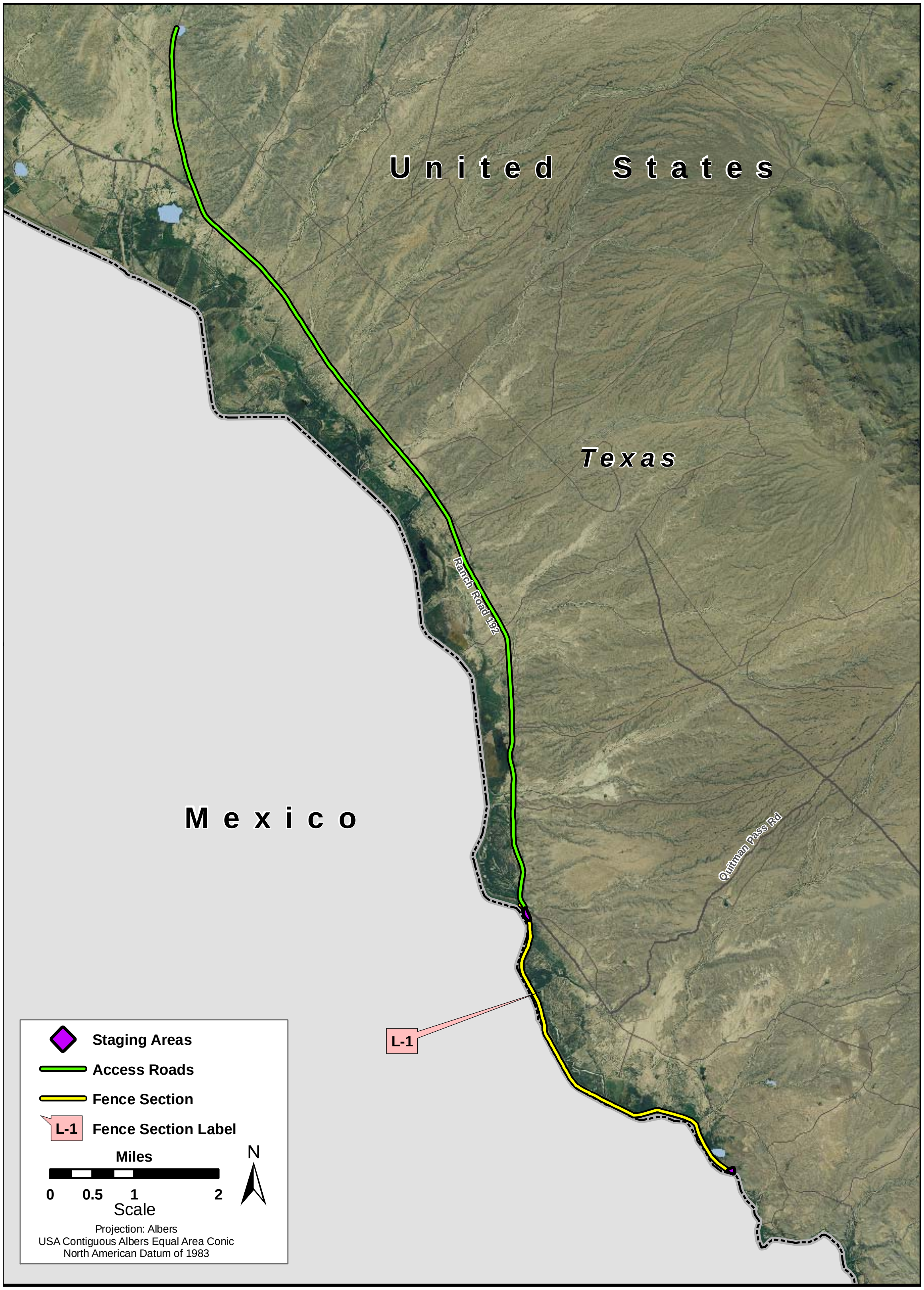
2. PROJECT DESCRIPTION

U.S. Customs and Border Protection (CBP) plans to construct, maintain, and operate tactical infrastructure consisting of pedestrian, aesthetic, or hybrid fence; associated access roads; patrol roads; and lights along the U.S./Mexico international border in the U.S. Border Patrol (USBP) Marfa Sector, Texas. **Figures 2-1** and **2-2** illustrate the locations of the new tactical infrastructure. The locations are based on a USBP Marfa Sector assessment of local operational requirements where it will assist USBP agents in reducing cross-border violator activities. The tactical infrastructure will be constructed in three discrete sections along the international border in Hudspeth and Presidio counties, Texas (**Table 2-1**). The individual tactical infrastructure sections range from 3.1 to 4.6 miles in length, or nearly 11 miles total.

Table 2-1. Tactical Infrastructure Sections, Marfa Sector

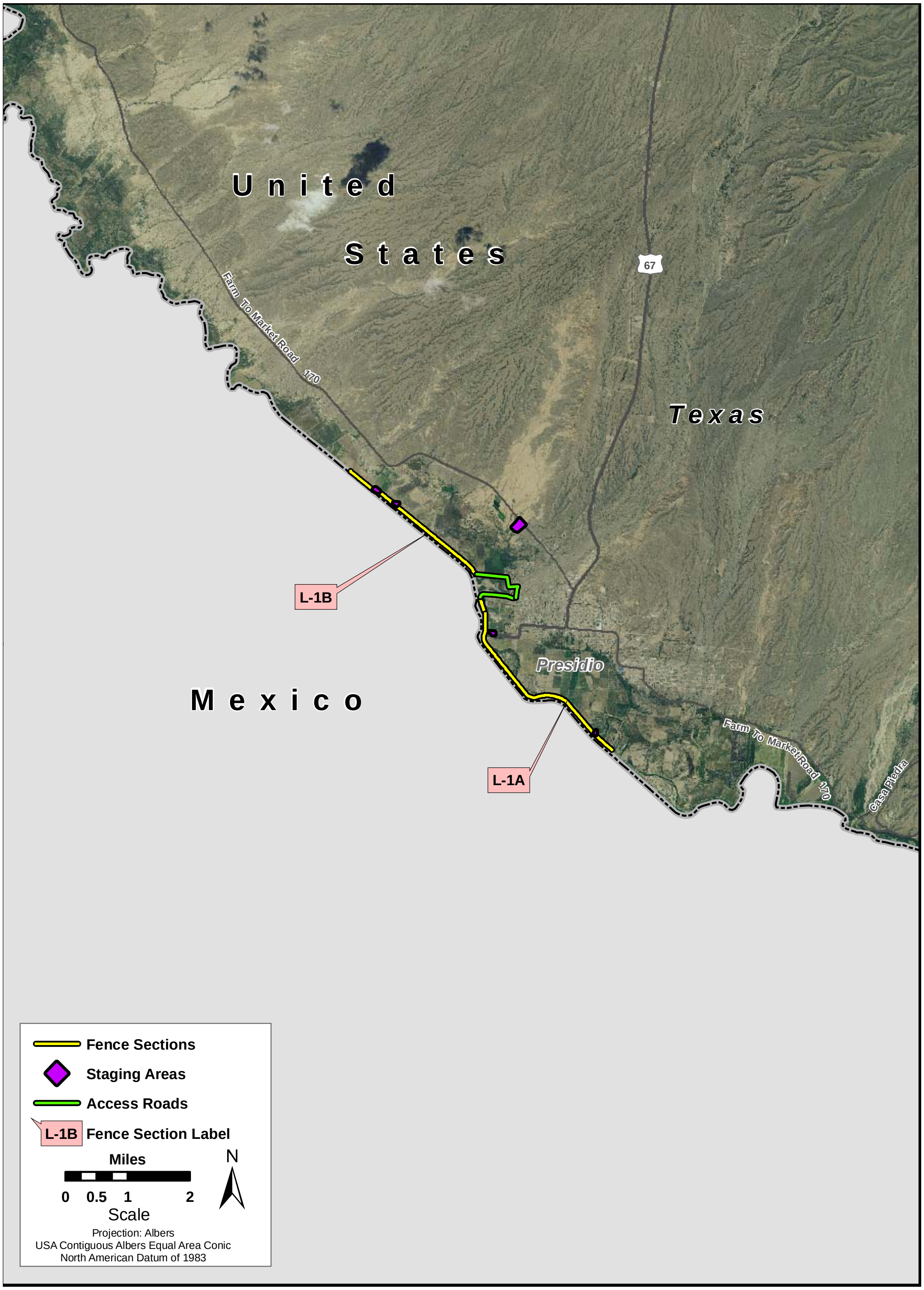
Section Number	USBP Station	General Location	Land Ownership	Length of Section (miles)
L-1	Sierra Blanca	Neely's Crossing	Public (USIBWC)	4.63
L-1A	Presidio	Rio Grande East of POE	Public (USIBWC) and private	3.3
L-1B	Presidio	Rio Grande West of POE	Public (USIBWC) and private	2.9
			Total	10.73

Note: IBWC = International Boundary and Water Commission; POE = Port of Entry



Source: ESRI StreetMap USA 2005

Figure 2-1. General Location of Tactical Infrastructure, Section L-1



Source: ESRI StreetMap USA 2005

Figure 2-2. General Location of Tactical Infrastructure, Sections L-1A and L-1B

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3. SURVEY METHODS

To provide flexibility in placement of tactical infrastructure within the project corridor, and to ensure consideration of potential impacts due to construction, patrol, and maintenance, surveys were conducted in an area extending 150 feet on the north side (the side away from the Rio Grande) of the three individual tactical infrastructure sections and extending at least 0.5 mile past the ends of each section. The areas thus defined are referred to hereafter as the “survey corridor” or “project corridor.”

Intuitive controlled investigations of the survey corridor were conducted by employees of engineering-environmental Management, Inc. (e^2M): James Von Loh (Senior Ecologist), Valerie Whalon (Staff Biologist), Karen Stackpole (Staff Biologist), Shannon Cauley (Wetlands Ecologist), and Brent Eastty (Staff Botanist). The November 2007 and January 2008 surveys examined the project corridor under rights-of-entry (ROE) approvals and CBP escort.

Due to the short time-frame for acquiring field information, e^2M assigned senior ecologists and biologists familiar with the NEPA process, vegetation and wildlife habitat classification and mapping protocols, and field sampling methods to intuitively examine the landscape and project corridor for the 11-mile length. The surveys were controlled, in that ROE were approved for the 150-foot-wide corridor, 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 lists by fence sections; assessment of habitat; surveys for rare plant and wildlife species, landscape photography points, and observation points; recording dominant species, location, cover, environmental conditions, and photo-documentation; determination of potential wetlands for January research; and general note-taking of natural resources and other NEPA reporting needs.

Biologists surveyed the length of the project corridor for each tactical infrastructure section. They conducted reconnaissance-level surveys on areas of land use (agricultural fields and access roads) and examined in more detail areas containing unique species compositions or habitat that might be conducive to sensitive species (grasslands, shrublands, woodlands, wetlands, water bodies, etc.). Observation data (UTM coordinates from GPS receivers, photographs, field notes, environmental information, vegetation structure, and plant community composition) were recorded at regular intervals along the project corridor where vegetation occurred as homogenous stands, and also where plant communities presented substantial shifts in species composition. These data were used to generate vegetation classifications and maps to inform 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 are included as a digital file in this final report. Although no protocol surveys were conducted, botanists and wildlife biologists specifically examined habitats to determine the presence of state- and federal-listed species (**Table 3-1**). Descriptions of the federally listed species are provided in **Attachment B**.

Table 3-1. Federal and State Threatened and Endangered Species Potentially Occurring in the Project Area

Common Name	Scientific Name	County	Federal Status	State Status	Habitat
Plants					
Hinckley oak	Quercus hinckleyi	P	T	T	Arid limestone slopes at mid elevations in Chihuahuan Desert
Fish					
Blue sucker	Cycleptus elongatus	P		T	Larger portions of major rivers in Texas; usually in channels and flowing pools with a moderate current; bottom type usually of exposed bedrock, perhaps in combination with hard clay, sand, and gravel; adults winter in deep pools and move upstream in spring to spawn on riffles
Chihuahua shiner	Notropis chihuahua	P		T	Rio Grande basin, Big Bend region; clear, cool water that is often associated with nearby springs; often in pools with slight current or riffles over a gravel or sand bottom where vegetation may be present
Conchos pupfish	Cyprinodon eximius	P		T	Rio Grande and Devils River basins; sloughs, backwaters, and margins of larger streams, channels of creeks, and mouths
Mexican stoneroller	Campostoma ornatum	P		T	In Texas, Big Bend region; clear, fast riffles, chutes, and pools in small to medium-sized creeks with gravel or sand bottoms

Common Name	Scientific Name	County	Federal Status	State Status	Habitat
Reptiles					
Chihuahuan Desert lyre snake	Trimorphodon vilkinsonii	H		T	Mostly crevice-dwelling in predominantly limestone-surfaced desert northwest of the Rio Grande from Big Bend to the Franklin Mountains, especially in areas with jumbled boulders and rock faults/fissures
Mountain short-horned lizard	Phrynosoma hernandesi	H		T	Open, shrubby, or openly wooded areas with sparse vegetation at ground level; soil may vary from rocky to sandy
Texas horned lizard	Phrynosoma cornutum	H		T	Open, arid, and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky
Birds					
American peregrine falcon	Falco peregrinus anatum	H	DL	E	Nests in tall cliff eyries; migratory stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands
Arctic peregrine falcon	Falco peregrinus tundrius	H	DL	T	Migratory stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands
Interior least tern	Sterna antillarum athalassos	H	E	E	Nests along sand and gravel bars within braided streams, rivers; also known to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc.)
Mexican spotted owl	Strix occidentalis lucida	H	T	T	Remote, shaded canyons of coniferous mountain woodlands (pine and fir)

Common Name	Scientific Name	County	Federal Status	State Status	Habitat
Birds (continued)					
Northern aplomado falcon	Falco femoralis septentrionalis	H, P	E	E	Open country, especially savanna and open woodland, and sometimes in very barren areas; grassy plains and valleys with scattered mesquite, yucca, and cactus
Southwestern willow flycatcher	Empidonax traillii extimus	H, P	E		Thickets of willow, cottonwood, mesquite, and other species along desert streams
Yellow-billed cuckoo	Coccyzus americanus	H, P	C; NL		Deciduous woodlands with cottonwoods and willows; dense understory foliage is important for nest site selection; nests in willow, mesquite, cottonwood, and hackberry; forages in similar riparian woodlands
Mammals					
Black bear	Ursus americanus	H	T/SA;NL	T	Bottomland hardwoods and large tracts of inaccessible forested areas
Mexican long-nosed bat	Leptonycteris nivalis	P	E	E	Cave-dwelling species that usually inhabits deep caverns; nectivorous, with *Agave* spp. preferred

Sources: TPWD 2007; USFWS 2007

Notes: DL = De-Listed

E=Endangered

T=Threatened

C = Species for which the Service has on file enough substantial information to warrant listing as threatened or endangered

NL= Not listed

T/SA= Threatened due to similar appearance

H= Hudspeth County (Fence Section L-1)

P= Presidio County (Fence Sections L-1A and L-1B)

4. ENVIRONMENTAL SETTING

The project area climate is Subtropical Arid within the Modified Marine climatic type, meaning that 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. In the project area, summertime precipitation anomalies related to the mountain relief of the Trans-Pecos region occur.

Temperatures in El Paso occur in an average annual minimum and maximum of 52 °F and 77 °F, respectively (NOAA 2007). The lowest and highest temperatures recorded for El Paso are -8 °F and 114 °F. Presidio average low temperatures range from 35 °F in January to 74 °F in July, and average high temperatures range form 69 °F in January to 102 °F in June. The average annual precipitation of the Trans-Pecos region recorded in Presidio is 9.6 inches, and in El Paso 9.4 inches. The distribution of rainfall throughout the year is irregular but occurs predominantly during the summer months when seasonal monsoons occur, from June to September. A long growing season occurs in the proposed project region, over 250 days. The evaporation rate during the summer season is high, about twice the amount of precipitation.

The vegetation of the Trans-Pecos Region of southwestern Texas has generally been classified under the Dry Domain (300), Tropical/Subtropical Steppe Division (320) of Bailey (1995). The project area is more finely classified as the Chihuahuan Desert Province (321). The 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 Chihuahuan Biotic Province; Trans Pecos Natural Region; and the Level III Ecoregion of the Chihuahuan Desert.

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5. BIOLOGICAL RESOURCES

5.1 Vegetation Classification

NatureServe (2007) 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. Chihuahuan Creosote bush Desert Scrub (CES302.731)
2. Chihuahuan Mixed Salt Desert Scrub (CES302.017)
3. North American Arid West Emergent Marsh (CES300.729).

This chapter provides a brief description of each plant community that surveyors observed within the fence sections. Communities are distinguished using the NatureServe Vegetation Alliance level of classification or an approximation (provisional community name).

Classification of existing vegetation within this corridor was achieved by accessing the project corridor and staging areas as sampling observation points, and relating them to the NatureServe Explorer classification database (2007). At the coarsest level, the three 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 2007) 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 proposed project corridor typically consisted of non-native species, including Athel Tamarisk (*Tamarix aphylla*) Woodland, Salt-cedar (*Tamarix chinensis*) Woodland and Shrubland, Bermuda Grass (*Cynodon dactylon*) Semi-Natural Herbaceous Vegetation, and Russian-thistle (*Salsola australis*) Semi-Natural Herbaceous Vegetation.

5.1.1 Vegetation Description

Habitats observed, sampled, and photographed within the project corridor range from desert scrub of uplands and creeks to riparian woodland communities in the Rio Grande floodplain and non-native grasslands and forblands. Much of the vegetation cover along the sections consists of non-native tree, shrub, grass, and forb species that are themselves dominant or often support an overstory of honey mesquite or salt cedar shrubs or small trees. Agricultural fields occur along much of the project corridor near Presidio, where they typically lie fallow and support stands of annual Russian-thistle forbs. Where actively farmed, the fields produce hay crops, principally alfalfa, sorghum, and Bermuda grass. The Rio

Grande has been channelized throughout the project corridor, which in addition to levee and road construction has disturbed a majority of the project landscape.

A brief description of each plant community observed within the fence sections (L-1, L-1A, L-1B) 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 non-native 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.

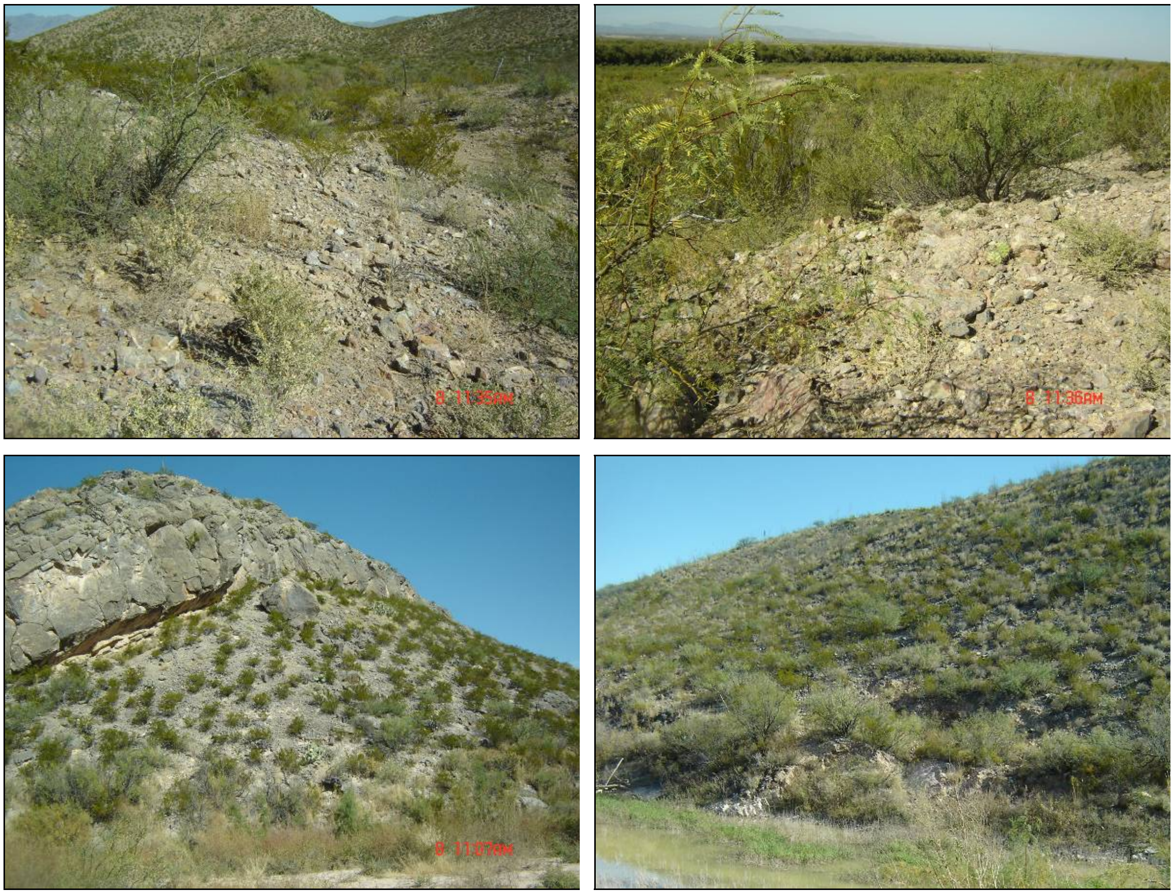
5.1.1.1 Chihuahuan Creosote bush Desert Scrub (CES302.731)

Creosote bush—Honey Mesquite Shrubland. This community occurs within Section L-1 near Sierra Blanca. The termini of bedrock ridges with gravelly slopes on the east end of the project corridor and a small area of gravelly upland slopes on the west end support creosote bush and honey mesquite shrubs 2–5 meters tall that provide 10–20 percent and 10–12 percent cover, respectively (see **Photograph 5-1**). These sites have moderately high diversity and support low cover of several succulents (*Opuntia* spp.) and the short shrub four-wing saltbush. The herbaceous layer is diverse and contributes sparse to low cover, up to 6 percent cover, of hairy grama, fluffgrass, hairy golden aster, and Russian-thistle.

5.1.1.2 North American Warm Desert Riparian Woodland and Shrubland (CES302.753)

Honey Mesquite Woodland. Honey mesquite woodlands characterized by small trees 2–5 meters tall occur within Sections L-1A and L-1B in the vicinity of Presidio, where they have become established in abandoned agricultural fields or form a linear band at the levee toe-of-fill (principally at the base of the south levee bank). In the canopy layer, honey mesquite cover ranges from 30 to 45 percent (see **Photograph 5-2**). The associated canopy tree salt-cedar contributes approximately 15 percent cover in each sampled stand. The herbaceous layer consists of Russian-thistle primarily, which provides 15–50 percent cover.

Salt-cedar / Bermuda Grass Shrubland and Shrub Herbaceous Vegetation. Salt-cedar tall shrubs, 2–5 meters tall, have invaded Bermuda grass-dominated grasslands within Section L-1 near Sierra Blanca (see **Photograph 5-3**). These stands occupy the narrow floodplain strip or first terrace between the Rio Grande and the access road, which is constructed on the short-stature levee. The tall shrub layer is monotypic with salt cedar and provides approximately 15–35 percent cover. The herbaceous layer contributes dense cover in the stand and is characterized by Bermuda grass (30–70 percent cover) and white aster (3–25 percent cover).



Photograph 5-1. Photographs of Representative Habitat: Creosote bush—Honey Mesquite Shrubland

Seepwillow Shrub Herbaceous Vegetation. Seepwillow occurs on one site within Section L-1A near Presidio as a shrub herbaceous stand that has become established in a small drainage adjacent to an irrigation ditch (see **Photograph 5-4**). The seepwillow shrubs are 2–5 meters tall and provide approximately 15 percent cover. The associated herbaceous layer includes approximately 15 percent cover each by Bermuda grass, Johnsongrass, and the annual forb Russian-thistle.

Rabbitbrush Shrubland. Rabbitbrush short shrubs have become established on roadway fill within the Section L-1 near Sierra Blanca. On these sites, the fill material supporting rabbitbrush ranges from 30 centimeters to 1 meter deep, and the stands form along both sides of the access road (see **Photograph 5-5**). In the short shrub layer, rabbitbrush contributes 30–55 percent cover, and honey mesquite provides 2–4 percent cover. An herbaceous layer is represented by Bermuda grass, six-weeks grama, dropseeds, and Russian-thistle that provide low cover, up to 13 percent cover in sampled stands.

Photograph 5-2. Photographs of Representative Habitat: Honey Mesquite Woodland

Photograph 5-3. Photographs of Representative Habitat: Salt-Cedar/Bermuda Grass Shrubland


Photograph 5-4. Photographs of Representative Habitat: Seepwillow


Photograph 5-5. Photographs of Representative Habitat: Rabbitbrush

Seepweed Shrubland. Seepweed short shrubs are common understory associates in several plant communities and rarely form small stands within Section L-1 (see **Photograph 5-6**). One stand, where seepweed shrubs up to 1 meter tall contribute 40 percent cover, has become established in an area with silty soils that receive inflow from runoff during precipitation events. The tall shrubs (2–5 meters) honey mesquite and salt-cedar each provide sparse cover at the stand margin. The herbaceous layer contributes sparse cover and includes dropseeds and six-weeks grama. In a second stand within Section L-1, seepweed short shrubs provided 15 percent cover and were co-dominant with the tall shrub salt-cedar (12 percent cover) and the short shrub rabbitbrush (8 percent cover). The herbaceous layer, characterized by six-weeks grama and dropseeds, provides low cover, up to 11 percent cover.

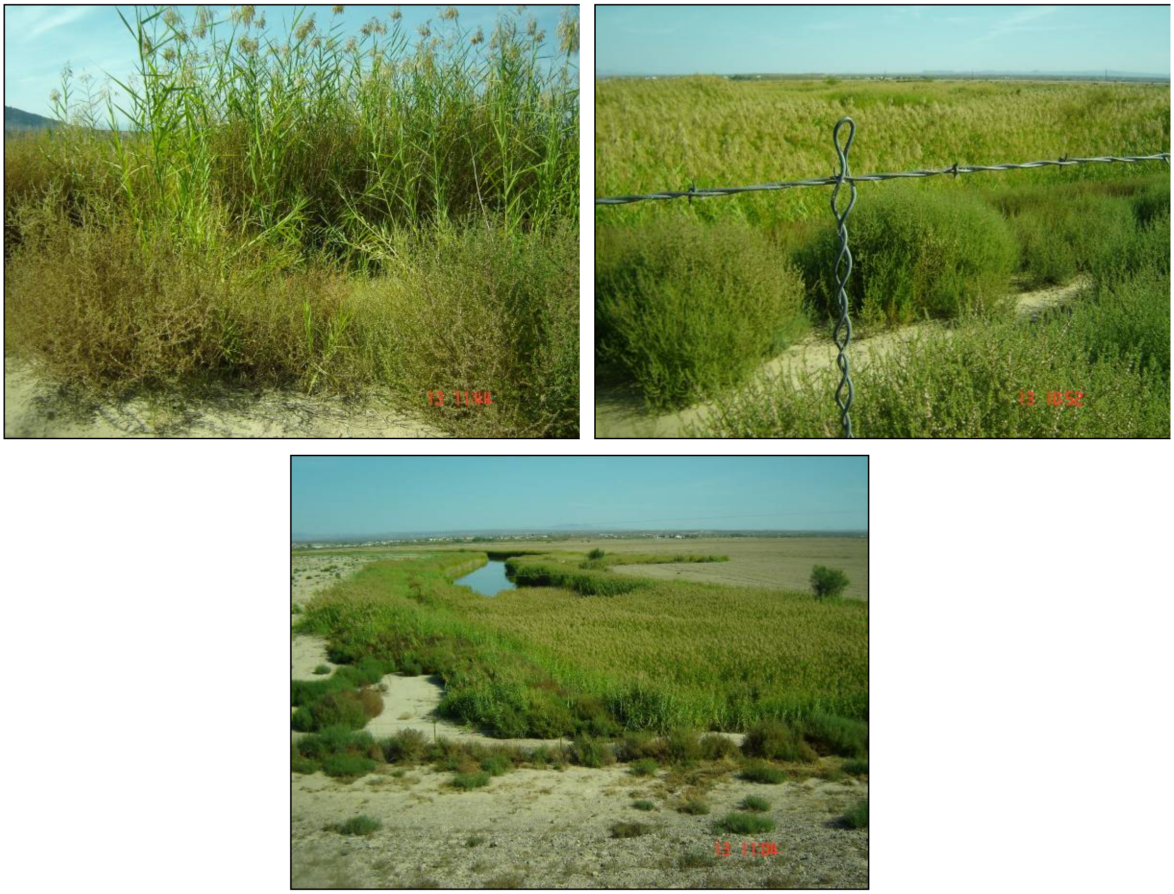
Photograph 5-6. Photograph of Representative Habitat: Seepweed

Arrowweed Shrubland. One small patch of arrowweed short shrubs has become established along the access road within Section L-1 near Sierra Blanca (see **Photograph 5-7**). Arrowweed short shrubs to 1 meter tall provide approximately 40 percent cover within a matrix of Bermuda grass over an area of approximately 200 square meters.

Photograph 5-7. Photograph of Representative Habitat: Arrowweed

5.1.1.3 North American Arid West Emergent Marsh Ecological System (CES300.729)

Common Reed Semipermanently Flooded Herbaceous Vegetation. Resacas located south of Presidio retain water sufficiently on an annual basis to support dense stands of common reed to 5 meters tall (see **Photograph 5-8**). Common reed stands are nearly monotypic, with common reed providing 75–80 percent cover, while low cover, up to 10 percent cover, is contributed by narrowleaf cattail and Russian-thistle. Small stands of common reed are often intermingled with tree and shrub species along the Rio Grande, where they provide low to moderate cover. In one stand adjacent to the Rio Grande, common reed provides 35 percent cover and seepwillow tall shrubs contribute approximately 10 percent cover, in addition to sparse cover by honey mesquite and salt-cedar trees.

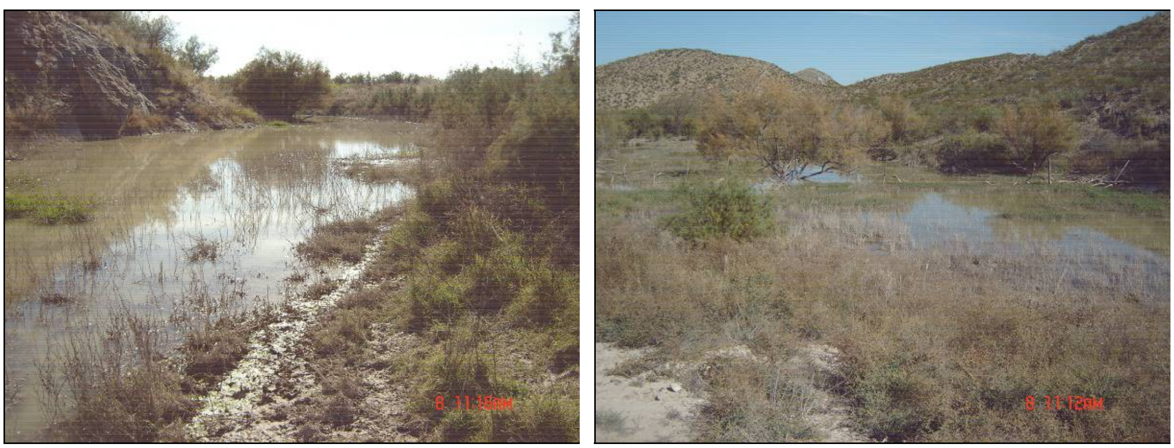


Photograph 5-8. Photographs of Representative Habitat: Common Reed

Narrowleaf Cattail—Common Reed Semipermanently Flooded Herbaceous Vegetation. One resaca located south of Presidio is sufficiently flooded annually to support approximately 50 percent cover by the tall graminoid, narrowleaf cattail (see **Photograph 5-9**). A band of common reed providing up to 45 percent cover has become established on saturated soils surrounding the narrowleaf cattail stand within the ponded water. A species of green algae occupies approximately 5 percent of the open water within the resaca. The tall shrubs honey mesquite and salt-cedar provide up to 10 percent cover on the upper wetland margin.

Photograph 5-9. Photographs of Representative Habitat: Narrowleaf Cattail

Crowngrass—Bermuda Grass Semipermanently Flooded Herbaceous Vegetation. A ponded area near the end of Section L-1 in the vicinity of Sierra Blanca supports shoreline cover by herbaceous vegetation (see **Photograph 5-10**). Crowngrass and Bermuda grass have become established in the shallow shoreline substrate and on small islands within the pond, contributing 15 percent and 4 percent cover, respectively. The tall shrub layer contributes approximately 12 percent cover and is characterized by salt-cedar to 5 meters tall. A species of green algae provides approximately 4 percent cover within the pond.



Photograph 5-10. Photographs of Representative Habitat: Crowngrass—Bermuda Grass

5.1.1.4 Non-Native Woodland, Shrubland, and Herbaceous Vegetation Alliances and Associations

Athel Tamarisk Woodland. A small stand of very large and old Athel tamarisk trees occurs near Presidio within Section L-1A, amid a broader disturbed area supporting Russian-thistle (see **Photograph 5-11**). These trees provide 75 percent cover, are up to 30 meters tall, are multiple branched from low on the trunk, and have very large basal diameters. A few honey mesquite and four-wing saltbush shrubs providing low cover occur around the perimeter of the woodland stand. Russian-thistle stands that occur adjacent to the Athel tamarisk trees provide approximately 55 percent cover. This site was formerly a farmhouse, thus accounting for the establishment of these large trees.

Photograph 5-11. Photographs of Representative Habitat: Athel Tamarisk

Salt-cedar Species Semi-Natural Temporarily Flooded Woodland/Shrubland Alliance. Salt-cedar has become established as small trees with basal diameters to 35 centimeters and as multiple-stemmed tall shrubs. Stands have formed on the banks of the Rio Grande, the adjacent floodplain, the levee toe-of-fill, and around low-lying areas that flood after precipitation (see **Photograph 5**–**12**). In the canopy layer, salt-cedar ranges from 3 to 10 meters tall and provides 45–80 percent cover. Associated canopy trees and shrubs include honey mesquite and rarely tree tobacco and seepwillow, which provide low cover, up to 15 percent cover. The herbaceous layer is characterized by low cover, from 5 to 15 percent cover, of grasses and forbs, including Bermuda grass and Russian-thistle.

Photograph 4-12. Photographs of Representative Habitat: Salt-cedar

Bermuda Grass Semi-Natural Herbaceous Vegetation. Large stands of Bermuda grass have become established between the levee toe-of-fill and the Rio Grande along the Marfa Sector sections (see **Photograph 5-13**). The stands are 20–75 meters wide along much of the L-1, L-1A, and L1-B sections near Presidio and Sierra Blanca. This non-native rhizomatous grass provides 55–90 percent cover in most stands. The commonly associated forb Russian-thistle provides 1–15 percent cover in the remaining herbaceous layer. Sparse cover by honey mesquite short shrubs occasionally occurs, and one stand supports 10 percent cover by salt-cedar tall shrubs. Near Presidio, Bermuda grass stands are maintained by mowing as part of the levee and adjacent floodplain maintenance schedule, which reduces the invasion of this type by shrubs.

Photograph 5-13. Photographs of Representative Habitat: Bermuda Grass

Bermuda Grass—Bristlegrass Semi-Natural Herbaceous Vegetation. Near Sierra Blanca, pastures have been introduced north of the access road and include moderate to dense cover, up to 65 percent cover, by bristlegrass, Bermuda grass, and dropseeds (see **Photograph 5-14**). The forb cocklebur is common to these pastures and contributes up to 10 percent cover in most stands. Moderate to heavy grazing by cattle had occurred prior to sampling this vegetation type.

Photograph 5-14. Photographs of Representative Habitat: Bermuda Grass—Bristlegrass

Bermuda Grass—Russian-thistle Semi-Natural Herbaceous Vegetation. Stands with co-equal dominance of Bermuda grass and Russian-thistle, approximately 15 percent cover for each species, occur between the levee toe-of-fill and the Rio Grande south of Presidio. Sites on the river side of the levee are typically dominated by Bermuda grass, but recent disturbance by bulldozers used in floodplain maintenance activities is evident (see **Photograph 5-15**). Bulldozers are used routinely to widen access roads, remove salt-cedar shrubs and trees from the levee toeslope, and repair damage to crossings of creeks and washes after flooding.

Russian-thistle Semi-Natural Herbaceous Vegetation. The non-native annual forb Russian-thistle is a notorious tumbleweed and has become established on soils disturbed for levee and road construction and also in adjacent agricultural fields lying fallow or abandoned. Stands are common on levees and fields within the Presidio sections, but rare within the Sierra Blanca project portion, becoming established as stands only on the road template. Russian-thistle provides cover ranging from 15–90 percent. They are maintained by mowing the levee banks, resulting in plants a few centimeters tall to some persisting up to 1–1.5 meters tall in agricultural fields (see **Photograph 5-16**). The short shrub layer provides sparse to low cover (up to 5 percent cover) on the levee banks and includes four-wing saltbush, seepweed, and honey mesquite. Low cover of Bermuda grass is occasionally present. The large, spherical Russian-thistle forbs break off at the base when mature and become tumbleweeds that blow into large mats or rafts against fencing and buildings. As such, they represent a fire hazard during the fall and winter months.

Photograph 5-15. Photographs of Representative Habitat: Bermuda Grass—Russian-thistle

Alfalfa—Russian-thistle Semi-Natural Herbaceous Vegetation. One agricultural field near Presidio formerly planted with alfalfa and then allowed to lay fallow now supports moderate cover of alfalfa and Russian-thistle forbs (10 percent cover for each species) adjacent to the levee (see **Photograph 5-17**). Sparse cover by rough pigweed also occurs at this site. The adjacent levee bank, toe-of-fill, and fence row are dominated by moderate to dense Russian-thistle (up to 40 percent cover).

Photograph 5-16. Photographs of Representative Habitat: Russian-thistle

Photograph 5-17. Photograph of Representative Habitat: Alfalfa—Russian-thistle

5.2 Plant Species Identified

Table 5-1 lists all plant species identified during the field surveys, including their wetland status and the fence section in which they were identified.

Table 5-1. Plant Species Observed in Marfa Sector Sections L-1, L-1A, and L-1B

Section			Scientific Name/ Common Name	Wetland Indictor Status
L-1	**L-1A**	**L-1B**		
	X	X	*Allionia incarnata*/Hierba de la Hormiga, Umbrellawort	—
X	X		*Amaranthus retroflexus*/Rough Pigweed	FACU-
X		X	*Aster* sp./Aster	—
X	X	X	*Atriplex canescens*/Four-wing Saltbush	UPL
X	X	X	*Baccharis glutinosa*/Mule's Fat, Seepwillow	FACW
X		X	*Bothriochloa laguroides*/Silver Bluestem	—
X			*Bouteloua adscencionis*/Six-weeks Grama	—
X			*Bouteloua hirsuta*/Hairy Grama	—
X			*Cercidium texanum*/Paloverde	—
X		X	*Chloris cucullata*/Hooded Windmillgrass	—
X	X	X	*Clematis drummondii*/Barbas de Chivato, Old Man's Beard	—
X	X		*Condalia* sp./Condalia	—
X	X	X	*Cynodon dactylon*/Pato de Gallo, Bermuda Grass	FACU+
X			*Cyperus* sp./Flat Sedge	—
X			*Dyssodia* sp./Dogweed	—
X			*Echinocereus triglochidiatus*/Hedgehog Cactus	—
	X		*Ephedra* sp./Joint-fir	—
X			*Ericameria triantha*/Rabbitbrush	—
X			*Fouquieria splendens*/Ocotillo	—
X			*Gaura parviflora*/Butterfly-weed	NI
X			*Gutierrezia (Xanthocephalum) microcephala*/Snakeweed	—
X	X	X	*Helianthus annuus*/Annual Sunflower	FAC
		X	*Heliotropium curassivicum*/Heliotrope	FACW
X		X	*Heterotheca villosa*/Hairy Golden-aster	—
X		X	*Larrea tridentata*/Creosote bush	—
X		X	*Leucelene ericoides*/White Aster	—
X	X		*Lygodesmia* sp./Skeletonweed	—
X	X		*Medicago sativa*/Alfalfa	—
X			*Mentzelia* sp./Stick-leaf	—

Section			Scientific Name/ Common Name	Wetland Indictor Status
L-1	L-1A	L-1B		
X		X	*Nicotiana glauca/*Tree Tobacco	FAC
		X	*Nicotiana longiflora*/Annual Tobacco	—
		X	*Opuntia imbricata*/Cane Cholla	—
		X	*Opuntia leptocaulis*/Tasajillo, Christmas Cactus	—
X		X	*Opuntia phaeacantha/*Prickly-pear	—
X			*Opuntia violaceae/*Prickly-pear	—
X			*Panicum virgatum*/Switchgrass	—
X	X	X	*Parkinsonia aculeata*/Retama	FACW-
X			*Parkinsonia texana/*Paloverde, Texas Paloverde	—
X			*Paspalum dissectum/*Mudbank Crowngrass	OBL
	X	X	*Pennisetum ciliare (Cenchrus ciliaris)*/Buffelgrass	—
X	X	X	*Phoradendron tomentosum*/Mistletoe	—
X	X	X	*Phragmites australis*/Common Reed	FACW
	X		*Phyla nodiflora*/Frog Fruit	FACW
		X	*Pluchea (Tessaria) sericea/*Arrow-weed	NI
X			*Polygonum pensylvanicum*/Smartweed	FACW-
		X	*Populus deltoides*/Eastern Cottonwood	FAC
X			*Portulaca oleracea/*Common Purslane	—
X	X	X	*Prosopis glandulosa*/Mesquite, Honey Mesquite	—
X	X	X	*Salsola australis*/Russian-thistle	FACU
X			*Setaria geniculata/*Bristlegrass	—
X			*Solanum elaeagnifolium/*Trompillo, Silverleaf Nightshade	—
X	X		*Sorghum halepense*/Johnsongrass	FACU
X	X		*Sphaeralcea angustifolia/*Narrow-leaved Globe-mallow	—
X			*Sporobolus airoides*/Alkali Sacaton	FAC
X			*Sporobolus cryptandrus/*Whorled Dropseed	FACU-
X			*Sporobolus flexuosus/*Mesa Dropseed	FAC-
X		X	*Suaeda depressa*/Seepweed	FACW
X			*Suaeda suffrutescens*/Desert Seepweed	FACW
	X		*Tamarix aphylla/*Athel Tamarisk	FACW
X	X	X	*Tamarix chinensis/*Salt-Cedar	FACW

Section			Scientific Name/ Common Name	Wetland Indictor Status
L-1	L-1A	L-1B		
X			*Tridens pulchellus*/Fluffgrass	—
X	X		*Typha domingensis*/Tule, Narrow-leaf Cattail	OBL
	X	X	*Verbesina encelioides*/Cowpen Daisy	FAC
X			*Xanthium strumarium*/Cocklebur	FAC-
53	**24**	**29**	**Total number of species in each section**	
21	**14**	**14**	**Total number of FACW- to OBL species per section**	

Notes:

Wetland Indicator Status (NRCS 2007): Facultative Upland (FACU)—usually occurs in non-wetlands, but occasionally found in wetlands; Facultative (FAC)—equally likely to occur in wetlands or non-wetlands; Facultative Wetland (FACW)—usually occurs in wetlands but occasionally found in non-wetlands; Obligate Wetland (OBL)—occurs almost always under natural conditions in wetlands; Obligate Upland (UPL)—occurs almost always under natural conditions, in non-wetlands; No Indicator (NI)—insufficient information was available to determine an indicator status.

(*) = tentative assignments based on limited information, (-) = less frequently found in wetlands.

5.3 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 USACE has jurisdiction to protect wetlands under Section 404 of the Clean Water Act 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 CFR 328.3[b]). Wetlands generally include swamps, marshes, bogs, and similar areas.*

Wetlands have three diagnostic characteristics: (1) over 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 (USCAE 1987).

Waters of the United States are defined under Title 33 (Navigation and Navigable Waters) USC 1344 (Permits for Dredge or Fill Material) 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.
8. Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of 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.
9. 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 Clean Water Act, the final authority regarding Clean Water Act 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.

f. 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.

5.3.1 Field Evaluation Summary

The fence sections follow the IBWC levee system of the Rio Grande for the majority of their lengths. No permanent surface water features occur within the project corridors. Surface water features occurring adjacent to the project corridors include the Rio Grande River and open water components of resacas (bancos) that occur to the north of fence sections L-1 and L-1A. The fence alignments cross several ephemeral washes within the project corridors, and numerous washes cross under the access road to the north of fence Section L-1.

Jurisdictional Wetlands and Other Waters of the United States within the Project Areas. Field surveys were conducted in Sections L-1, L-1A, and L-1B on January 28 and January 29, 2008, to delineate jurisdictional wetlands and other waters of the United States (WOUS) within the project areas. Delineations were also conducted along access roads and staging areas associated with the fence alignments. Formal delineations were conducted within a 150-foot corridor associated with the fence alignments, 60 feet to either side of access roads, and within staging areas.

Determination of the occurrence and extent of jurisdictional wetlands and other WOUS was based on the application of procedures established in the USACE *Wetlands Delineation Manual*, Technical Report Y-87-1 (USACE 1987) and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region,* Technical Report ERDC/EL TR-06-16 (USACE 2006). Determination of the occurrence of jurisdictional wetlands was based on the presence or absence of hydrophytic (wetland) vegetation, hydric (wetland) soils, and wetland hydrology. The presence of all three of the criteria is necessary for an area to be designated as a jurisdictional wetland under normal conditions.

Determination of the extent of jurisdictional washes (arroyos) and other WOUS in the project areas was based on characterization of the landward extent of the ordinary high water mark (OHM). Indicators used to determine the occurrence and extent of jurisdictional washes included the presence of developed channels, typically 2 feet or greater in width; the occurrence of an OHM; the absence of fine sediments along flow paths; distinct changes in the vegetative assemblage, or larger or more dense vegetation than surrounding areas; the presence of cut banks; the presence of litter, debris, or rack lines; occurrence of desiccation cracks or other indicators of hydrology; and other indicators of the occurrence of intermittent water flow regimes.

All wetlands and other WOUS within the projects areas were delineated.

Table 5-2 provides the section locations, wetland or other WOUS types, and the acreage of each identified wetland or other WOUS within a 60-foot-wide assessment corridor. The 60-foot corridor is considered the maximum width of potential impact associated with implementing the preferred alternative.

Based on the field surveys, 14 wetlands or other WOUS (WL 1 through WL 14) occur within the assessment areas. WL1 through WL9 occur in Section L-1; WL11 and WL 12 occur in Section L-1B; and WL 13 and WL14 occur in Section L-1A. The following text provides brief descriptions of the delineated wetlands.

WL1/L-1 is palustrine forested wetland associated with a resaca (banco). Vegetation in the wetland is characterized by a near monotypic cover of *Tamarisk ramosissima*.

WL2/L-1 is the eastern component of WL1. It is separated from WL1 by a road. Vegetation in WL2 is characterized by *Tamarisk ramosissima*.

WL3/L-1 is a palustrine emergent and scrub shrub habitat characterized by *Distichlis spicata* and cut *Tamarisk ramosissima*. An approximately three foot high berm separates the emergent and scrub shrub component of WL3 from adjacent open water habitat to the north.

Table 5-2. Wetlands and Other Waters of the U.S. and Acreages within the 60 Foot Impact Corridor in Sections L-1, L-1A, and L-1B

Wetland or Other WOUS Identification	Section	Wetland or Other WOUS Type	Acreage Within 60 Foot Potential Impact Corridor
WL 1	L-1	Palustrine forested wetland associated with a resaca	0.17 acre

WL 2	L-1	Palustrine forested wetland associated with a resaca	0.25 acre
WL 3	L-1	Palustrine emergent/scrub shrub wetland	0.0 acre
WL 4	L-1	Palustrine scrub shrub/emergent wetland with open water components	0.47 acre
WL 5	L-1	Palustrine emergent wetland bordering a palustrine forested/scrub shrub	0.0 acre
WL 6	L-1	Wash	0.02 acre
WL 7	L-1	Wash	0.02 acre
WL 8	L-1	Wash	0.04 acre
WL 9	L-1	Palustrine forested wetland associated with a playa	0.08 acre
WL 10	L-1B	Wash tributary to Cibelo Wash	0.08 acre
WL 11	L-1B	Cibelo Wash – north channel	0.47 acre
WL 12	L-1B	Cibelo Wash – south channel	0.08 acre
WL 13	L-1A	Palustrine emergent wetland associated with a resaca	0.0 acre
WL 14	L-1A	Palustrine emergent wetland associated with a resaca	0.0 acre

WL4/L-1 is a palustrine scrub shrub and emergent habitat bordering open water habitat. Vegetation in the wetland is characterized by *Distichlis spicata* and *Tamarisk ramosissima*. WL4 is connected to the open water component adjacent to WL3.

WL5/L-1 is a palustrine emergent wetland bordering palustrine forested and emergent habitat. Vegetation in the wetland is characterized by *Distichlis spicata* and *Tamarisk ramosissima*.

WL6/L-1 is an ephemeral drainage channel that drains directly to the Rio Grande. The channel narrows down and then ends approximately 250 feet upstream of the access road. The channel is approximately 8 to 10 feet wide at the road crossing.

WL7/L-1 is an ephemeral wash that drains directly to the Rio Grande. The channel narrows down and then ends approximately 75 feet upstream of the access road. The channel is approximately 2 to 8 feet wide upstream of the access road, and 4 to 5 feet wide downstream of the road.

WL8/L-1 is a wide shallow ephemeral wash that drains directly into the Rio Grande. The wash channel ranges from approximately 10 to 20 feet in width in proximity to the road crossing. It narrows down to 8 feet approximately 150 feet downstream of the road crossing.

WL9/L-1 is characterized by a palustrine forested habitat bordering open water. Vegetation in the wetland is characterized by a near monotypic cover of *Tamarisk ramosissima*. Much of the open water component of WL9 had dried down at the time of the delineation.

WL10/L-1B is an ephemeral tributary channel to the Cibolo Wash.

WL11/L-1B is a wide ephemeral wash channel on the west side of Cibolo Wash.

WL12/L-1B is a wide ephemeral wash channel on the east side of Cibolo Wash.

WL13/L-1A is a palustrine emergent wetland associated with a resaca (banco). The wetland is characterized by a near monotypic stand of *Phragmites australis*.

WL14/L-1A is a palustrine emergent wetland associated with a resaca (banco). The wetland is characterized by a near monotypic stand of *Phragmites australis* bordered on the upland edge by a dense coverage of *Salsola tragus*.

5.3.2 Wetlands Vegetation Summary

Wetlands delineated within the Marfa Sector included palustrine forested, palustrine scrub shrub, and palustrine emergent wetlands. The characteristic species for each wetland type were:

- *Tamarisk ramaosissima* in palustrine forested wetlands
- *Tamarisk ramaossima* in palustrine scrub shrub wetlands
- *Phragmites australis* in palustrine emergent wetlands.

5.3.3 Wetland Soils Summary

NRCS has not mapped soils on the Marfa Sector U.S./Mexico international border. Soils characterized in wetland habitats within the Marfa Sector exhibited hydric characteristics.

5.4 Noxious Weeds and Invasive Nonnative Species

The State of Texas maintains a noxious weed definition, species list, and control districts under a legislative determination (Texas Agriculture Code 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, 67th 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 (**Table 5-3**). The website, TexasInvasives.org, provides a list of 137 plant species considered to be nonnative invasives and/or noxious weeds within Texas, seven of which occur within the project corridor and are listed in **Table 5-3**.

Table 5-3. Nonnative or Noxious Weeds Occurring Within the Project Corridor

Common Name	Scientific Name	Fence Sections Observed
[2]Bermuda Grass	*Cynodon dactylon*	L-1, L-1A, L-1B
[2]Tree Tobacco	*Nicotiana glauca*	L-1, L-1B
[2]Buffelgrass	*Pennisetum ciliare*	L-1A, L-1B
[2]Russian-thistle	*Salsola tragus*	L-1, L-1A, L-1B
[2]Johnsongrass	*Sorghum halepense*	L-1, L-1A
[1,2]Athel Tamarisk	*Tamarix aphylla*	L-1B
[1,2]Fivestamen Tamarisk	*Tamarix chinensis*	L-1, L-1A, L-1B

Source: http://www.texasinvasives.org/Invasives_Database/

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, seven species of nonnative plants have been identified, and two of these species (Athel tamarisk and fivestamen 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.

5.5 Wildlife and Wildlife Habitat

5.5.1 Wildlife and Habitat Overview

The project corridor supports a diverse population and individuals of vertebrate and invertebrate wildlife species (see **Table 5-4** and **Attachment D**), and unique-to-common native and nonnative wildlife habitats, described as vegetation alliances, plant associations, and land use types in this BSR. **Table 5-4** lists wildlife observed during the field surveys. The table can provide a general indication of species richness in each section. **Tables 5-5** and **5-6** lists the habitat observed during the surveys, and the estimated acreage in each segment. **Table 5-5** provides the acreage for habitats in a 60-foot corridor, and **Table 5-6** lists the acreage of habitats in a 150-foot corridor.

Table 5-4. Wildlife Observed During Natural Resources Surveys Conducted November 5 and 6, 2007

Common Name	Scientific Name	Species Status	Section		
			L-1	L-1A	L-1B
Insects					
Monarch Butterfly	Danaus plexippus	C		X	
Birds					
American Coot	Fulica americana	C	X	X	
American Kestrel	Falco sparverius	C		X	X
Barn Swallow	Riparia riparia	C		X	X
Bell's Vireo	Vireo bellii	C		X	
Cardinal	Cardinalis cardinalis	C	X		
Cattle Egret	Bubulcus egret	C	X		
Chipping Sparrow	Spizella passerina	C		X	X
Birds (continued)					
Curved Billed Thrasher	Toxostoma curvirostre	C	X		
Flycatcher	Empidonax sp.	C	X	X	
Gadwall	Anas strepera	C			X
Gambel's Quail	Callipepla gambelli	C	X		
Gray Flycatcher	Empidonax wrightii	C			X
Great Blue Heron	Ardea herodias	C		X	
Great Egret	Ardea alba	C	X		
Great-tailed Grackle	Quiscalus mexicanus	C		X	
Greater Roadrunner	Geococcyx californianus	C	X	X	
House Sparrow	Passer domesticus	C		X	
Loggerhead Shrike	Lanius ludovicianus	C	X	X	X
Mockingbird	Mimus polyglottos	C			X

Common Name	Scientific Name	Species Status	Section		
			L-1	L-1A	L-1B
Mourning Dove	Zenaida macroura	C		X	X
Northern Harrier	Circus cyaneus	C	X	X	X
Red-tailed Hawk	Buteo jamaicensis	C		X	
Red-winged Blackbird	Agelaius phoeniceus	C	X	X	X
Ring-necked Duck	Aythya collaris	C		X	
Rock Pigeon	Columba livia	C			X
Rufous-sided Towhee	Pipilo erythrophthalmus	C	X		
Say's Phoebe	Sayornis saya	C		X	
Teal	Anas sp.	C	X	X	
Western Kingbird	Tyrannus verticalis	C	X	X	X
Western Meadowlark	Sturnella neglecta	C	X	X	
Western Wood Peewee	Contopus sordidulus	C		X	
White-winged Dove	Zenaida asiatica	C			X
Mammals					
Collared Peccary (Javelina)	Pecari tajacu	C	X		
Coyote	Canis latrans	C	X		X
Deer	Odocoileus sp.	C			X
Mexican Ground Squirrel	Spermophilus mexicanus	C	X		
Reptiles					
Round-tailed Horned Lizard	Phrynosoma modestum	C	X		

Note: C = Common

5.6 Wildlife Observed

Table 5-4 lists wildlife observed during the field surveys. The table provides a general indication of species richness in each section.

5.7 Species Groups and Habitat Affinity

5.7.1 Mammals

Almost one-third of the 92 species of mammals that occur in the Trans-Pecos region are primarily restricted in distribution to that region. Most of these mammals are species characteristic of the arid Mexican Plateau and southwestern United States or the montane woodlands of the western United States. Some of the mammals occurring principally in this region are the hooded skunk, wapiti, kit fox, western mastiff bat, pocketed free-tailed bat, gray-footed chipmunk, Merriam’s kangaroo rat, and the Texas antelope squirrel. Black bear and mountain lions can also still be found in the Trans-Pecos region (NSRL 1997).

The diversity of the Trans-Pecos region is vast. For example, the Sierra Diablo Wildlife Mangement Area (WMA), located in the mountain range extending north and south along Hudspeth and Culberson county lines, supports the largest free-ranging desert bighorn sheep population in Texas. The WMA also has an established and stable desert mule deer population. This area consists of rugged hills and steep canyons, with an average elevation of 6,200 feet (TPWD 2007).

Table 5-5. Wildlife Habitat Types Observed in the 60-foot Mapping Corridor

Wildlife HabitatType Observed	Acreage by Section Numbers			Total Acreage of Wildlife Habitats
	L-1	L-1A	L-1B	
Herbaceous Vegetation				
Bermuda Grass—Bristlegrass Herbaceous Vegetation	0.0134			0.013
Bermuda Grass Herbaceous Vegetation	11.6690			11.669
Common Reed—Cattail Herbaceous Vegetation				0.000
Crowngrass—Bermuda Grass Herbaceous Vegetation	0.2460			0.246
Russian-thistle Herbaceous Vegetation		19.3135	16.5744	35.888
Shrubland				
Creosote bush—Honey Mesquite Shrubland	0.7894			0.789
Rabbitbush—Seepweed—Arrowweed Shrubland	5.0176			5.018
Honey Mesquite Woodland/Shrubland		0.0792	0.1434	0.223
Woodland and Forest				
Athel Tamarisk Woodland				0.000
Salt Cedar/Bermuda Grass Woodland/Shrubland	12.4301		0.8148	13.245
Open Water				
Playa	0.2003			0.200
Land Use				
Agricultural Field				0.000
Other Land Use		0.0954		0.095
Rail-line		0.0230		0.023
Roads and Trails	2.8445	4.4557	3.5786	10.879
	33.2103	**23.9668**	**21.1112**	**78.288**

Table 5.6 Wildlife Habitat Types Observed in the 150-foot Mapping Corridor

Wildlife HabitatType Observed	Acreage by Section Numbers			Total Acreage of Wildlife Habitats
	L-1	L-1A	L-1B	
Herbaceous Vegetation				
Bermuda Grass—Bristlegrass Herbaceous Vegetation	3.3634			3.363
Bermuda Grass Herbaceous Vegetation	15.6171			15.617
Common Reed—Cattail Herbaceous Vegetation		0.4130		0.413
Crowngrass—Bermuda Grass Herbaceous Vegetation	1.1638			1.164
Russian-thistle Herbaceous Vegetation		40.7682	38.2358	57.343
Shrubland				
Creosote bush—Honey Mesquite Shrubland	3.2450			3.245
Rabbitbush—Seepweed—Arrowweed Shrubland	11.9768			11.977
Honey Mesquite Woodland/Shrubland		5.2625	1.9476	5.406
Woodland and Forest				
Athel Tamarisk Woodland		0.1494		0.149
Salt Cedar/Bermuda Grass Woodland/Shrubland	43.7543	0.0306	0.8699	44.600
Open Water				
Playa	0.4083			0.408
Land Use				
Agricultural Field		7.0053	8.4786	7.005
Other Land Use		0.4664		0.466
Rail-line		0.0597		0.060
Roads and Trails	3.8041	5.9188	4.0259	13.302
	83.3328	**60.0739**	**53.5578**	**196.965**

The range of the Mexican long-nosed bat overlaps some of the medium to high elevations in Presidio County, which includes fence sections L-1A and L-1B. Habitats in the county include desert scrub, open conifer-oak woodlands, and pine forests in the Upper Sonoran and Transition Life Zones, generally arid areas where agave plants are present (USFWS 1994). Colonies roost in caves (or similar mines and tunnels), sometimes in culverts, hollow trees, or unused buildings.

5.7.2 Birds

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.

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 *Code of Federal Regulations* (CFR) 10.13, and is also compiled in **Attachment D** of this Report.

A total of 54 species of birds are primarily confined to the Trans-Pecos region, among them the Crissal Thrasher, the Black-tailed Gnatcatcher, Gambel's Quail, and Lucy's Warbler. The Chisos Mountains of Big Bend National Park are the only place in Texas where the Lucifer Hummingbird, Gray-breasted Jay, Hutton's Vireo, and Painted Redstart can be reliably found (TPWD 2007).

A variety of habitats ranging from, but not limited to, sanddunes, desert-scrub, arid canyons, oak-juniper woodlands, lush riparian woodlands, plateau grasslands, cienegas (desert springs), pinyon-juniper woodlands, pine-oak woodlands and montane evergreen forests contribute to a diverse and complex avifauna in the region. As much as any other factor, elevation influences and dictates habitat and, thus, bird occurrence. Elevations range from the highest point in Texas at 8,749 feet (Guadalupe Peak) to under 2,000 feet (within Big Bend along the Rio Grande River). A total of 106 peaks in the region are over 7,000 feet in elevation; 20 are over 8,000 feet high. These montane islands contain some of the most unique components of Texas' avifauna (TPWD 2002).

In the southeastern portion of the region a number of eastern U.S. birds reach the western limits of their ranges. The Red-shouldered Hawk, Chuck-will'swidow, Eastern Wood-Pewee, Acadian Flycatcher, White-eyed, Yellow-throated and Red-eyed Vireo, Carolina Wren, Northern Parula, and Yellow-throated and Black-and-white Warblers are representative of this group (TPWD 2002).

Montane habitats also harbor species of limited distribution. Numerous species of birds associated with the Rocky Mountains and/or Mexican highlands bird guilds normally occur only in islands of montane habitats within the region. Examples include the Band-tailed Pigeon, Flammulated and Northern Saw-whet Owl, Whip-poor-will, Blue-throated and Magnificant Hummingbird, Williamson's Sapsucker, Cordilleran Flycatcher, Hutton's Vireo, Mexican and Steller's Jays, Mountain Chickadee, Pygmy Nuthatch, Colima and Grace's Warblers, and Painted Redstart (TPWD 2002).

Other "borderland" specialties help characterize the region's avifauna. Included would be Gray and Zone-tailed Hawk, Common Black-Hawk, Elf Owl, Lesser Nighthawk, Common Poorwill, Lucifer Hummingbird, Vermilion Flycatcher, Verdin, Black-tailed Gnatcatcher, Varied Bunting, and Hooded Oriole (TPWD 2002).

Three federally listed endangered and one federally listed threatened bird species have ranges that overlap portions of the counties surrounding the Marfa fence sections L-1 through L-1B. The willow flycatcher was designated as a federally endangered species on March 29, 1995. It occurs in dense riparian habitats along streams, rivers, and other wetlands. At low elevations, the flycatcher breeds in stands of dense cottonwood, willow, and tamarisk thickets, as well as other lush woodland areas near water. The northern aplomado falcon was designated as endangered on March 27, 1986. Its habitat includes yucca-covered sand ridges in coastal prairies, riparian woodlands in open grasslands, and in desert grasslands with scattered curly-mesquite (*Hilaria belangeri*) and yucca. The interior population of the least tern was listed as endangered on June 27, 1985 (USFWS 1990). The Mexican spotted owl was designated as a federally threatened species on March 16, 1993. In the state of Texas, it is also designated as a threatened species. The Mexican spotted owl occurs in a variety of habitats, consisting of mature montane forests, shady canyons, and steep canyons at higher elevations. The key components in montane forests appear to be characteristics common in old-growth forests: uneven-age stands with high canopy closure and tree density, fallen logs, and snags.

5.7.3 Herpetiles

Over 200 species of reptiles and amphibians occur in Texas and the habitats found in the region. Habitat for approximately 60 species can be found along the Rio Grande River in Presido and Hudpeth counties. Several are listed as threatened in the state of Texas, including the plains black-headed snake, Texas horned lizard, short-horned lizard, and the reticulated gecko (WFSC 2008).

5.7.4 Invertebrates

There are 137 species of butterflies that have been recorded in Hudspeth and Presidio counties. Rare species include: Mary's giant skipper, scarce streaky skipper, and Poling's hairstreak. Suitable habitat for Mary's giant skipper is primarily thorn forests and desert hills. The scarce streaky skipper is found in desert foothills, canyons, and alluvial fans, and preferred habitat for Poling's hairstreak is primarily oak woodlands (Opler et. al 2006 and NatureServe 2008).

6. RARE SPECIES DATA

To ensure that 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 and e²M 2007). The data fields requested and geographic scope of this request were:

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 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 between NatureServe and e²M was signed in 2007. 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 license agreement 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.

The license agreement provides the following guidelines regarding 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.

The Texas Natural Diversity Database (TXNDD) was established in 1983 and is the TPWD's 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.

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 the following factors: (1) data gaps occurring 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 on-site inventory and evaluation.

7. PROJECT DATABASE AND INTERACTIVE GIS

A Microsoft (MS) 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 for recording ecological information within the project corridor (**Attachment C**).

During field surveys, UTM coordinates were collected with GPS receivers to locate observation points, photo-documentation points, wetlands, etc. 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, field 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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BIOLOGICAL SURVEY ATTACHMENT A

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.

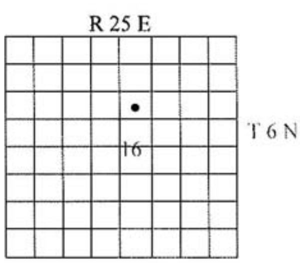
GPS Unit:
Record the name and model of the GPS receiver being used to record data for the observation point. If a GPS unit was not used to determine UTMs record 'none' here and be sure to complete the 'GPS Comments' field below.

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.

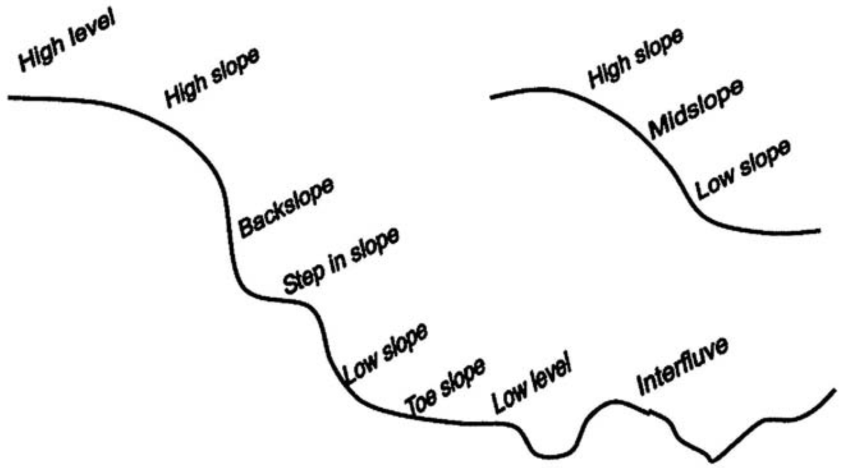
Aspect
Measure the site aspect in degrees using a compass (set for local magnetic declination). If the slope is flat, enter "n/a" for aspect. If the site wraps around different aspects on a slope, enter "variable" and describe further under the Environmental Comments section.

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.

4

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):

5

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.

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 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?

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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.)

BIOLOGICAL SURVEY
ATTACHMENT B

DESCRIPTION OF FEDERALLY LISTED SPECIES

Black-footed Ferret (*Mustela nigripes*)

Hudsputh County

The black-footed ferret was listed as a federally endangered species on March 11, 1967.

Distribution: The black-footed ferret is found in shortgrass prairies. Historically, the black-footed ferret was found in the Trans-Pecos region of Texas, as well as other regions of Texas; however, it has not been observed in Texas since 1963.

Natural History

This carnivore is shaped like a mink, but the dorsal color is yellowish brown or buff, with a brownish wash on the back; belly is slightly paler; tail tip and feet are black or at least dark; the face has a dark mask around the eyes, with white on the face above and below the mask [Whitaker 1996] (NatureServe).

Black-footed ferrets rely on prairie dogs for food and shelter. Prairie dogs make up 90 percent of their diet. Ferrets hunt mostly at night. They live in burrows made by prairie dogs. Approximately 100 acres of prairie dog colony are needed to support one ferret family (a female and her young).

Habitat: Shortgrass prairies are ideal habitat for black-footed ferrets.

Threats: The primary threat to black-footed ferrets is habitat loss due to agriculture. In addition, their main prey, the prairie dog, has been severely reduced through trapping and hunting to protect grasslands for livestock.

NatureServe. 2007. Black-footed ferret Ecology. Accessed on-line at: *www.natureserve.org*

Hinkley's Oak (Quercus hinkleyi)

Presidio County

Hinkley's oak was listed as a federally threatened species on August 26, 1988.

Distribution: Hinkley's oak is found in the Trans-Pecos region of west Texas.

Natural History

Hinckley's oak is a dwarf, evergreen, multi-branched shrub that forms thickets about 1.2 meters tall. It has small, waxy, gray-green leaves less than approximately 15 centimeters long. The leaves are round or oval with wavy margins and coarse, spiny teeth.

This unique shrub produces small acorns in the fall. The acorns are solitary or paired, oval, brown, and about 1.5 centimeters wide. Reasons for the decline of this species include limited distribution, climate change, and low reproduction.

Habitat: Hinkley's oak grows on dry, rocky limestone slopes in desert scrub communities of west Texas.

Threats: Hinkley's oak has declined within its range due to limited distribution, climate change, and low reproduction.

Texas Parks and Wildlife Department. Accessed on-line at:
http://www.tpwd.state.tx.us/huntwild/wild/species/hinkley/

Gray Wolf (Canis lupus)

Hudsputh County

The gray wolf was listed as federally endangered on March 11, 1967.

Distribution: Currently extirpated from Texas.

Natural History

The gray wolf is a close relative of domestic dogs. Its thick fur ranges in color from creamy white to reddish-brown and shades of gray and black. Gray wolves are the largest species of wolf and may be 22–40 kilograms in weight and about 1.2–1.5 meters long. Adult males are larger than adult females.

Gray wolves breed once a year. They mate in late winter, and pups are born in the spring. Dens are usually ground burrows excavated in slopes where rocks will function to support the roof of the tunnel and burrow. Both parents and other pack members, if present, will bring food to the young, which average about five pups in a litter. The bond between mated wolves is very strong and commonly lasts their lifetime. Gray wolves can live up to 15 years.

Gray wolves are carnivores that prey on large herbivores such as deer and Pronghorn antelope, but they will also eat rabbits, ground squirrels, and mice. The decline of the gray wolf has been attributed mostly to predator control by humans. In the late 1800s and early 1900s, ranchers killed wolves to prevent loss of livestock and wild ungulates such as deer. In those days, even people living in the towns and cities feared wolves and applauded their demise. Predator control was so successful that few individuals remained. Reintroduction efforts of captive-bred individuals have been difficult to initiate due to residual fears for livestock and people, as well as a lack of large, remote tracts of suitable habitat.

Habitat: Gray wolves are found in forests, brushlands, or grasslands where suitable cover and denning sites are available.

Threats: The primary reasons that the gray wolf was extirpated from its range was loss of habitat and widespread hunting, both for sport and to protect livestock.

Texas Parks and Wildlife Department. 2007. *Gray Wolf Species Profile.* Accessed on-line at: *http://www.tpwd.state.tx.us/huntwild/wild/species/graywolf/*

Interior Least tern (Sterna antillarum athalassos)

Hudsputh 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 and Red Rivers and the 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: Along river systems such as the Rio Grande, least terns nest on sparsely vegetated sand and gravel bars along a wide, unobstructed river channel or salt flats along lake shorelines. Least terns also have been observed to nest on artificial habitats such as sand and gravel pits and dredge islands (USFWS 1990).

Breeding: Least terns reside 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 two or three eggs, which are laid by late May. Incubation lasts 20–25 days, and fledging 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 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.* They usually hunt near their nesting sites (USFWS 1990).

Threats: The taming of wild 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.

Greater Long-Nosed Bat (Also called Mexican Long-Nosed Bat) (Leptonycteris nivalis)

Presidio County

The Mexican long-nosed bat was designated as a federally endangered species on March 30, 1988.

Distribution: The range of the Mexican long-nosed bat includes medium to high elevations in northern and central Mexico, southwestern Texas (southern Brewster and Presidio counties), and southwestern New Mexico. They typically exist at elevations of approximately 500 to 3,000 meters.

In Texas, the species is known from the Big Bend National Park and Chinati Mountain area. The only colonial roost in the United States is a cave at Emory Peak, at an elevation of 2,290 meters in the Chisos Mountains, Texas (NatureServe).

Natural History

Habitat: Habitats include desert scrub, open conifer-oak woodlands, and pine forests in the Upper Sonoran and Transition Life Zones, generally arid areas where agave plants are present (USFWS 1994). Colonies roost in caves (or similar mines and tunnels), sometimes in culverts, hollow trees, or unused buildings. Roosting habitat requirements are not well known.

Breeding: Litter size normally is 1. Young are born apparently in spring (April-June) in Mexico before females arrive in Texas; no records exist of pregnant females from Texas. In Texas, lactating females have been observed in June-July, flying juveniles in late June. Weaned in July or August (NatureServe).

*Diet***:** THE MEXICAN LONG-NOSED BAT MAINLY EATS nectar and pollen of saguaro and organ pipe cacti, and paniculate agaves. They also east insects associated with flowers, and probably some fruits, especially in the south.

In Texas, nectar of the mescal and Chisos agave flowers probably are the main food. This bat emerges to feed relatively late in the evening.

Threats: Although the Mexican long-nosed bat is widely distributed in southern Texas, southwestern New Mexico, and Mexico, it is declining; however, population trends are not well documented. They are threatened primarily by the disturbance of roosts and loss/degradation of foraging habitat (NatureServe).

NatureServe. 2007. Mexican Long-Nosed Bat. Accessed on-line at *www.natureserve.org*.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

Hudspeth and Presidio County

The southwest willow flycatcher was designated as a federally endangered species on March 29, 1995.

Natural History

Habitat: The southwestern willow flycatcher occurs in dense riparian habitats along streams, rivers, and other wetlands. At low elevations, the flycatcher breeds in stands of dense cottonwood, willow, and tamarisk thickets, as well as other lush woodland areas near water

Breeding: The southwestern willow flycatcher is present on breeding grounds by mid-May. By late May, nests are built, usually in a branched tree fork near the water. Typically, three eggs are laid and then incubated for 12–13 days. Breeding success is heavily affected by predation and brown-headed cowbird parasitism.

Diet: The southwestern willow flycatcher is an insectivore, taking insects from the air, or picking them from the foliage.

Threats: Populations throughout its range are severely impacted by the destruction and loss of riparian habitats through development.

Northern Aplomado Falcon (Falco femoralis septentrionalis)

Hudspeth County

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 meters in the Andes. The falcon also inhabits areas in most of Latin America. The historic range includes areas of Texas, New Mexico, and Arizona. In Texas, they are still observed in south Texas and the Trans-Pecos region (USFWS 1990).

Natural History

Habitat: In populations found in the United States, northern aplomado falcons inhabited yucca-covered sand ridges in coastal prairies, riparian woodlands in open grasslands, and in desert grasslands with scattered mesquite (*Hilaria belangeri*) and yucca. They do not construct their own stick platform 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 their parents 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 of 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. 56 pp.

Mexican Spotted Owl (Strix occidentalis lucida)

Hudspeth County

The Mexican spotted owl was designated as a federally threatened species on March 16, 1993. In the state of Texas, it is also designated as a threatened species.

Distribution: In Texas, Mexican spotted owls occur in the Guadalupe Mountains near the New Mexico border. In 1990, it was estimated that the Mexican spotted owl population for the southwestern United States was 2,160 birds, extremely rare and local in Texas.

Natural History: Mexican spotted owls have dark eyes. They are an ashy-chestnut brown color with white and brown spots on their abdomen, back, and head. Their brown tails are marked with thin white bands.

Woodrats, mice, pocket gophers, birds, and insects make up the Mexican spotted owl's diet. These owls hunt at night, moving from tree to tree, pausing to look and listen for prey. Their nests consist of stick platforms made by other birds, in tree cavities, and on cliff ledges, and they lay 1 to 3 eggs during March or April. Most owlets (baby owls) leave the nest in June, about 35 days after hatching. Owlets are unable to fly very well when they first leave the nest, and their parents continue to feed them until they become fully independent, usually by October. The owls prefer the coolest part of the forest, often choosing nest trees on the northern or eastern-facing slopes. Nests on cliffs in Texas are at 5,000 to 7,000 feet elevation in deep, cool canyons.

Threats: The Mexican spotted owl has declined because of habitat loss and alteration. Harvest of old-growth timber stands, even-aged timber harvest systems, and wildfires have contributed to loss of habitat.

Rio Grande silvery minnow (*Hybognathus amarus)*

Maverick County

The Rio Grande silvery minnow was listed as a federally endangered fish on July 20, 1994.

Distribution: Historically the Rio Grande silvery minnow occurred in the Rio Grande and Pecos River systems in Texas, New Mexico, and Mexico. The range of the Rio Grande silvery minnow is currently drastically reduced and occurs only in perennial sections of the Rio Grande in New Mexico (NatureServe 2007).

Natural History

Habitat: The Rio Grande silvery minnow prefers large freshwater streams with slow to moderate current over mud, sand, or gravel bottoms, perennial sections of the Rio Grande, and irrigation canals [Sublette et al. 1990]. It spawns probably in still waters over sandy-silt bottoms [Sublette et al. 1990] (NatureServe 2007).

Diet: The diet of the Rio Grande silvery minnow is assumed to be the same as others in the Genus Hybognathus: diatoms, algae, larval insect skins, and plant material scraped from ooze in bottom sediment [Sublette et al. 1990] (NatureServe 2007).

Threats: Survival continues to be threatened by habitat degradation and flow modifications, introduction of non-native fishes, and lack of adequate refugia during periods of low or no flow (NatureServe).

NatureServe. 2007. Rio Grande silvery minnow. Accessed on-line at: *http://www.natureserve.org*

U.S. Fish and Wildlife Service. 2007. *Draft Revised Recovery Plan.* Accessed on-line at: *http://ecos.fws.gov/docs/recovery_plan/070118a.pdf*

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BIOLOGICAL SURVEY ATTACHMENT C

GIS PRODUCTS

GIS PRODUCTS

GIS Interactice File

Access Database for PF225

GIS Layer: Vegetation Database

Maps Including Vegetation Layer

Field Photographs

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BIOLOGICAL SURVEY
ATTACHMENT D

NO EFFECT DETERMINATION

Listed Species/Habitat No Effect Determination

Construction, Maintenance, and Operation of Tactical Infrastructure for:

L-1 Neely's Crossing, Sierra Blanca Station, fence
L-1A Presidio POE to 3.2 mi E of POE, Presidio Station, fence
L1-B Presidio POE to 3.2 mi W of POE, Presidio Station, fence

Hudspeth and Presidio Counties, Texas

December 31, 2007

U.S. Department of Homeland Security
U.S. Customs and Border Protection
U.S. Border Patrol Marfa Sector
Sierra Blanca Station
Presidio Station

U.S. Customs and Border Protection and the USBP are planning to install and operate tactical infrastructure consisting of pedestrian fence and associated patrol roads, access roads, and lights along three segments along the U.S./Mexico international border in Hudspeth and Presidio Counties, Texas.

The following federally listed species and habitats are known to occur within 25 miles of the international border in Hudspeth County:

SPECIES	LISTING STATUS	DETERMINATION
Least tern, *Sterna antillarum*	endangered	no effect
Whooping crane, *Grus Americana*	endangered	no effect
Whooping crane, critical habitat	designated	no effect
Piping plover, *Charadrius melodus*	endangered	no effect
Piping plover, critical habitat	designated	no effect
Northern aplomado falcon, *Falco femoralis septentrionalis*	endangered	no effect
Southwestern willow flycatcher, *Empidonax trailii extimus*	endangered	no effect
Southwestern willow flycatcher, critical habitat	proposed	no effect
Mexican spotted owl, *Strix occidentalis lucida*	threatened	no effect

The following federally listed species and habitats are known to occur within 25 miles of the international border in Presidio County:

SPECIES	LISTING STATUS	DETERMINATION
Northern aplomado falcon, *Falco femoralis septentrionalis*	endangered	no effect
Whooping crane, *Grus Americana*	endangered	no effect
Whooping crane, critical habitat	designated	no effect
Piping plover, *Charadrius melodus*	endangered	no effect
Piping plover, critical habitat	designated	no effect
Least tern, *Sterna antillarum*	endangered	no effect
Southwestern willow flycatcher, *Empidonax trailii extimus*	endangered	no effect
Southwestern willow flycatcher, critical habitat	proposed	no effect
Mexican long-nosed bat, *Leptonycteris nivalis*	endangered	no effect
Hinckley oak, *Quercus hinckleyi*	threatened	no effect
Lloyd's Mariposa cactus, *Sclerocactus mariposensis*	threatened	no effect

Determination

The Service identified species that are listed under the ESA that occur in Hudspeth and Presidio Counties, Texas. These species are: least tern, Northern aplomado falcon, southwestern willow flycatcher, piping plover, whopping crane, Mexican spotted owl, Mexican long-nosed bat, Lloyd's Mariposa cactus, and Hinckley oak. Documented below are anticipated effects to listed species if the Project is implemented.

The species listed above are known to occur in the area; however, the location of the fencing in the Marfa Project, Sections L-1, L-1A, L-1B, will be on an existing levee. Prior construction of this levee resulted in the loss of any potential habitat for these species in the project area. In addition, the levee has ongoing maintenance and operations disturbances that prevent restoration of any habitat in the area, and there is an existing road on the top of the levee where the fence will be placed. The levee is subject to frequent border patrolling, and any disturbance from this activity is not expected to increase disturbances to the species beyond those already occurring.

Based on the information above and the description of the Project as follows, we have determined that there will be no effect to the species listed in Hudspeth and Presidio Counties, Texas for the Marfa Sector.

Project Description

The Project includes the construction and operation of tactical infrastructure, including primary pedestrian fence and associated access and patrol roads, along approximately 10.73 miles of the U.S./Mexico international border in Hudspeth and Presidio Counties, Texas. The Project will be implemented in three distinct segments, ranging from approximately 2.9 miles to 4.63 miles in length. The proposed corridor will impact approximately 60 feet and includes the fence and patrol roads. Vegetation will be cleared and grading will occur as necessary. A permanent impact area of 78 acres will occur.

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

- Built 15 to 18 feet high and extending below ground
- 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 to not impede the natural flow of surface water
- Aesthetically pleasing to the extent possible.

For Section L-1, the fence construction will be a "bollard floating" fence and placed atop the levee. For Sections L-1A and L-1B, the fencing will include the construction of new levee retaining wall on the side of the existing levee facing the Rio Grande. There will be a break in the fence at Cibolo Creek. A patrol road will be inserted that will run around the perimeter of the creek crossing at a suitable point.

BIOLOGICAL SURVEY ATTACHMENT E

MARFA SECTOR SPECIES LISTS

Mammals

Scientific Name	Common Name	Rankings	State Status	Federal Status
Order Didelphimorphia (opossum and allies)				
Family Didelphidae (opossums)				
Didelphis virginiana	Virginia Opossum	G5/S5		
Order Insectivora (shrews and moles)				
Family Soricidae (shrews)				
Notiosorex crawfordi	Desert Shrew	G5		
Family Talpidae (moles)				
Scalopus aquaticus	Eastern Mole	G5		
Order Chiroptera (bats)				
Family Mormoopidae (mormoopid bats)				
Mormoops megalophylla	Ghost-faced Bat	G4		
Family Phyllostomidae (leaf-nosed bats)				
Choeronycteris mexicana	Mexican Long-tongued Bat	G4		
Leptonycteris nivalis	Mexican Long-nosed Bat	G3	E	E
Family Vespertilionidae (vespertilionid bats)				
Antrozous pallidus	Pallid Bat	G5		
Eptesicus fuscus	Big Brown Bat	G5		
Lasionycteris noctivagans	Silver-haired Bat	G5		
Lasiurus blossevillii	Western Red Bat	G5		
Lasiurus borealis	Eastern Red Bat	G5		

Mammals

Scientific Name	Common Name	Rankings	State Status	Federal Status
Lasiurus cinereus	Hoary Bat	G5		
Myotis californicus	California Myotis	G5		
Myotis ciliolabrum	Western Small-footed Myotis	G5		
Myotis thysanodes	Fringed Myotis	G4G5		
Myotis velifer	Cave Myotis	G5		
Myotis volans	Long-legged Myotis	G5		
Myotis yumanensis	Yuma Myotis	G5		
Nyctinomops macrotis	Big Free-tailed Bat	G5		
Pipistrellus hesperus	Western Pipistrelle	G5		
Plecotus townsendii	Townsend’s Big-eared Bat	No NS Record		
Family Molossidae (free-tailed bats)				
Eumops perotis	Western Mastiff Bat	G5		
Tadarida brasiliensis	Brazilian Free-tailed Bat	G5		

Order Lagomorpha (hares and rabbits)

Family Leporidae (hares and rabbits)				
Lepus californicus	Black-tailed Jackrabbit	G5		
Sylvilagus audubonii	Desert Cottontail	G5		
Sylvilagus floridanus	Eastern Cottontail	G5		
Sylvilagus robustus	Eastern Cottontail	G3		

Order Rodentia (rodents)

Family Sciuridae (squirrels and allies)				
Ammospermophilus interpres	Texas Antelope Squirrel	G4G5		
Cynomys ludovicianus	Black-tailed Prairie Dog	G4		

Mammals

Scientific Name	Common Name	Rankings	State Status	Federal Status
Neotamias canipes	Gray-footed Chipmunk	G4		
Spermophilus mexicanus	Mexican Ground Squirrel	G5		
Spermophilus spilosoma	Spotted Ground Squirrel	G5		
Spermophilus variegatus	Rock Squirrel	G5		
Family Geomyidae (pocket gophers)				
Cratogeomys castanops	Yellow-faced Pocket Gopher	G5		
Geomys arenarius	Desert Pocket Gopher	G3		
Geomys personatus	Texas Pocket Gopher	G4		
Thomomys bottae	Botta's Pocket Gopher	G5		
Family Heteromyidae (pocket mice and kangaroo rats)				
Chaetodipus eremicus	Chihuahuan Desert pocket mouse	G5		
Chaetodipus hispidus	Hispid Pocket Mouse	G5		
Chaetodipus intermedius	Rock Pocket Mouse	G5		
Chaetodipus nelsoni	Nelson's Pocket Mouse	G5		
Chaetodipus penicillatus	Desert Pocket Mouse	No NS Record		
Dipodomys elator	Texas Kangaroo Rat	G2	T	
Dipodomys merriami	Merriam's Kangaroo Rat	G5		
Dipodomys ordii	Ord's Kangaroo Rat	G5		
Dipodomys spectabilis	Banner-tailed Kangaroo Rat	G5		
Perognathus flavus	Silky Pocket Mouse	G5		
Perognathus merriami	Merriam's Pocket Mouse	G5		
Family Castoridae (beavers)				
Castor canadensis	American Beaver	G5		

Mammals

Scientific Name	Common Name	Rankings	State Status	Federal Status
Family Muridae (mice and rats)				
Mus musculus	House Mouse	G5		
Neotoma albigula	White-throated Woodrat			
Neotoma leucodon	White-toothed Woodrat	G5		
Neotoma mexicana	Mexican Woodrat	G5		
Neotoma micropus	Southern Plains Woodrat	G5		
Ondatra zibethicus	Common Muskrat	G5		
Onychomys arenicola	Mearns' Grasshopper Mouse	G4G5		
Onychomys leucogaster	Northern Grasshopper Mouse	G5		
Peromyscus boylii	Brush Mouse	G5		
Peromyscus eremicus	Cactus Mouse	G5		
Peromyscus leucopus	White-footed Mouse	G5		
Peromyscus maniculatus	Deer Mouse	G5		
Peromyscus nasutus	Northern Rock Mouse	G5		
Peromyscus pectoralis	White-ankled Mouse	G5		
Rattus norvegicus	Norway Rat	G5		
Rattus rattus	Roof Rat	G5		
Reithrodontomys fulvescens	Fulvous Harvest Mouse	G5		
Reithrodontomys megalotis	Western Harvest Mouse	G5		
Reithrodontomys montanus	Plains Harvest Mouse	G5		
Sigmodon hispidus	Hispid Cotton Rat	G5		
Sigmodon ochrognathus	Yellow-nosed Cotton Rat	G4G5		
Family Erethizontidae (New World porcupines)				
Erethizon dorsatum	Porcupine	G5		

Mammals

Scientific Name	Common Name	Rankings	State Status	Federal Status
Order Carnivora (carnivores)				
Family Canidae (canids)				
Canis latrans	Coyote	G5		
Vulpes velox	Swift or Kit Fox	G3		
Urocyon cinereoargenteus	Common Gray Fox	G5		
Family Ursidae (bears)				
Ursus americanus	Black Bear	G5	T	
Family Procyonidae (procyonids)				
Bassariscus astutus	Ringtail	G5		
Procyon lotor	Common Raccoon	G5		
Family Mustelidae (mustelids)				
Conepatus mesoleucus	Common Hog-nosed Skunk			
Mephitis macroura	Hooded Skunk	G5		
Mephitis mephitis	Striped Skunk	G5		
Spilogale gracilis	Western Spotted Skunk	G5		
Taxidea taxus	American Badger	G5		
Family Felidae (cats)				
Felis concolor	Mountain Lion	G5		
Lynx rufus	Bobcat	G5		

Mammals

Scientific Name	Common Name	Rankings	State Status	Federal Status
Order Artiodactyla (even-toed ungulates)				
Family Suidae (pigs)				
Sus scrofa	Feral Hog	G5		
Family Dicotylidae (peccaries)				
Tayassu tajacu	Collared Peccary	No NS Record		
Family Cervidae (cervids)				
Cervus elaphus/canadensis	Wapiti or Elk	G5		
Odocoileus hemionus	Mule Deer	G5		
Odocoileus virginianus	White-tailed Deer	G5		
Family Antilocapridae (pronghorn)				
Antilocapra americana	Pronghorn	G5		
Family Bovidae (bovids)				
Ammotragus lervia	Barbary Sheep	G5		
Antilope cervicapra	Blackbrush Antelope	G3G4		
Boselaphus tragocamelus	Nilgai	G3G4		

Source: http://www.nsrl.ttu.edu/tmot1/distribu.htm

Key:
E = Endangered
T = Threatened
G2 = NatureServe Ranking; Imperiled

Mammals

Scientific Name	Common Name	Rankings	State Status	Federal Status

G3 = NatureServe Ranking; Vulnerable to Exterpation or Extinction
G4 = NatureServe Ranking; Apparently Secure
G5 = NatureServe Ranking; Demonstratably Widespread, Abundant and Secure
S5 = NatureServe Ranking; State of Texas Demonstratably Widespread, Abundant and Secure
No NS Record = No record found in NatureServe Database

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Accipitridae				
Accipiter cooperii	Cooper's Hawk	G5/S4		
Accipiter gentilis	Northern Goshawk	G5		
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	T	
Buteo albonotatus	Zone-tailed Hawk	G4/S3	T	
Buteo jamaicensis	Red-tailed Hawk	G5/S5		
Buteo lagopus	Rough-legged Hawk	G5		
Buteo lineatus	Red-shouldered Hawk	G5/S4		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
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	T	
Circus cyaneus	Northern Harrier	G5/S2		
Elanoides forficatus	Swallow-tailed Kite	G5/S2	T	
Elanus leucurus	White-tailed Kite	G5/S4		
Haliaeetus leucocephalus	Bald Eagle	G5/S3	T	
Ictinia mississippiensis	Mississippi Kite	G5/S4		
Pandion haliaetus	Osprey	G5/S4		
Parabuteo unicinctus	Harris's Hawk	G5/S3		

Aegithalidae

Psaltriparus minimus				

Alaudidae

Eremophila alpestris				

Alcedinidae

Ceryle (Megaceryle) torquata				

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Ceryle (Megacryle) alcyon	Belted Kingfisher	G5/S5		
Chloroceryle Americana	Green Kingfisher	G5/S4		
Anatidae				
Aix sponsa				
Anas acuta	Northern Pintail	G5/S3		
Anas Americana	American Wigeon	G5/S3		
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		
Anas Penelope	Eurasian Wigeon	G5/No TX Record		
Anas platyrhynchos	Mallard	G5/S3		
Anas querquedula	Garganey	G5		
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		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Aythya marila	Greater Scaup	G5/No TX Record		
Aythya valisineria	Canvasback	G5/S4		
Branta Canadensis	Canada Goose	G5/S5		
Bucephala albeola	Bufflehead	G5/No TX Record		
Bucephala clangula	Common Goldeneye	G5/No TX Record		
Bucephala islandica	Barrow's Goldeneye	G5		
Chen caerulescens	Snow Goose	G5/S5		
Chen rossii	Ross' Goose	G4/S3		
Clangula hyemalis	Long-tailed Duck	G5/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		
Lophodytes cucullatus	Hooded Merganser	G5/S3		
Melanitta fusca	White-winged Scoter	G5/No TX Record		
Melanitta nigra	Black Scoter	G5		
Melanitta perspicillata	Surf Scoter	G5/No TX Record		
Mergus merganser	Common Merganser	G5/No TX Record		
Mergus serrator	Red-breasted Merganser	G5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Nomonyx dominicus	Masked Duck	G5/S3		
Oxyura jamaicensis	Ruddy Duck	G5/S3		
Anhingidae				
Anhinga anhinga				
Apodidae				
Aeronautes saxatalis				
Chaetura pelagica	Chimney Swift	G5/S3		
Cypseloides niger	Black Swift	G4		
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	T	
Egretta thula	Snowy Egret	G5/S5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
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-widdow	G5/S3		
Caprimulgus vociferous	Whip-poor-will	G5/S4		
Chordeiles acutipennis	Lesser Nighthawk	G5/S4		
Chordeiles minor	Common Nighthawk	G5/S4		
Phalaenoptilus nuttallii	Common Poorwill	G5/S4		
Cardinalidae				
Cardinalis cardinalis	Northern Cardinal	G5/S5		
Cardinalis sinuatus	Pyrrhuloxia	G5/S4		
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		
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	T	T
Charadrius montanus	Mountain Plover	G2/S2		
Charadrius semipalmatus	Semipalmated Plover	G5/S4		
Charadrius vociferous	Killdeer	G5/S5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Pluvialis dominicus	American Golden-Plover	G5/S3		
Pluvialis squatarola	Black-bellied Plover	G5/S4		
Ciconiidae				
Mycteria Americana	Wood Stork	G4/SH	T	
Cinclidae				
Cinclus mexicanus	American Dipper	G5		
Columbidae				
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		
Leptotila verreauxi	White-tipped Dove	G5/S4		
Streptopelia decaucto	Eurasian Collared-Dove	G5/Exotic		
Zenaida asiatica				
Zenaida macroura	Mourning Dove	G5/S5		
Patagioenas fasciata	Band-tailed Pigeon	G4		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Corvidae				
Corvus cryptoleucus	Chihuahuan Raven	G5/S4		
Cyanocitta cristata	Blue Jay	G5/S5		
Cyanocitta stelleri	Steller's Jay	G5		
Cyanocorax yncas	Green Jay	G5/No TX Record		
Aphelocoma californica	Western Scrub-Jay	G5		
Aphelocoma ultramarina	Mexican Jay	G5		
Gymnorhinus cyanocephalus				
Nucifraga columbiana	Clark's Nutcracker	G5		
Pica hudsonia	Black-billed Magpie	G5		
Cuculidae				
Coccyzus Americanus	Yellow-billed Cuckoo	G5/S4		
Coccyzus erythrophthalmus				
Crotophaga sulcirostris	Groove-billed Ani	G5/S4		
Geococcyx Californianus	Greater Roadrunner	G5/S4		
Emberizidae				
Aimophila botterii	Botteri's Sparrow	G4/S3		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Aimophila cassinii	Cassin's Sparrow	G5/S4		
Aimophila ruficeps	Rufous-crowned Sparrow	G5/S4		
Ammodramus bairdi	Baird's Sparrow	G4/S2		
Ammodramus leconteii	Le Conte's Sparrow	G4		
Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow	G5/No TX Record		
Ammodramus savannarum	Grasshopper Sparrow	G5/S3		
Amphispiza belli	Sage Sparrow	G5		
Amphispiza bilineata	Black-throated Sparrow	G5/S4		
Arremonops rufivirgatus	Olive Sparrow	G5/S4		
Calamospiza melanocorys	Lark Bunting	G5/S4		
Calcarius lapponicus	Lapland Longspur	G5		
Calcarius mccownii	McCown's Longspur	G4		
Calcarius ornatus	Chestnut-collared Longspur	G5/S3		
Calcarius pictus	Smith's Longspur	G5		
Chondestes grammacus	Lark Sparrow	G5/S4		
Junco hyemalis	Dark-eyed Junco	G5/S5		
Junco phaeonotus	Yellow-eyed Junco	G5		
Melospiza Georgiana	Swamp Sparrow	G5/S4		
Melospiza lincolnii	Lincoln's Sparrow	G5/S5		
Melospiza melodia	Song Sparrow	G5/S5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Passerella iliaca	Fox Sparrow	G5		
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		
Pipilo fuscus	Canyon Towhee	G5		
Plectrophenax nivalis	Snow Bunting	G5/No TX Record		
Pooecetes gramineus	Vesper Sparrow	G5/S5		
Spizella arborea	American Tree Sparrow	G5/No TX Record		
Spizella atrogularis	Black-chinned Sparrow	G5		
Spizella breweri	Brewer's Sparrow	G5/S4		
Spizella pallida	Clay-colored Sparrow	G5/S4		
Spizella passerine	Chipping Sparrow	G5/S4		
Spizella pusilla	Field Sparrow	G5/S5		
Zonotrichia albicollis	White-throated Sparrow	G5		
Zonotrichia atricapilla				
Zonotrichia leucophrys	White-crowned Sparrow	G5/S5		
Zonotrichia querula	Harris's Sparrow	G5/S4		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Falconidae				
Caracara plancus	Crested Caracara	G5/S4		
Falco columbarius	Merlin	G5/No NS Record		
Falco femoralis	Aplomado Falcon	G4/S1	E	E
Falco mexicanus				
Falco peregrinus	Peregrine Falcon	G4/S3	E, T	
Falco sparverius	American Kestrel	G5/S4		
Fringillidae				
Carduelis flammea	Common Redpoll	G5/No TX Record		
Carduelis lawrencii	Lawrence’s Goldfinch	No NS Record		
Carduelis pinus	Pine Siskin	G5/S2		
Carduelis psaltria	Lesser Goldfinch	G5/S5		
Carduelis tristis	American Goldfinch	G5/S2		
Carpodacus cassinii	Cassin's Finch	G5		
Carpodacus mexicanus	House Finch	G5/S5		
Carpodacus purpureus	Purple Finch	G5/S4		
Coccothraustes vespertinus				
Loxia curvirostra	Red Crossbill	G5/S3		
Pinicola enucleator	Pine Grosbeak	G5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Gaviidae				
Gavia adamsii	Yellow-billed Loon	G4/No Tx Record		
Gavia immer				
Gavia pacifica	Pacific Loon	G5/No Tx Record		
Gavia stellata	Red-throated Loon	G5		
Gruidae				
Grus Americana	Whooping Crane	G1/S1	E	E
Grus Canadensis	Sandhill Crane	G5/S5		
Hirundinidae				
Hirundo rustica	Barn Swallow	G5/S5		
Petrochelidon fulva	Cave Swallow	G5/S4		
Petrochelidon pyrrhonota	Cliff Swallow	G5/S4		
Progne subis	Purple Martin	G5/S5		
Riparia riparia	Bank Swallow	G5/S2		
Stelgidopteryx serripennis				
Tachycineta bicolor	Tree Swallow	G5/S3		
Tachycineta thalassina	Violet-green Swallow	G5/S4		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
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 wagleri	Black-vented Oriole	No NS Record		
Molothrus aeneus	Bronzed Cowbird	G5/S5		
Molothrus ater	Brown-headed Cowbird	G5/S5		
Quiscalus mexicanus	Great-tailed Grackle	G5/S5		
Quiscalus quiscula	Common Grackle	G5/S5		
Sturnella magna				
Sturnella neglecta	Western Meadowlark	G5/S5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	G5/S3		
Jacanidae				
Jacana spinosa	Northern Jacana	No NS Record		
Laniidae				
Lanius excubitor	Northern Shrike	G5		
Lanius ludovicianus	Loggerhead Shrike	G4/S4		
Laridae				
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 canus	Mew Gull	G5		
Larus Delawarensis	Ring-billed Gull	G5/S5		
Larus fuscus	Lesser Black-backed Gull	G5/No TX Record		
Larus heermanni	Heermann's Gull	G4		
Larus hyperboreus	Glaucous Gull	G5/No TX Record		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Larus minutus	Little Gull	G5		
Larus occidentalis	Western Gull	G5/No TX Record		
Larus Philadelphia	Bonaparte's Gull	G5/S4		
Larus pipixcan	Franklin's Gull	G4G5/S2		
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		
Sterna antillarum	Least Tern	No NS Record	E	E
Sterna caspia	Caspian Tern	No NS Record		
Sterna forsteri				
Sterna fuscata	Sooty Tern	No NS Record	T	
Sterna hirundo	Common Tern	G5/S1		
Sterna paradisaea	Arctic Tern	G5		
Thalasseus elegans	Elegant Tern	G2		
Xema sabini	Sabine's Gull	G5/No TX Record		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Mimidae				
Dumetella carolinensis	Gray Catbird	G5/S4		
Mimus polyglottos				
Oreoscoptes montanus	Sage Thrasher	G5/No NS Record		
Toxostoma crissale	Crissal Thrasher	G5		
Toxostoma curvirostre	Curve-billed Thrasher	G5/S4		
Toxostoma longirostre				
Toxostoma rufum	Brown Thrasher	G5/S4		
Motacillidae				
Anthus rubescens	American Pipit	G5/S4		
Anthus spragueii	Sprague's Pipit	G4/No TX Record		
Odontophoridae				
Callipepla gambelii	Gambel's Quail	G5		
Callipepla squamata	Scaled Quail	G5/S4		
Colinus virginianus	Northern Bobwhite	G5/S4		
Cyrtonyx montezumae	Montezuma Quail	G4G5		
Paridae				

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Baeolophus atricristatus	Black-crested Titmouse	G5/S5		
Baeolophus ridgwayi	Juniper Titmouse	G5		
Parus (Poecile) carolinensis	Carolina Chickadee	G5/S5		
Poecile atricapillus	Black-capped Chickadee	G5		
Poecile gambeli	Mountain Chickadee	G5		
Parulidae				
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	E	E
Dendroica coronata	Yellow-rumped Warbler	G5		
Dendroica discolor	Prairie Warbler	G5/S3		
Dendroica dominica	Yellow-throated Warbler	G5/S4		
Dendroica fusca	Blackburnian Warbler	G5/S3		
Dendroica graciae	Grace's Warbler	G5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
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 pinus	Pine Warbler	G5/S5		
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 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		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
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	T	
Parula superciliosa	Crescent-chested Warbler	No NS Record		
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		
Vermivora chrysoptera	Golden-winged Warbler	G4/S3		
Vermivora crissalis	Colima Warbler	G3G4/S3		
Vermivora luciae	Lucy's Warbler	G5		
Vermivora peregrine	Tennessee Warbler	G5/S4		
Vermivora pinus				
Vermivora ruficapilla	Nashville Warbler	G5/S5		
Vermivora virginiae	Virginia's Warbler	G5/S3		
Wilsonia Canadensis				
Wilsonia citrine	Hooded Warbler	G5/S5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
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	E	E
Peucedramidae				
Peucedramus taeniatus	Olive Warbler	G5		
Phalacrocoracidae				
Phalacrocorax auritus				
Phalacrocorax brasilianus	Neotropic Cormorant	G5/S4		
Phasianidae				
Meleagris gallopavo	Wild Turkey	G5/S5		
Phasianus colchicus	Ring-necked Pheasant	G5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Picidae				
Colaptes auratus	Northern Flicker	G5/S3		
Melanerpes aurifrons	Golden-fronted Woodpecker	G5/S5		
Melanerpes erythrocephalus	Red-headed Woodpecker	G5/S3		
Melanerpes formicivorus	Acorn Woodpecker	G5/S4		
Melanerpes lewis	Lewis's Woodpecker	G4		
Picoides pubescens	Downy Woodpecker	G5/S4		
Picoides scalaris				
Picoides villosus	Hairy Woodpecker	G5		
Sphyrapicus nuchalis	Red-naped Sapsucker	G5/S3		
Sphyrapicus ruber	Red-breasted Sapsucker	G5		
Sphyrapicus thyroideus	Williamson's Sapsucker	G5		
Sphyrapicus varius	Yellow-bellied Sapsucker	G5/No TX Record		
Podicipedidae				
Aechmophorus clarkii	Clark's Grebe	G5		
Aechmophorus occidentalis				
Podiceps auritus	Horned Grebe	G5/No Tx Record		
Podiceps grisegena	Red-necked Grebe	G5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Podiceps nigricollis				
Podilymbus podiceps	Pied-billed Grebe	G5/S5		
Tachybaptus dominicus	Least Grebe	G5/S3		
Psittacidae				
Myiopsitta monachus	Monk Parakeet	G5		
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				
Gallinula chloropus	Common Moorhen	G5/S4		
Porphyrio martinica	Purple Gallinule	G5/S4		
Porzana Carolina	Sora	G5/S3		
Rallus elegans				
Rallus limicola	Virginia Rail	G5/S3		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Recurvirostridae				
Himantopus mexicanus				
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		
Calidris canutus	Red Knot	G4/No TX Record		
Calidris fuscicollis	White-rumped Sandpiper	G5/S3		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Calidris himantopus	Stilt Sandpiper	G5/S3		
Calidris mauri	Western Sandpiper	G5/S5		
Calidris melanotos	Pectoral Sandpiper	G5/S4		
Calidris minutilla	Least Sandpiper	G5/S5		
Calidris pusilla	Semipalmated Sandpiper	G5/S5		
Calidris ruficollis	Red-necked Stint	G5		
Catoptrophorus semipalmatus	Willet	G5/S5		
Gallinago gallinago	Common Snipe	No NS 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	E	E
Numenius phaeopus	Whimbrel	G5/S4		
Phalaropus fulicarius	Red Phalarope	G5/No TX Record		
Phalaropus tricolor	Wilson's Phalarope	G5/S3		
Phalarupus lobatus				
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				
Sittidae				
Sitta canadensis				
Sitta carolinensis	White-breasted Nuthatch	G5		
Sitta pygmaea	Pygmy Nuthatch	G5		
Strigidae				
Asio flammeus	Short-eared Owl	G5/No TX Record		
Asio otus	Long-eared Owl	G5/S2		
Athene cunicularia	Burrowing Owl	G4/S3		
Bubo virginianus	Great Horned Owl	G5/S5		
Glaucidium brasilianum	Ferruginous Pygmy-Owl	G5/S3		
Glaucidium gnoma	Northern Pygmy-Owl	G5		
Micrathene whitneyi	Elf Owl	G5/S4		
Otus asio	Eastern Screech-Owl	G5/S2		
Otus flammeolus	Flammulated Owl	G4/S3		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Strix occidentalis	Spotted Owl	G3		
Strix varia				
Aegolius acadicus	Northern Saw-whet Owl	G5		
Megascops kennicottii	Western Screech-Owl	G5		
Sturnidae				
Sturnus vulgaris	European Starling	G5/Exotic		
Sylviidae				
Polioptila caerulea	Blue-gray Gnatcatcher	G5/S3		
Polioptila melanura	Black-tailed Gnatcatcher	G5/S4		
Tetraonidae				
Tympanuchus pallidicinctus	Lesser Prairie-chicken	G3		
Thraupidae				
Piranga bidentata	Flame-colored Tanager	No NS Record		
Piranga flava	Hepatic Tanager	G5/S4		
Piranga ludoviciana				

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Piranga olivacea	Scarlet Tanager	G5/S4		
Piranga rubra	Summer Tanager	G5/S5		
Threskiornithidae				
Eudocimus albus	White Ibis	G5/S4		
Platalea ajaja				
Plegadis chihi	White-faced Ibis	G5/S4	T	
Plegadis falcinellus	Glossy Ibis	G5/S3		
Trochilidae				
Amazilia beryllina	Berylline Hummingbird	G4		
Amazilia violiceps	Violet-crowned Hummingbird	G5/No TX Record		
Amazilia yucatanensis	Buff-bellied Hummingbird	G4/S3		
Archilochus colubris	Ruby-throated Hummingbird	G5/S4		
Archilocus alexandri	Black-chinned Hummingbird	G5/S5		
Calothorax lucifer	Lucifer Hummingbird	G4G5		
Calypte anna	Anna's Hummingbird	G5/No TX Record		
Calypte costae	Costa's Hummingbird	G5		
Cynanthus latirostris	Broad-billed Hummingbird	G4/SH		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Eugenes fulgens	Magnificent Hummingbird	G5		
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		
Selasphorus sasin				
Stellula calliope	Calliope Hummingbird	G5		
Troglodytidae				
Campylorhynchus brunneicapillus	Cactus Wren	G5/S4		
Catherpes mexicanus	Canyon Wren	G5		
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				
Troglodytes troglodytes	Winter Wren	G5/No TX Record		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Trogonidae				
Trogon elegans	Elegant Trogon	G5		
Turdidae				
Catharus fuscescens	Veery	G5/No TX Record		
Catharus guttatus	Hermit Thrush	G5/S4		
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		
Sialia currucoides	Mountain Bluebird	G5/S3		
Sialia mexicana	Western Bluebird	G5		
Sialia sialis	Eastern Bluebird	G5/S5		
Turdus migratorius	American Robin	G5/S4		
Turdus rufopalliatus				
Ridgwayia pinicola	Aztec Thrush	No NS Record		
Tyrannidae				
Camptostoma imberbe	Northern Beardless-Tyrannulet	G5/S3	T	
Contopus cooperi	Olive-sided Flycatcher	G4/S3		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Contopus pertinax	Greater Pewee	G5/No TX Record		
Contopus sordidulus	Western Wood-Pewee	G5/S4		
Contopus virens	Eastern Wood-Pewee	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 oberholseri	Dusky Flycatcher	G5		
Empidonax occidentalis	Cordilleran Flycatcher	G5		
Empidonax traillii	Willow Flycatcher	G5/S1		
Empidonax virescens	Acadian Flycatcher	G5/S4		
Empidonax wrightii	Gray Flycatcher	G5		
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		
Pachyramphus aglaiae	Rose-throated Becard	G4G5/No Tx Record	T	
Pitangus sulphuratus	Great Kiskadee	G5/S4		
Pyrocephalus rubinus	Vermilion Flycatcher	G5/S4		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Sayornis nigricans	Black Phoebe	G5/S4		
Sayornis phoebe	Eastern Phoebe	G5/S4		
Sayornis saya	Say's Phoebe	G5/S4		
Tyrannus couchii	Couch's Kingbird	G5		
Tyrannus crassirostris	Thick-billed Kingbird	G5		
Tyrannus forficatus	Scissor-tailed Flycatcher	G5/S3		
Tyrannus melancholicus	Tropical Kingbird	G5/S1		
Tyrannus tyrannus	Eastern Kingbird	G5/S4		
Tyrannus verticalis	Western Kingbird	G5/S3		
Tyrannus vociferans				
Mitrephanes phaeocercus	Tufted Flycatcher	No NS Record		
Tytonidae				
Tyto alba	Barn Owl	G5/S5		
Vireonidae				
Vireo atricapillus	Black-capped Vireo	G2G3/S2	E	E
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		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Vireo huttoni	Hutton's Vireo	G5		
Vireo olivaceus	Red-eyed Vireo	G5/S5		
Vireo philadelphicus	Philadelphia Vireo	G5/S4		
Vireo plumbeus	Plumbeous Vireo	G5		
Vireo solitarius	Blue-headed Vireo			
Vireo vicinior	Gray Vireo	G4		

Source:
http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_bk_w7000_0809.pdf

Key:

E = Endangered

T = Threatened

SC = Special concern

SAT = Listed endangered or threatened because of similarity of appearance

G1 = NatureServe Ranking; Critically Imperiled

G2 = NatureServe Ranking; Imperiled

G3 = NatureServe Ranking; Vulnerable to Exterpation or Extinction

G4 = NatureServe Ranking; Apparently Secure

G5 = NatureServe Ranking; Demonstratably Widespread, Abundant and Secure

No NS Record = No record found in NatureServe Database

Reptiles

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
TURTLES				
Emydidae				
Terrapene ornata	Western Box Turtle	G5		
Trachemys gaigeae	Mexican Plateau Slider	G3		
Kinosternidae				
Kinosternon flavescens	Yellow Mud Turtle	G5		
Kinosternon hirtipes	Rough-footed Mud Turtle	G5		
Trionychidae				
Apalone spinifera	Spiny Softshell Turtle	G5		
LIZARDS				
Crotaphytidae				
Crotaphytus collaris	Eastern Collared Lizard	G5		
Gambelia wislizenii	Long-nosed Leopard Lizard	G5		

Reptiles

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
Gekkonidae				
Coleonyx brevis	Texas Banded Gecko	G5		
Coleonyx reticulatus	Reticulated Gecko	G3	T	
Phrynosomatidae				
Cophosaurus texanus	Greater Earless Lizard	G5		
Holbrookia maculata	Lesser Earless Lizard	G5		
Sceloporus magister	Desert Spiny Lizard	G5		
Sceloporus merriami	Canyon Lizard	G4		
Sceloporus poinsettii	Crevice Spiny Lizard	G5		
Sceloporus serrifer	Blue Spiny Lizard	G5		
Sceloporus undulatus	Fence/prairie/plateau Lizard	G5		
Phrynosoma cornutum	Texas Horned Lizard	G4G5	T	
Phrynosoma hernandesi	Mountain short-horned Lizard	G5	T	
Phrynosoma modestum	Round-tailed Horned Lizard	G5		
Uta stansburiana	Side-blotched Lizard	G5		
Urosaurus ornatus	Tree Lizard	G5		
Scincidae				
Eumeces multivirgatus	Many-lined Skink	G5		

Reptiles

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
Eumeces obsoletus	Great Plains Skink	G5		
Eumeces tetragrammus	Four-lined Skink	G5		
Teiidae				
Aspidoscelis dixoni	Gray-checkered Whiptail	G3G4		
Aspidoscelis exsanguis	Chihuahuan Spotted Whiptail	G5		
Aspidoscelis gularis	Texas Spotted Whiptail	G5		
Aspidoscelis inornata	Little Striped Whiptail	G5		
Aspidoscelis neomexicana	New Mexico Whiptail	G5		
Aspidoscelis septemvittata	Plateau Spotted Whiptail	G5		
Aspidoscelis tesselata	Common Checkered Whiptail	G5		
Aspidoscelis tigris marmorata	Western Marbled Whiptail	G5T5		

SNAKES

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
Colubridae				
Arizona elegans	Glossy Snake	G5		
Bogertophis subocularis	Trans-pecos Snake	G4G5		E
Diadophis punctatus	Ring-necked Snake	G5		
Elaphe guttata	Red Cornsnake	G5		
Gyalopion canum	Chihuahuan Hook-nosed Snake	G5		

Reptiles

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
Heterodon nasicus	Western Hog-nosed Snake	G5		
Hypsiglena torquata	Nightsnake	G5		
Lampropeltis alterna	Gray-banded Kingsnake	G5		
Lampropeltis getula	Common Kingsnake	G5		
Lampropeltis triangulum	Milksnake	G5		
Masticophis flagellum	Coachwhip	G5		
Masticophis taeniatus	Striped Whipsnake	G5		
Pituophis catenifer	Gophersnake	G5		
Rhinocheilus lecontei	Long-nosed Snake	G5		
Salvadora grahamiae	Eastern Patch-nosed Snake	G5		
Salvadora hexalepis deserticola	Big Bend Patch-nosed Snake	G5T5		
Sonora semiannulata	Groundsnake	G5		
Tantilla cucullata	Trans-Pecos Black-headed Snake	G3		
Tantilla hobartsmithi	Smith's Black-headed Snake	G5		
Tantilla nigriceps	Plains Black-headed Snake	G5	T	
Thamnophis cyrtopsis	Black-necked Gartersnake	G5		
Thamnophis marcianus	Checkered Gartersnake	G5		
Trimorphodon vilkinsonii	Chihuahuan desert lyre snake	G4	T	
Tropidoclonion lineatum	Lined Snake	G5		
Leptotyphlopidae				

Reptiles

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
Leptotyphlops dulcis	Texas Threadsnake	G5		
Leptotyphlops humilis	Western Threadsnake	G5		
Viperidae				
Agkistrodon contortrix	Copperhead	G5		
Crotalus atrox	Western Diamond-backed Rattlesnake	G5		
Crotalus lepidus	Rock Rattlesnake	G5		
Crotalus molossus	Black-tailed Rattlesnake	G5		
Crotalus scutulatus	Mohave Rattlesnake	G5		
Crotalus viridis	Prairie Rattlesnake	G5		

Source: http://wfscnet.tamu.edu/tcwc/Herps_online/CountyRecords.htm

Key:

E = Endangered

T = Threatened

DL = Delisted

G1 = NatureServe Ranking; Critically Imperiled

G2 = NatureServe Ranking; Imperiled

G3 = NatureServe Ranking; Vulnerable to Exterpation or Extinction

G4 = NatureServe Ranking; Apparently Secure

Reptiles

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status

G5 = NatureServe Ranking; Demonstratably Widespread, Abundant and Secure

S1 = NatureServe Ranking; State of Texas Critically Imperiled

No TX Record = No record found in NatureServe Database for State of Texas

No NS Record = No record found in NatureServe Database

Amphibians

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
Ambystomatidae				
Ambystoma tigrinum	Tiger Salamander	G5		
Bufonidae				
Bufo cognatus	Great Plains Toad	G5		
Bufo debilis	Green Toad	G5		
Bufo punctatus	Red-spotted Toad	G5		
Bufo speciosus	Texas Toad	G5		
Bufo woodhousii	Woodhouse's Toad	G5		
Hylidae				

Amphibians

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
Hyla arenicolor	Canyon Treefrog	G5		
Leptodactylidae				
Eleutherodactylus guttilatus	Spotted Chirping Frog	G4		
Microhylidae				
Gastrophryne olivacea	Great Plains Narrowmouth Toad	G5		
Ranidae				
Rana berlandieri	Rio Grande Leopard Frog	G5		
Rana catesbeiana	Bullfrog	G5		
Scaphiopodidae				
Scaphiopus couchii	Couch's Spadefoot	G5		
Spea bombifrons	Plains Spadefoot	G5		

Source: http://wfscnet.tamu.edu/tcwc/Herps_online/CountyRecords.htm

Key:

E = Endangered

Amphibians

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status

T = Threatened

DL = Delisted

G1 = NatureServe Ranking; Critically Imperiled

G2 = NatureServe Ranking; Imperiled

G3 = NatureServe Ranking; Vulnerable to Exterpation or Extinction

G4 = NatureServe Ranking; Apparently Secure

G5 = NatureServe Ranking; Demonstratably Widespread, Abundant and Secure

S1 = NatureServe Ranking; State of Texas Critically Imperiled
No TX Record = No record found in NatureServe Database for State of Texas

No NS Record = No record found in NatureServe Database

Butterflys

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
Skippers (Hesperiidae)					
Grass Skippers (Hesperiinae)					
Amblyscirtes aenus	Bronze Roadside-skipper	G5			P
Amblyscirtes eos	Dotted Roadside-skipper	G5			P
Amblyscirtes nereus	Slaty Roadside-skipper	G4G5			H,P
Amblyscirtes nysa	Nysa Roadside-skipper	G5			P

Butterflys

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
Amblyscirtes simius	Simius Roadside-skipper	G4			H,P
Amblyscirtes texanae	Texas Roadside-skipper	G3G4			P
Ancyloxypha arene	Tropical Least Skipper	G5			H,P
Atalopedes campestris	Sachem	G5			H,P
Atrytonopsis edwardsi	Sheep Skipper	G3G4			P
Atrytonopsis pittacus	White-barred Skipper	G3G4			P
Atrytonopsis vierecki	Viereck's Skipper	G4			H,P
Copaeodes aurantiaca	Orange Skipperling	G5			P
Hesperia pahaska	Pahaska Skipper	G5			H,P
Hesperia uncas	Uncas Skipper	G5			P
Hesperia viridis	Green Skipper	G5			H,P
Hesperia woodgatei	Apache Skipper	G3G4			H,P
Hylephila phyleus	Fiery Skipper	G5			H,P
Lerodea eufala	Eufala Skipper	G5			H,P
Nastra julia	Julia's Skipper	G5			P
Polites carus	Carus Skipper	G4			H,P
Stinga morrisoni	Morrison's Skipper	G4G5			H,P
Giant-Skippers (Megathyminae)					
Agathymus mariae	Mary's Giant-skipper	G3G4			H,P
Agathymus neumoegeni	Orange Giant-skipper	G4G5			H,P
Megathymus ursus	Ursine Giant-skipper	G4G5			P
Megathymus yuccae	Yucca Giant-skipper	G5			P

Butterflys

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
Spread-wing Skippers (Pyrginae)					
Achalarus casica	Desert Cloudywing	G5			H,P
Celotes limpia	Scarce Streaky-skipper	G2			H
Celotes nessus	Common Streaky-skipper	G5			H,P
Cogia hippalus	Acacia Skipper	G5			H,P
Erynnis brizo	Sleepy Duskywing	G5			H
Erynnis funeralis	Funereal Duskywing	G5			H,P
Erynnis meridianus	Meridian Duskywing	G5			H,P
Erynnis tristis	Mournful Duskywing	G5			P
Heliopyrgus domicella	Erichson's White-skipper	G5			H,P
Hesperopsis alpheus	Saltbush Sootywing	G4			H
Pholisora catullus	Common Sootywing	G5			H,P
Pholisora mejicanus	Mexican Sootywing	G5			P
Pyrgus albescens	White Checkered-skipper	G5			H
Pyrgus philetas	Desert Checkered-skipper	G5			H,P
Pyrgus scriptura	Small Checkered-skipper	G5			H
Staphylus ceos	Golden-headed Scallopwing	G5			H,P
Systasea pulverulenta	Texas Powdered-skipper	G5			H
Systasea zampa	Arizona Powdered-skipper	G5			P
Thorybes pylades	Northern Cloudywing	G5			H,P
Firetips (Pyrrhopyginae)					
Apyrrothrix araxes	Dull Firetip	G5			P

Butterflys

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
Gossamer-wing Butterflies (Lycaenidae)					
Blues (Polyommatinae)					
Brephidium exilis	Western Pygmy-blue	G5			P
Cupido (Everes) comyntas	Eastern Tailed-blue	G5			H,P
Echinargus isola	Reakirt's Blue	G5			P
Hemiargus ceraunus	Ceraunus Blue	G5			H,P
Leptotes marina	Marine Blue	G5			H,P
Plebejus lupini	Lupine Blue	G5			P
Zizula cyna	Cyna Blue	G4G5			H,P
Hairstreaks (Theclinae)					
Atlides halesus	Great Purple Hairstreak	G5			H,P
Callophrys gryneus	Juniper Hairstreak	G5			P
Callophrys mcfarlandi	Sandia Hairstreak	G4			H
Callophrys spinetorum	Thicket Hairstreak	G5		SC	H
Ministrymon leda	Leda Ministreak	G5			H,P
Phaeostrymon alcestis	Soapberry Hairstreak	G5			H
Satyrium polingi	Poling's Hairstreak	G2			P
Strymon bebrycia	Red-lined Scrub-Hairstreak	N/A			H
Strymon melinus	Gray Hairstreak	G5			P
Brush-footed Butterflies (Nymphalidae)					
Emperors (Apaturinae)					

Butterflys

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
Asterocampa celtis	Hackberry Emperor	G5			P
Asterocampa clyton	Tawny Emperor	G5			H,P
Asterocampa leilia	Empress Leilia	G5			H,P
Anaea andria	Goatweed Leafwing	G5			P
Milkweed Butterflies (Danainae)					
Danaus gilippus	Queen	G5			P
Danaus plexippus	Monarch	G5			P
Longwings (Heliconiinae)					
Agraulis vanillae	Gulf Fritillary	G5			P
Euptoieta claudia	Variegated Fritillary	G5			P
Euptoieta hegesia	Mexican Fritillary	N/A			P
Snouts (Libytheinae)					
Libytheana carinenta	American Snout	G5			P
Admirals and Relatives (Limenitidinae)					
Adelpha bredowii	California Sister	G5			P
Historis acheronta	Tailed Cecropian	N/A			H,P
Limenitis archippus	Viceroy	G5			H,P
Limenitis arthemis	White Admiral	G5			H,P
Limenitis arthemis astyanax	Red-spotted Purple	G5T5			H,P
Marpesia petreus	Ruddy Daggerwing	G5			P

Butterflys

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
Mestra amymone	Common Mestra	G5			H,P
True Brushfoots (Nymphalinae)					
Anthanassa texana	Texan Crescent	G5			P
Anthanassa tulcis	Tulcis Crescent	G5			H
Chlosyne acastus	Acastus Checkerspot	G4G5			H
Chlosyne definita	Definite Patch	G3G4			H,P
Chlosyne fulvia	Fulvia Checkerspot	G5			H,P
Chlosyne lacinia	Bordered Patch	G5			P
Chlosyne theona	Theona Checkerspot	G5			H,P
Dymasia dymas	Tiny Checkerspot	G5			P
Junonia coenia	Common Buckeye	G5			H,P
Nymphalis antiopa	Mourning Cloak	G5			H,P
Phyciodes graphica	Graphic Crescent	G5			H,P
Phyciodes mylitta	Mylitta Crescent	G5			H
Phyciodes phaon	Phaon Crescent	G5			H,P
Phyciodes picta	Painted Crescent	G5			H,P
Phyciodes tharos	Pearl Crescent	G5			P
Poladryas minuta	Dotted Checkerspot	G5			P
Polygonia interrogationis	Question Mark	G5			H
Siproeta stelenes	Malachite	G5			H,P
Texola elada	Elada Checkerspot	G5			P
Vanessa annabella	West Coast Lady	G5			H
Vanessa atalanta	Red Admiral	G5			H,P

Butterflys

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
Vanessa cardui	Painted Lady	G5			P
Vanessa virginiensis	American Lady	G5			P
Satyrs and Wood-Nymphs (Satyrinae)					
Cercyonis meadii	Mead's Wood-nymph	G5			P
Cercyonis pegala	Common Wood-nymph	G5			P
Cyllopsis pertepida	Canyonland Satyr	G5			H,P
Gyrocheilus patrobas	Red-bordered Satyr	G4			P
Megisto rubricata	Red Satyr	G5			P

Parnassians and Swallowtails (Papilionidae)

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
Swallowtails (Papilioninae)					
Battus philenor	Pipevine Swallowtail	G5			P
Papilio anchisiades	Ruby-spotted Swallowtail	G5			H,P
Papilio cresphontes	Giant Swallowtail	G5			P
Papilio multicaudata	Two-tailed Swallowtail	G5			P
Papilio ornythion	Ornythion Swallowtail	N/A			H,P
Papilio polyxenes	Black Swallowtail	G5			P
Papilio rutulus	Western Tiger Swallowtail	N/A			H
Metalmarks (Riodinidae)					
Apodemia duryi	Mexican Metalmark	G3G4			P
Apodemia palmerii	Palmer's Metalmark	G5			P
Calephelis nemesis	Fatal Metalmark	G5			P

Butterflys

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
Calephelis rawsoni	Rawson's Metalmark	G4			H,P

Whites and Sulphurs (Pieridae)

Sulphurs (Coliadinae)					
Abaeis nicippe	Sleepy Orange	G5			P
Anteos clorinde	White Angled-Sulphur	N/A			P
Colias eurytheme	Orange Sulphur	G5			P
Eurema boisduvaliana	Boisduval's Yellow	N/A			P
Eurema mexicana	Mexican Yellow	G5			P
Kricogonia lyside	Lyside Sulphur	G5			H,P
Lerema accius	Clouded Skipper	G5			P
Nathalis iole	Dainty Sulphur	G5			P
Phoebis agarithe	Large Orange Sulphur	G5			H,P
Phoebis sennae	Cloudless Sulphur	G5			P
Pyrisitia lisa	Little Yellow	G5			P
Pyrisitia proterpia	Tailed Orange	N/A			H
Zerene cesonia	Southern Dogface	G5			P

Whites (Pierinae)					
Anthocharis cethura	Desert Orangetip	G4G5			H
Anthocharis thoosa	Southwestern Orangetip	G5			H
Ascia monuste	Great Southern White	G5			H
Euchloe lotta	Desert Marble	G4G5			H
Pieris rapae	Cabbage White	G5			H

Butterflys

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
Pontia protodice	Checkered White	G4			H
Pontia sisymbrii	Spring White	G5			H

Source: http://www.butterfliesandmoths.org/

Key:

H = Hudspeth County

P = Presidio County

SC = State of Texas Species of Special Concern

G1 = NatureServe Ranking; Critically Imperiled

G2 = NatureServe Ranking; Imperiled

G3 = NatureServe Ranking; Vulnerable to Exterpation or Extinction

G4 = NatureServe Ranking; Apparently Secure

G5 = NatureServe Ranking; Demonstratably Widespread, Abundant and Secure

S1 = NatureServe Ranking; State of Texas Critically Imperiled

N/A = Not applicable (no record found)

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APPENDIX E

Listed Species/
Habitat No Effect Determination

DEPARTMENT OF THE ARMY
FORT WORTH DISTRICT, CORPS OF ENGINEERS
P. O. BOX 17300
FORT WORTH, TEXAS 76102-0300

REPLY TO
ATTENTION OF:

February 26, 2008

Engineering and Construction Support Office

U.S. Fish and Wildlife Service
Ecological Services – South Texas
ATTN: Mr. Allan M. Strand
c/o TAMU-CC, Campus Box 338
6300 Ocean Drive
Corpus Christi, Texas 78412

SUBJECT: Determination of No Effect for Construction, Operation, and Maintenance of Tactical Infrastructure, Marfa Sector, Texas

Dear Mr. Strand:

U.S. Customs and Border Protection (CBP) and the U.S. Border Patrol (USBP) are proposing to install and operate tactical infrastructure consisting of primary pedestrian fence and associated patrol roads, access roads, and lights along three sections on the U.S./Mexico international border in Hudspeth and Presidio Counties, Texas.

Enclosed is a Determination of No Effect on listed species and their habitats potentially occurring in the vicinity of the proposed action.

Should you have any questions or concerns about this determination, please do not hesitate to contact Ms. Cheryl Schmidt (e^{2}M; 605-456-1473).

Sincerely,

M. Todd Smith

for Eric W. Verwers
Director, Engineering and Construction
Support Office

Listed Species/Habitat
No Effect Determination

Proposed Construction, Operation, and Maintenance of Tactical Infrastructure for:

L-1.	Neely's Crossing, Sierra Blanca Station, 4.63 miles primary pedestrian fence
L-1A.	Presidio point of entry (POE) to 3.05 miles E of POE, Presidio Station, primary pedestrian fence
L-1B.	Presidio POE to 3.05 miles W of POE, Presidio Station, primary pedestrian fence

Hudspeth and Presidio Counties, Texas

February 22, 2008

U.S. Department of Homeland Security
U.S. Customs and Border Protection
U.S. Border Patrol Marfa Sector
Sierra Blanca Station
Presidio Station

U.S. Customs and Border Protection (CBP) and the U.S. Border Patrol (USBP) are proposing to install and operate tactical infrastructure consisting of primary pedestrian fence and associated patrol roads, access roads, and lights along three sections along the U.S./Mexico international border in Hudspeth and Presidio Counties, Texas.

The following federally-listed species and habitats are known to occur within 25 miles of the U.S./Mexico international border in Hudspeth County:

SPECIES	LISTING STATUS	DETERMINATION
Least tern, *Sterna antillarum*	endangered	no effect
Whooping crane, *Grus Americana*	endangered	no effect
Whooping crane, critical habitat	designated	no effect
Piping plover, *Charadrius melodus*	endangered	no effect
Piping plover, critical habitat	designated	no effect
Northern aplomado falcon, *Falco femoralis septentrionalis*	endangered	no effect
Southwestern willow flycatcher, *Empidonax trailii extimus*	endangered	no effect
Southwestern willow flycatcher, critical habitat	proposed	no effect
Mexican spotted owl, *Strix occidentalis lucida*	threatened	no effect

The following federally-listed species and habitats are known to occur within 25 miles of the U.S./Mexico international border in Presidio County:

SPECIES	LISTING STATUS	DETERMINATION
Northern aplomado falcon, *Falco femoralis septentrionalis*	endangered	no effect
Whooping crane, *Grus Americana*	endangered	no effect
Whooping crane, critical habitat	designated	no effect
Piping plover, *Charadrius melodus*	endangered	no effect
Piping plover, critical habitat	designated	no effect
Least tern, *Sterna antillarum*	endangered	no effect
Southwestern willow flycatcher, *Empidonax trailii extimus*	endangered	no effect
Southwestern willow flycatcher, critical habitat	proposed	no effect
Mexican long-nosed bat, *Leptonycteris nivalis*	endangered	no effect
Hinckley oak, *Quercus hinckleyi*	threatened	no effect
Lloyd's Mariposa cactus, *Sclerocactus mariposensis*	threatened	no effect

Determination

The U.S. Fish and Wildlife Service identified species that are listed under the Endangered Species Act (ESA) that occur in Hudspeth and Presidio Counties, Texas. These species are: least tern, Northern aplomado falcon, southwestern willow flycatcher, piping plover, whooping crane, Mexican spotted owl, Mexican long-nosed bat, Lloyd's Mariposa cactus, and Hinckley oak. Documented below are anticipated effects to listed species if the proposed action is implemented.

The species listed above are known to occur in the area; however, the location of the fencing in the Marfa Project, sections L-1, L-1A, L-1B, will be on an existing levee. Prior construction of this levee resulted in the loss of any potential habitat for these species in the project area. In addition, the levee has ongoing maintenance and operations disturbances that prevent restoration of any habitat in the area and there is an existing road on the top of the levee where the fence will be placed. The levee is subject to frequent border patrolling and any disturbance from this activity is not expected to increase disturbances to the species beyond those disturbances that are already occurring.

Based on the information above and the description of the project as follows, we have determined that there will be no effect to the species listed in Hudspeth and Presidio Counties, Texas for the Marfa Sector.

Project Description

The proposed action includes the construction, operation, and maintenance of tactical infrastructure to include primary pedestrian fence and associated access and patrol roads along approximately 10.73 miles of the U.S./Mexico international border in Hudspeth and Presidio Counties, Texas. The proposed action will be implemented in three (3) distinct sections, ranging from approximately 3.05 miles and 4.63 miles in length. The proposed corridor would impact approximately 60 feet and includes the fence and patrol roads. Vegetation would be cleared and grading would occur as necessary. A permanent impact area of 78 acres will occur.

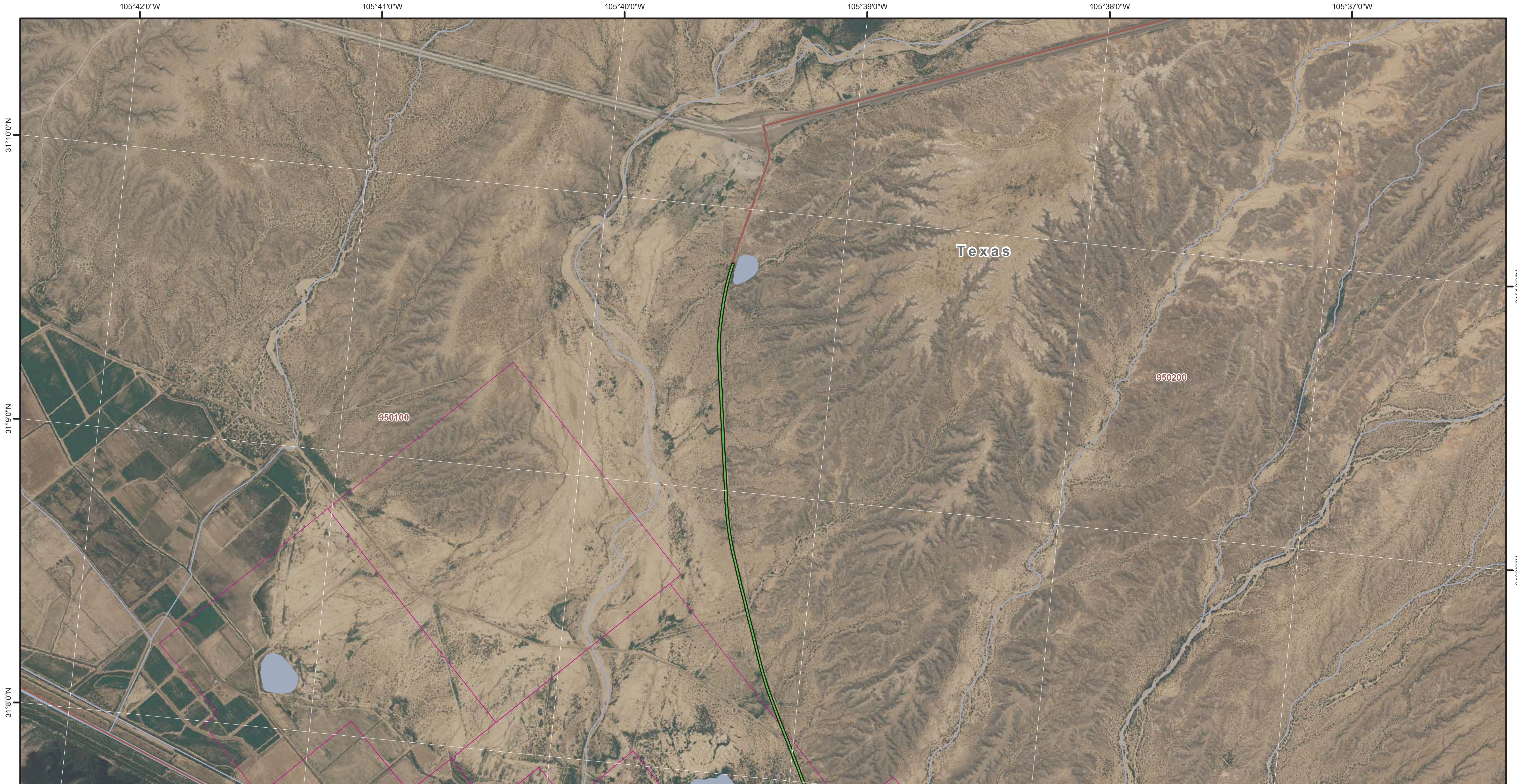
Design criteria that have been established based on USBP operational needs specify that, at a minimum, any fencing must meet the following requirements:

- Built 15 to 18 feet high extending below ground
- 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 to not impede the natural flow of surface water
- Aesthetically pleasing to the extent possible

For section L-1, the fence construction will be a "floating" fence and placed atop the levee. For sections L-1A and L-1B, the proposed fencing would include the construction of a new levee retaining wall on the side of the existing levee facing the Rio Grande. There will be a break in the fence at Cibolo Creek. A patrol road will be inserted that will run around the perimeter of the creek crossing at a suitable point.

APPENDIX F

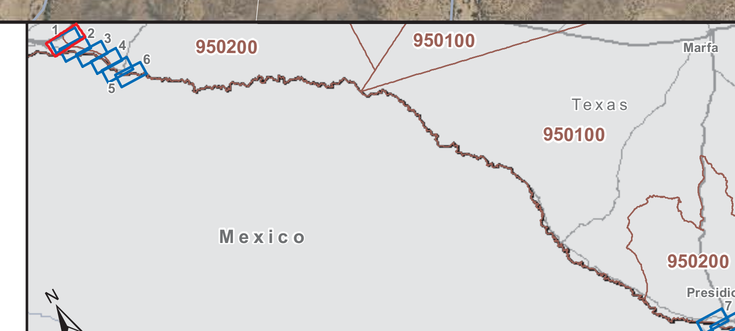
Detailed Maps of the Planned Tactical Infrastructure Sections Showing Land Use and Water



Fence Sections
Access Roads
Staging Areas
Land Parcels
Census Tracts
Port of Entry
Surface Water

Feet
0 500 1,000 2,000
Scale

N



Environmental Stewardship Plan for the Contruction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Marfa Sector, Texas Detailed Fence Section Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

July 10, 2008	Scale 1" = 2000'	Map 1 of 8

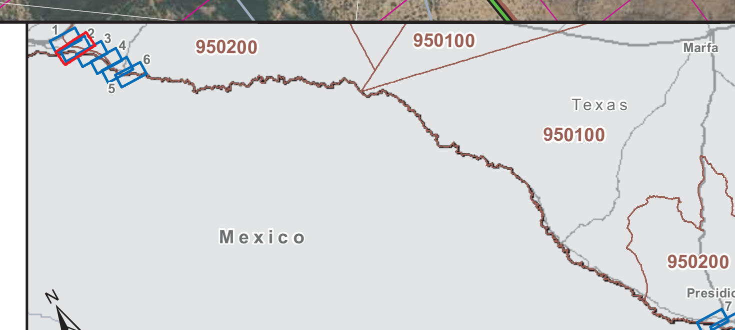
Fence Sections
Access Roads
Staging Areas
Land Parcels
Census Tracts
Port of Entry
Surface Water

Feet

0 500 1,000 2,000

Scale

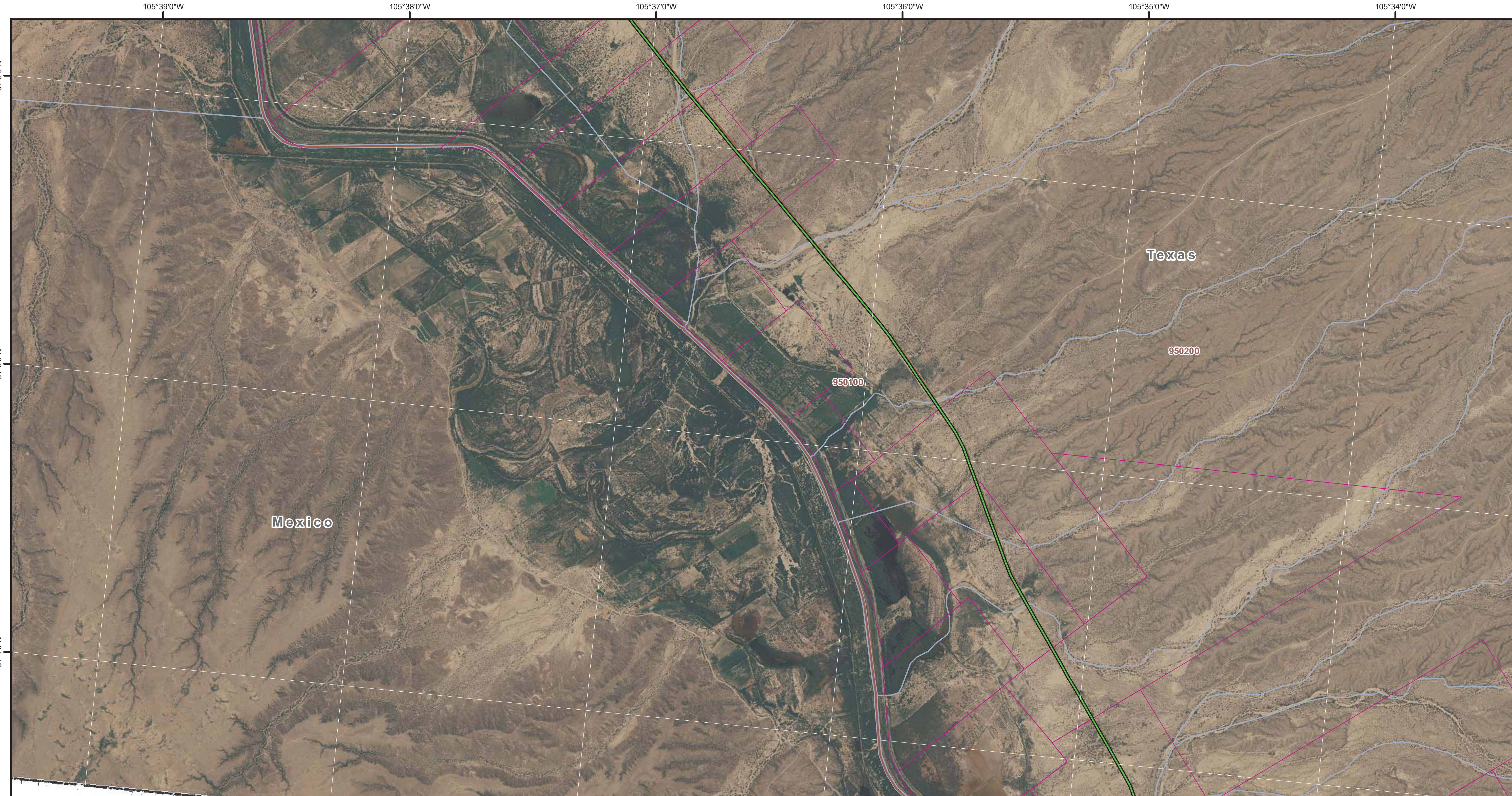
N



Environmental Stewardship Plan for the Contruction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Marfa Sector, Texas Detailed Fence Section Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

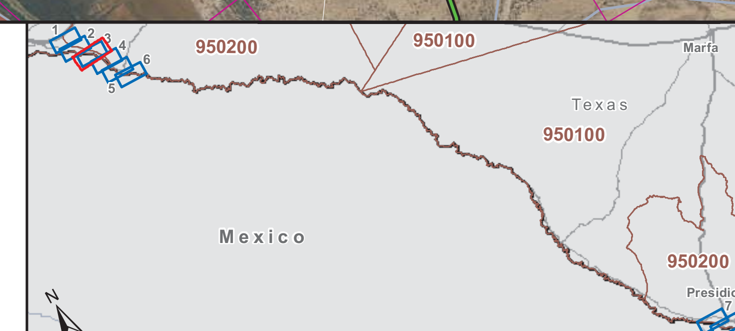
July 10, 2008	Scale 1" = 2000'	Map 2 of 8



Fence Sections
Access Roads
Staging Areas
Land Parcels
Census Tracts
Port of Entry
Surface Water

Feet
0 500 1,000 2,000
Scale

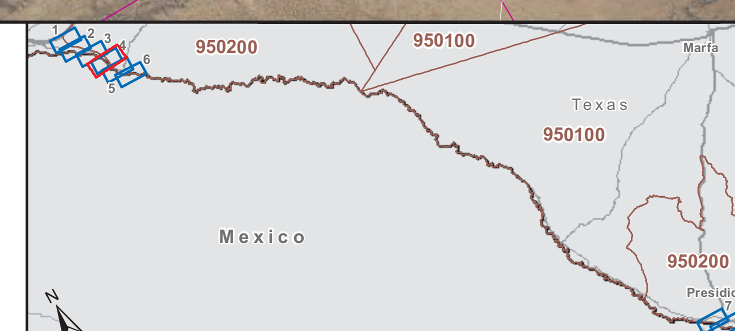
N



Environmental Stewardship Plan for the Contruction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Marfa Sector, Texas Detailed Fence Section Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

July 10, 2008	Scale 1" = 2000'	Map 3 of 8



Fence Sections
Access Roads
Staging Areas
Land Parcels
Census Tracts
Port of Entry
Surface Water

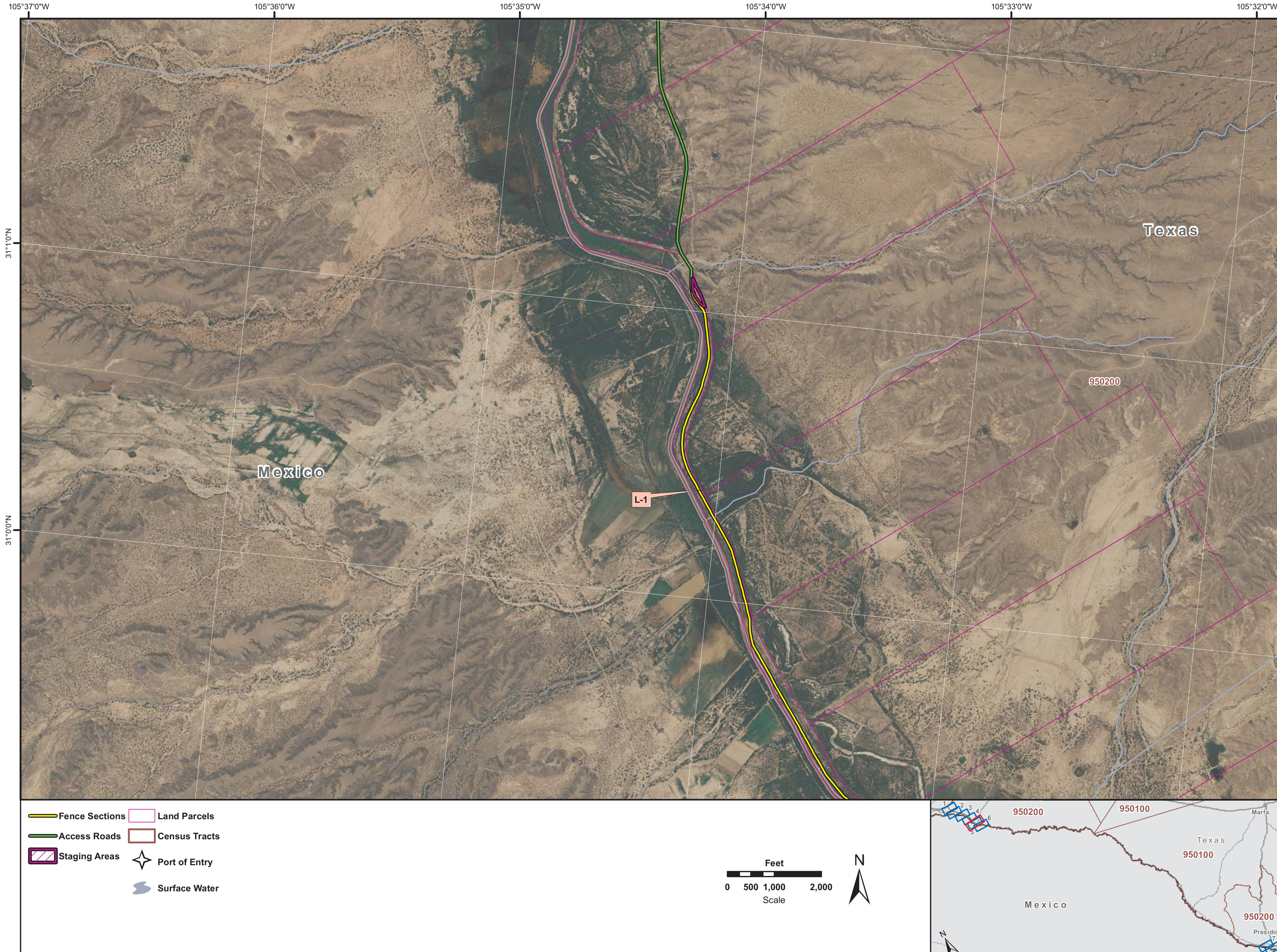
Feet
0 500 1,000 2,000
Scale

N

Environmental Stewardship Plan for the Contruction, Operation, and Maintenance of Tactical Infrastructure
U.S. Border Patrol
Marfa Sector, Texas
Detailed Fence Section Maps
Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

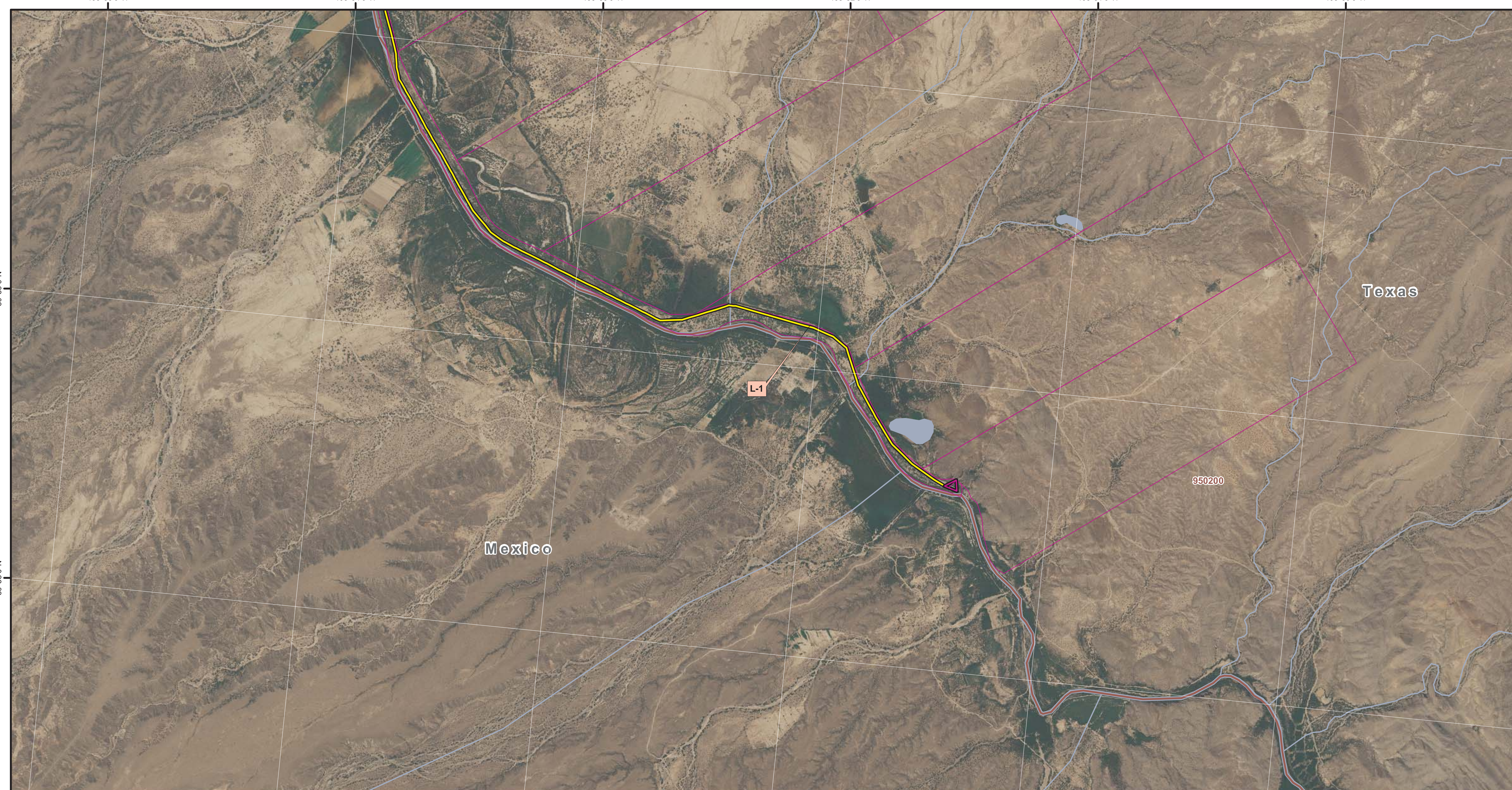
July 10, 2008	Scale 1" = 2000'	Map 4 of 8



Environmental Stewardship Plan for the Contruction, Operation, and Maintenance of Tactical Infrastructure
U.S. Border Patrol
Marfa Sector, Texas
Detailed Fence Section Maps
Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

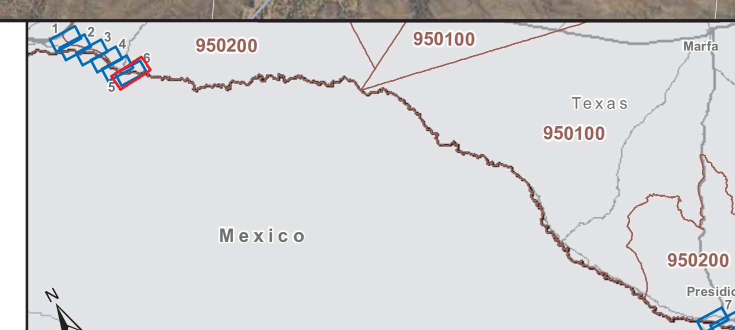
July 10, 2008	Scale 1" = 2000'	Map 5 of 8



Fence Sections
Access Roads
Staging Areas
Land Parcels
Census Tracts
Port of Entry
Surface Water

Feet
0 500 1,000 2,000
Scale

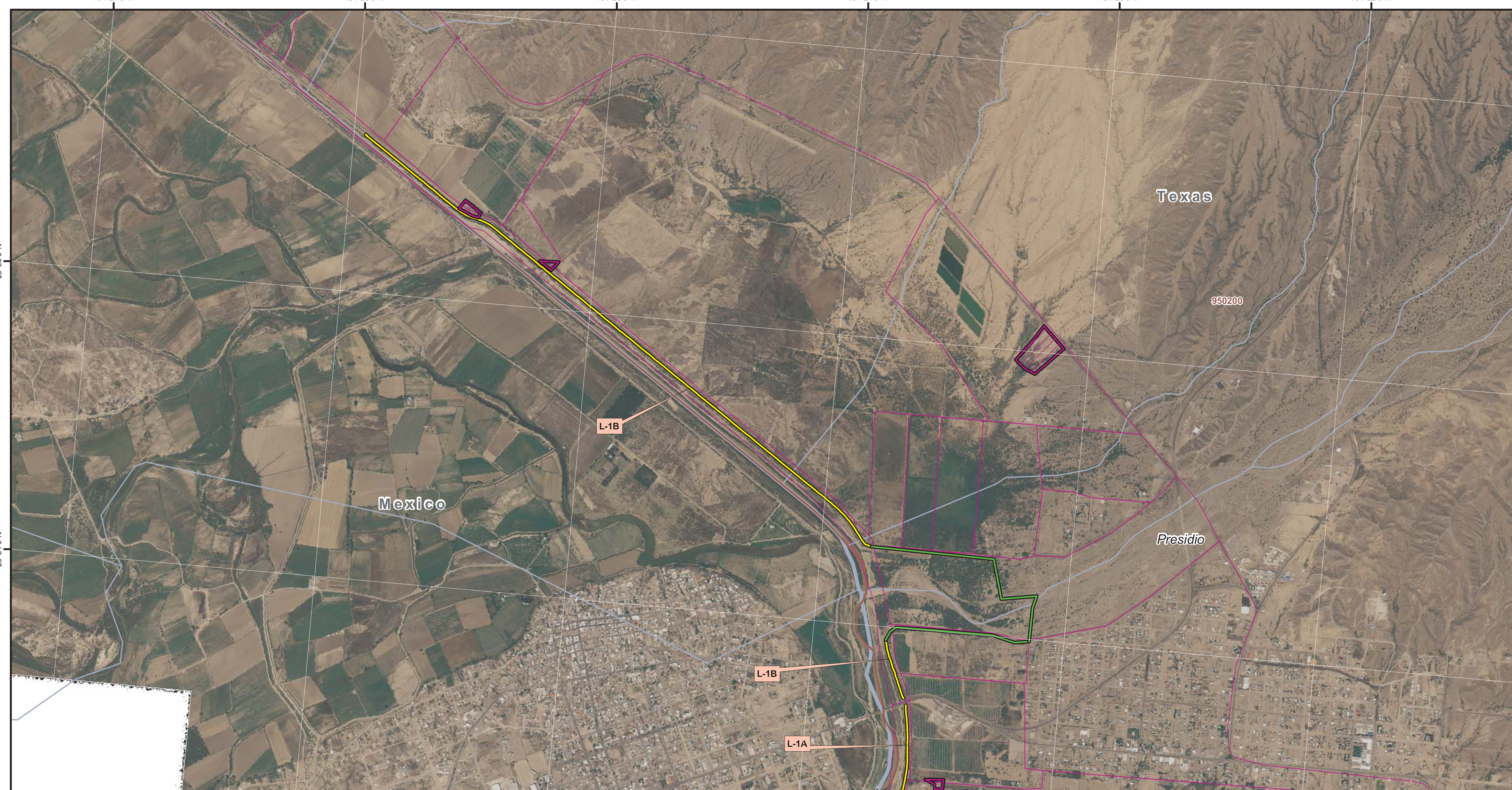
N



Environmental Stewardship Plan for the Contruction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Marfa Sector, Texas Detailed Fence Section Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

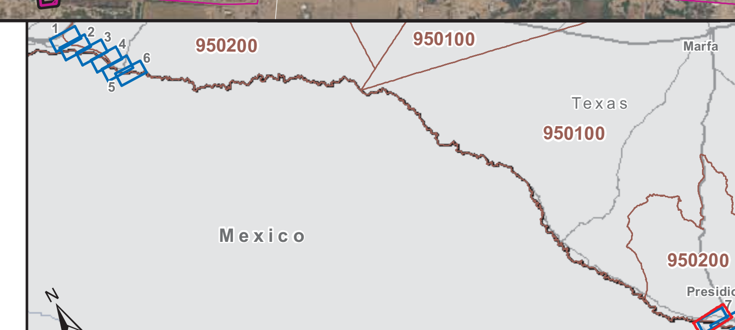
July 10, 2008	Scale 1" = 2000'	Map 6 of 8



Fence Sections
Land Parcels
Access Roads
Census Tracts
Staging Areas
Port of Entry
Surface Water

Feet
0 500 1,000 2,000
Scale

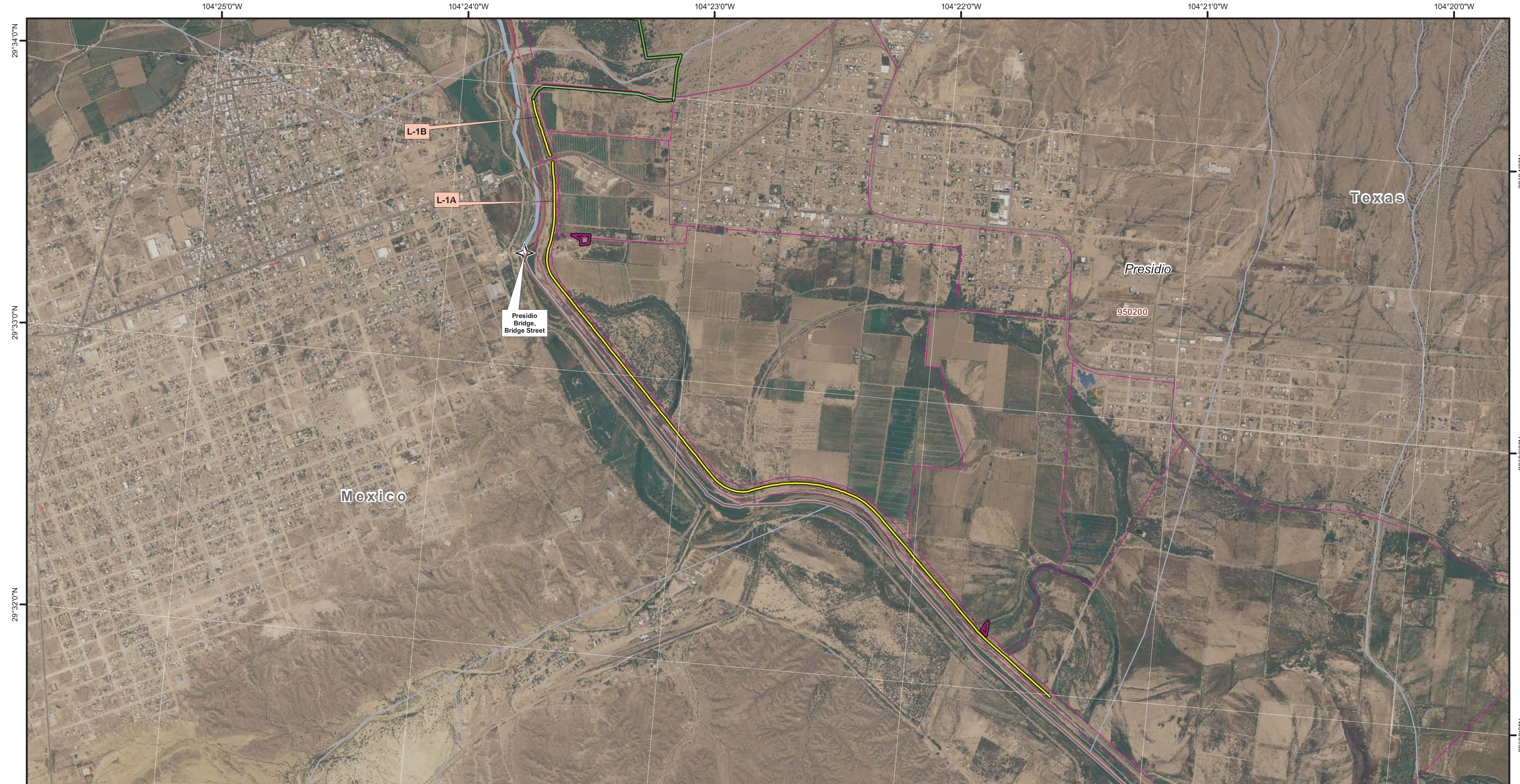
N



Environmental Stewardship Plan
for the Contruction, Operation,
and Maintenance of
Tactical Infrastructure
U.S. Border Patrol
Marfa Sector, Texas
Detailed Fence Section Maps
Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

July 10, 2008	Scale 1" = 2000'	Map 7 of 8



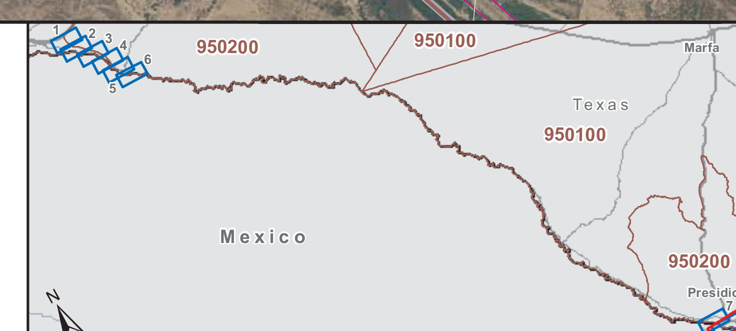
Fence Sections
Access Roads
Staging Areas
Land Parcels
Census Tracts
Port of Entry
Surface Water

Feet

0 500 1,000 2,000

Scale

N



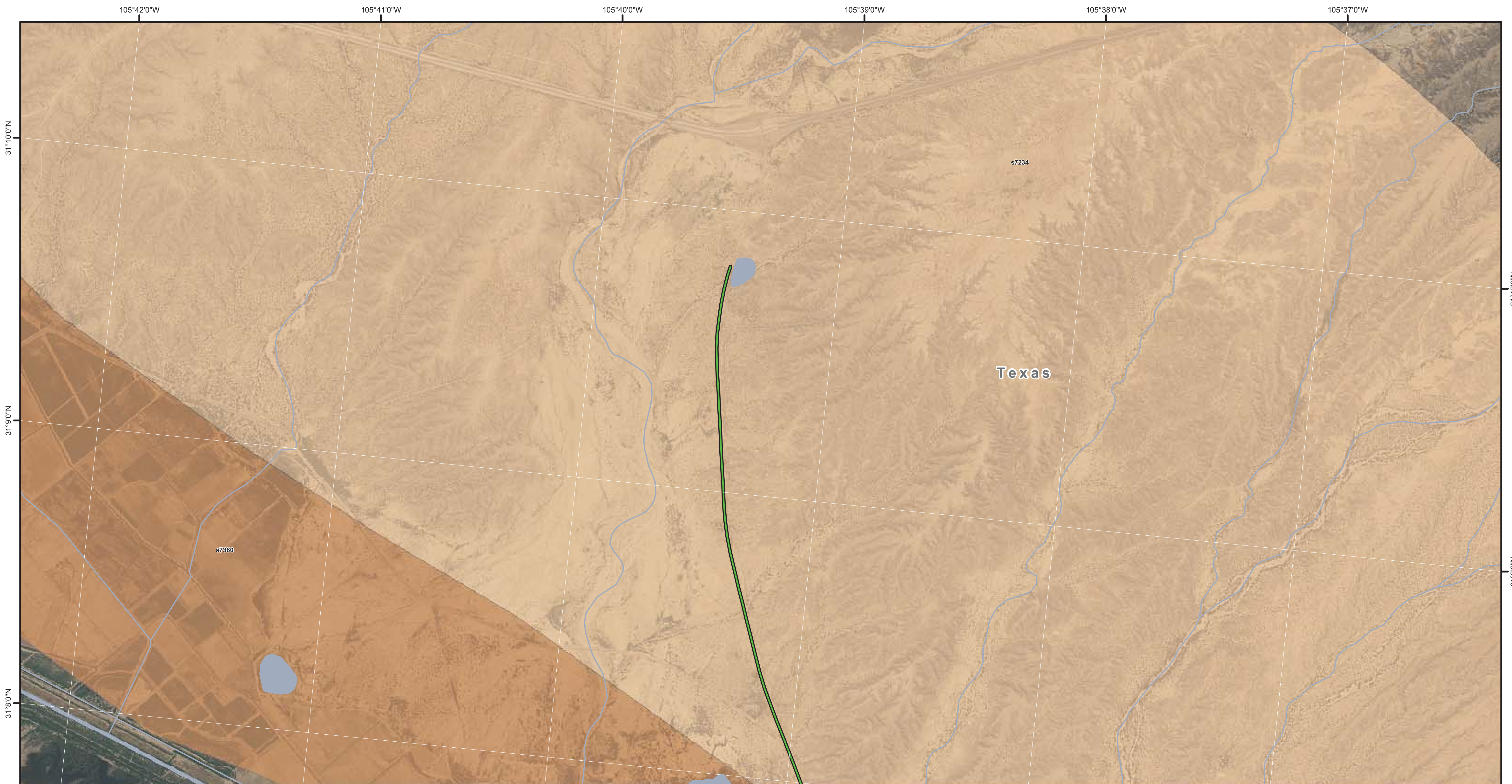
Environmental Stewardship Plan for the Contruction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Marfa Sector, Texas Detailed Fence Section Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

July 10, 2008	Scale 1" = 2000'	Map 8 of 8

APPENDIX G

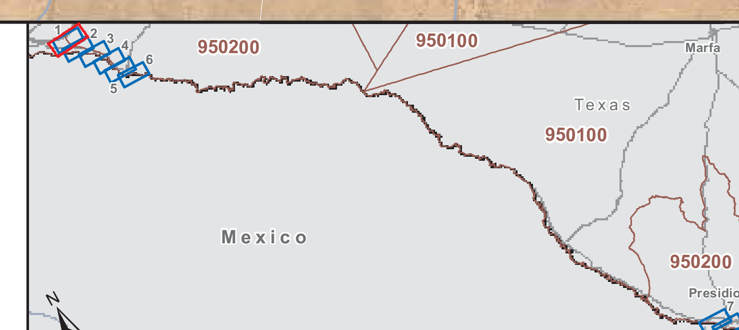
Detailed Maps of the Planned Tactical Infrastructure Sections Showing Soils



Fence Sections
Access Roads
Staging Areas
Surface Water
Nickel-Delnorte-Canutio-Badland (s7234)
Tigua-Harkey-Glendale-Gila (s7360)

Feet
0 500 1,000 2,000
Scale

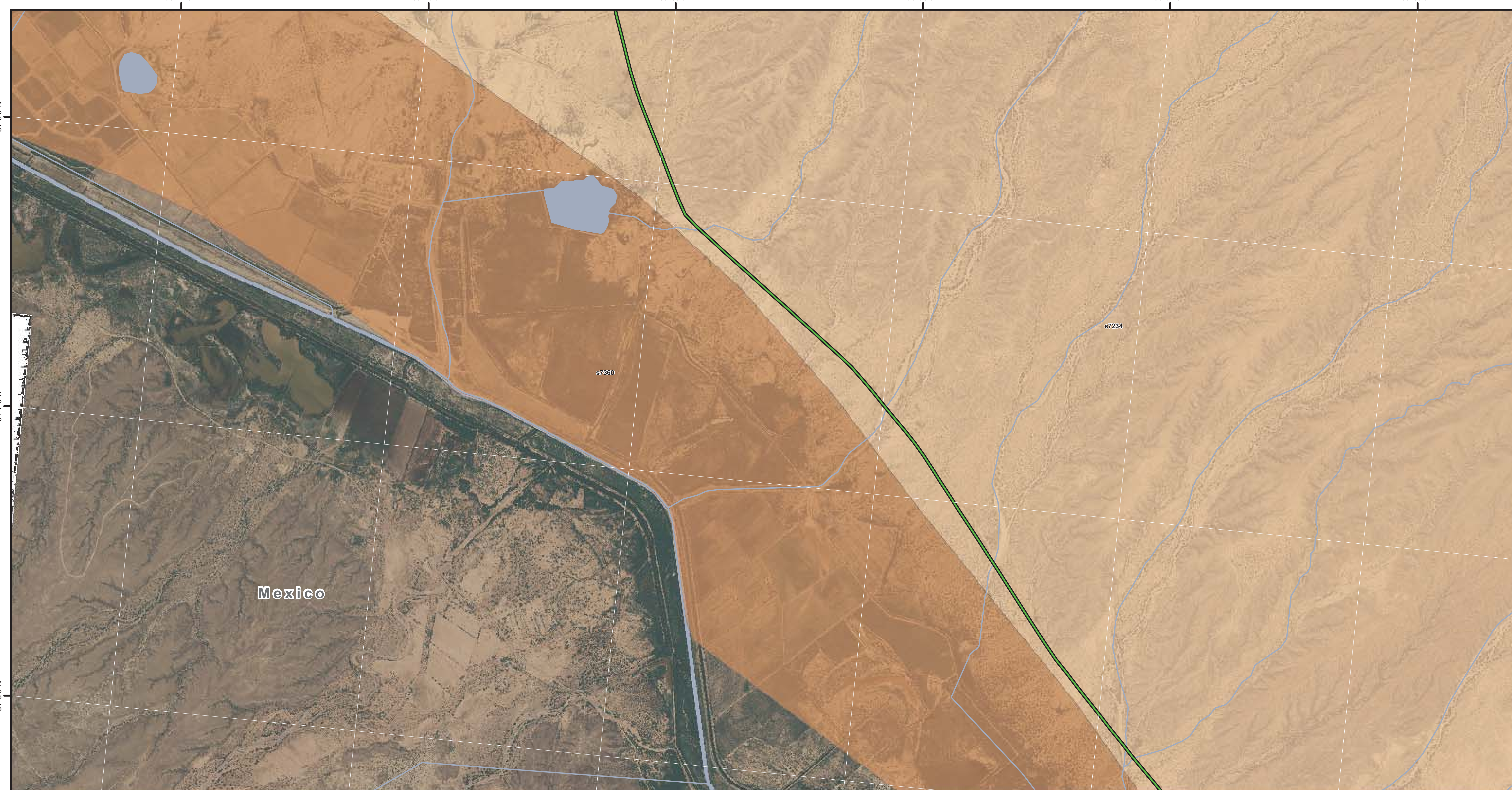
N



Environmental Stewardship Plan for the Contruction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Marfa Sector, Texas Soil Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

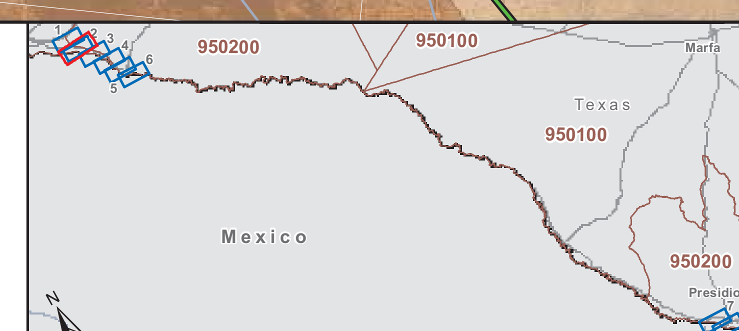
July 10, 2008	Scale 1" = 2000'	Map 1 of 8



- Fence Sections
- Access Roads
- Staging Areas
- Surface Water
- Nickel-Delnorte-Canutio-Badland (s7234)
- Tigua-Harkey-Glendale-Gila (s7360)

Feet
0 500 1,000 2,000
Scale

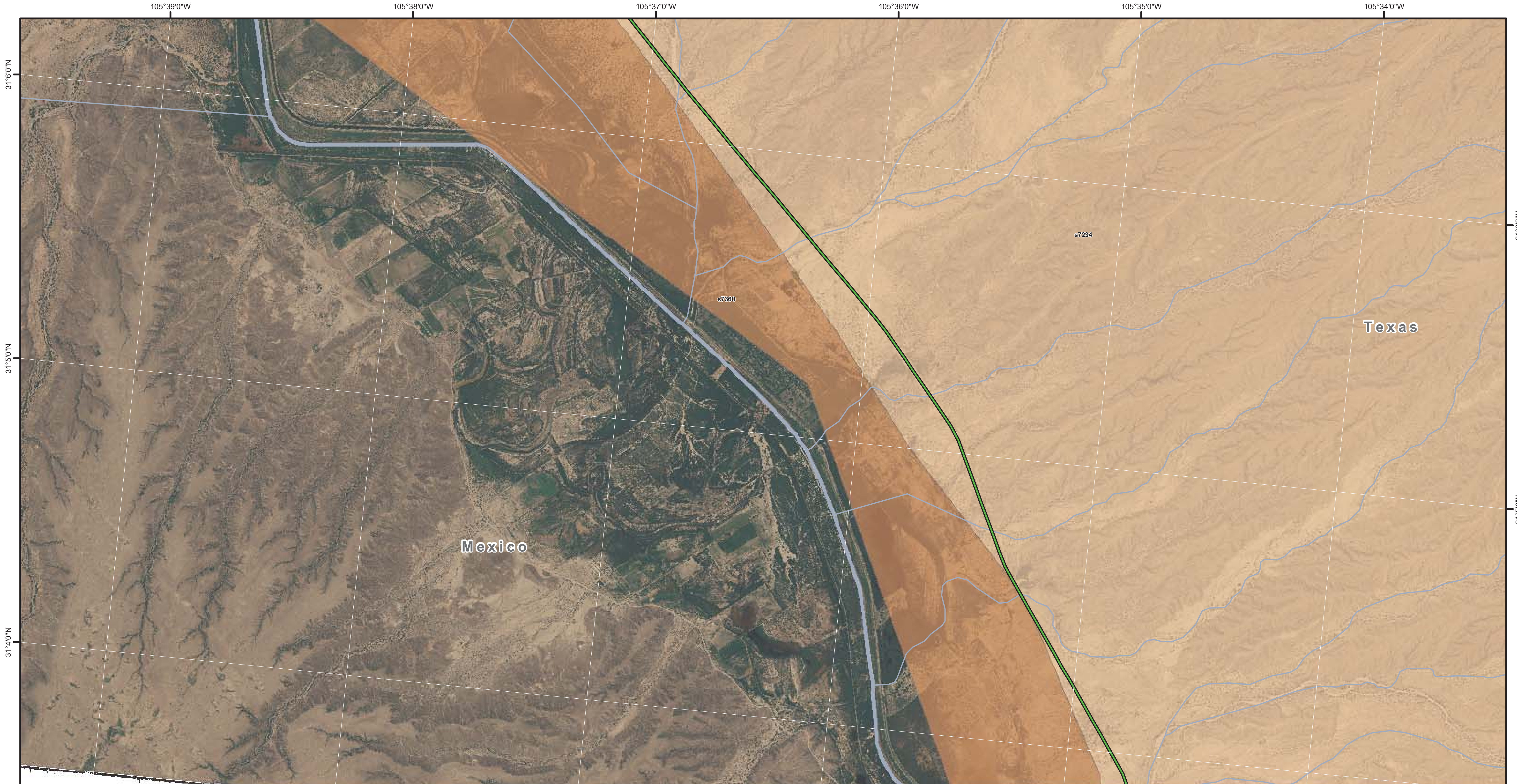
N



Environmental Stewardship Plan for the Contruction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Marfa Sector, Texas Soil Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

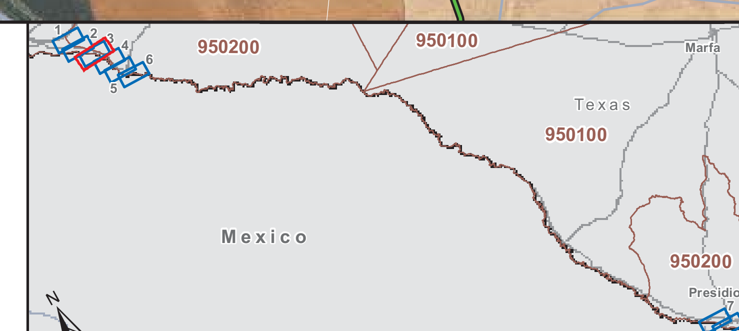
July 10, 2008	Scale 1" = 2000'	Map 2 of 8



- Fence Sections
- Access Roads
- Staging Areas
- Surface Water
- Nickel-Delnorte-Canutio-Badland (s7234)
- Tigua-Harkey-Glendale-Gila (s7360)

Feet
0 500 1,000 2,000
Scale

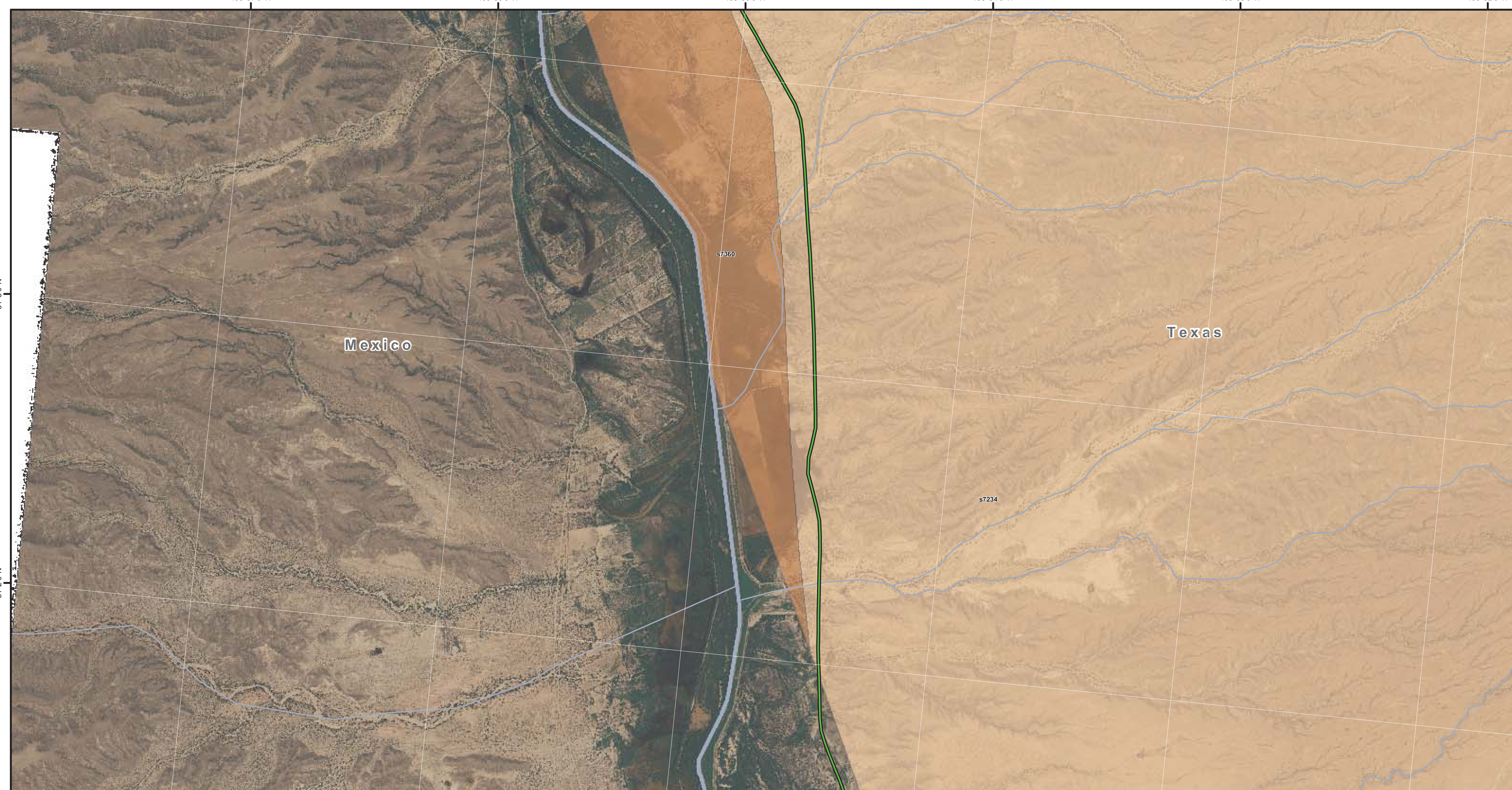
N



Environmental Stewardship Plan for the Contruction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Marfa Sector, Texas Soil Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

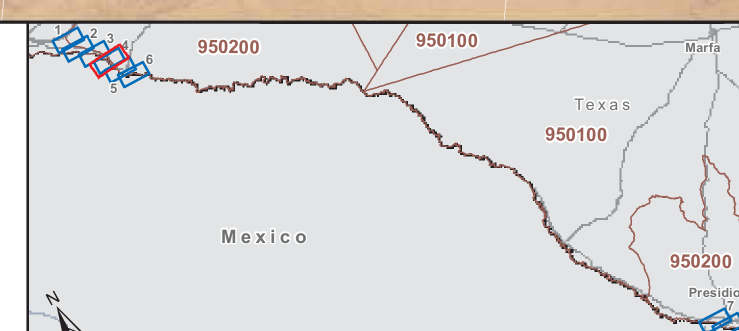
July 10, 2008	Scale 1" = 2000'	Map 3 of 8



Fence Sections
Access Roads
Staging Areas
Surface Water
Nickel-Delnorte-Canutio-Badland (s7234)
Tigua-Harkey-Glendale-Gila (s7360)

Feet
0 500 1,000 2,000
Scale

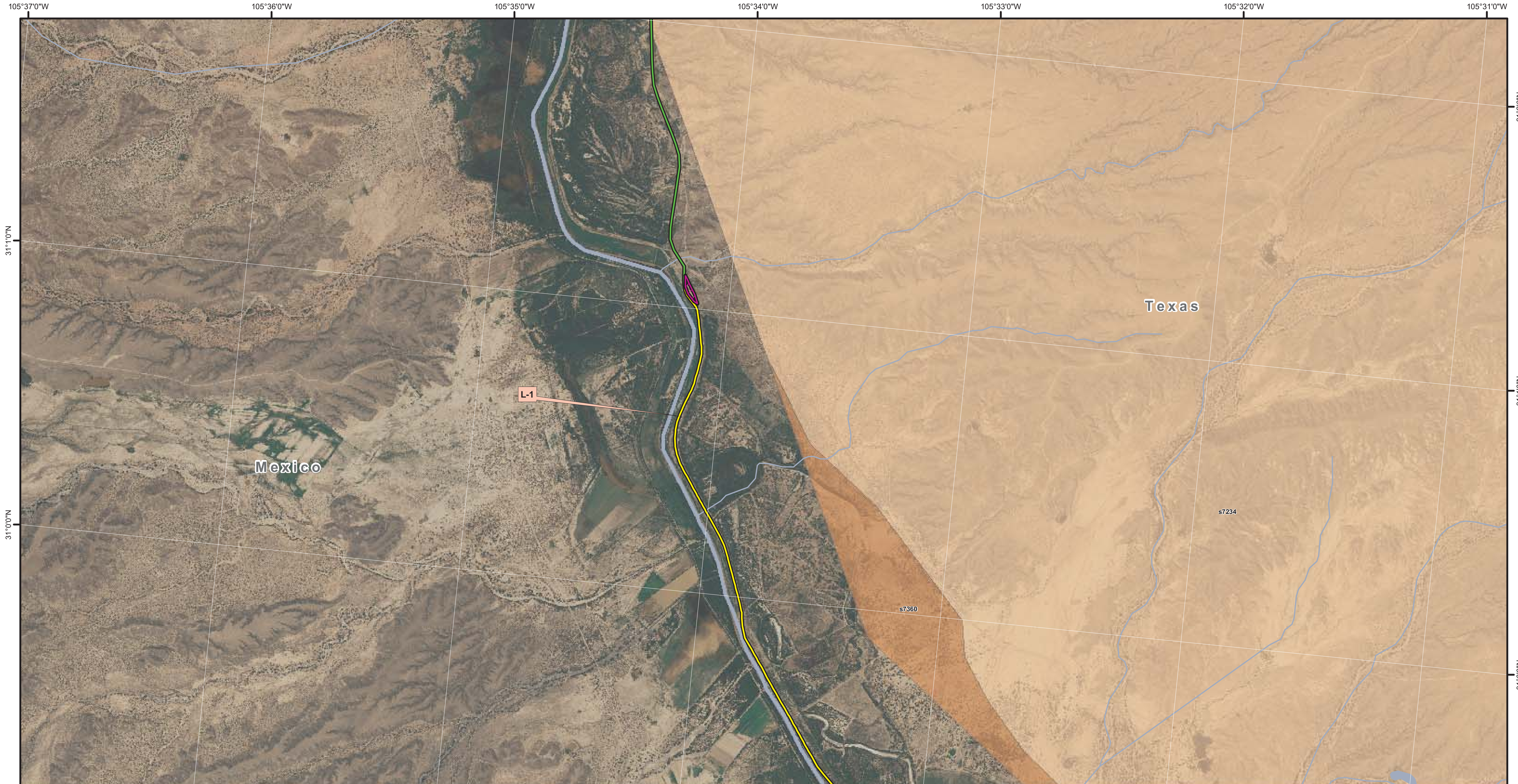
N



Environmental Stewardship Plan
for the Contruction, Operation,
and Maintenance of
Tactical Infrastructure
U.S. Border Patrol
Marfa Sector, Texas
Soil Maps
Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

July 10, 2008	Scale 1" = 2000'	Map 4 of 8



Fence Sections

Access Roads

Staging Areas

Surface Water

Nickel-Delnorte-Canutio-Badland (s7234)

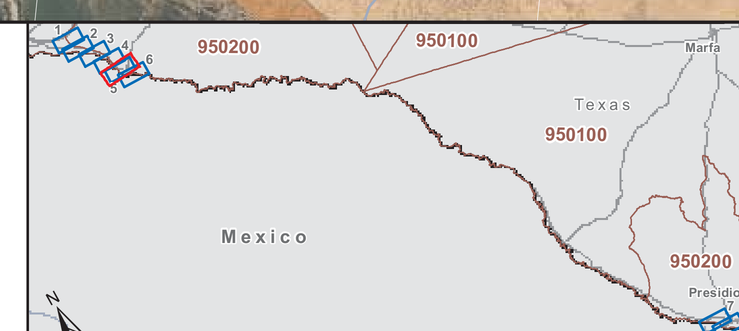
Tigua-Harkey-Glendale-Gila (s7360)

Feet

0 500 1,000 2,000

Scale

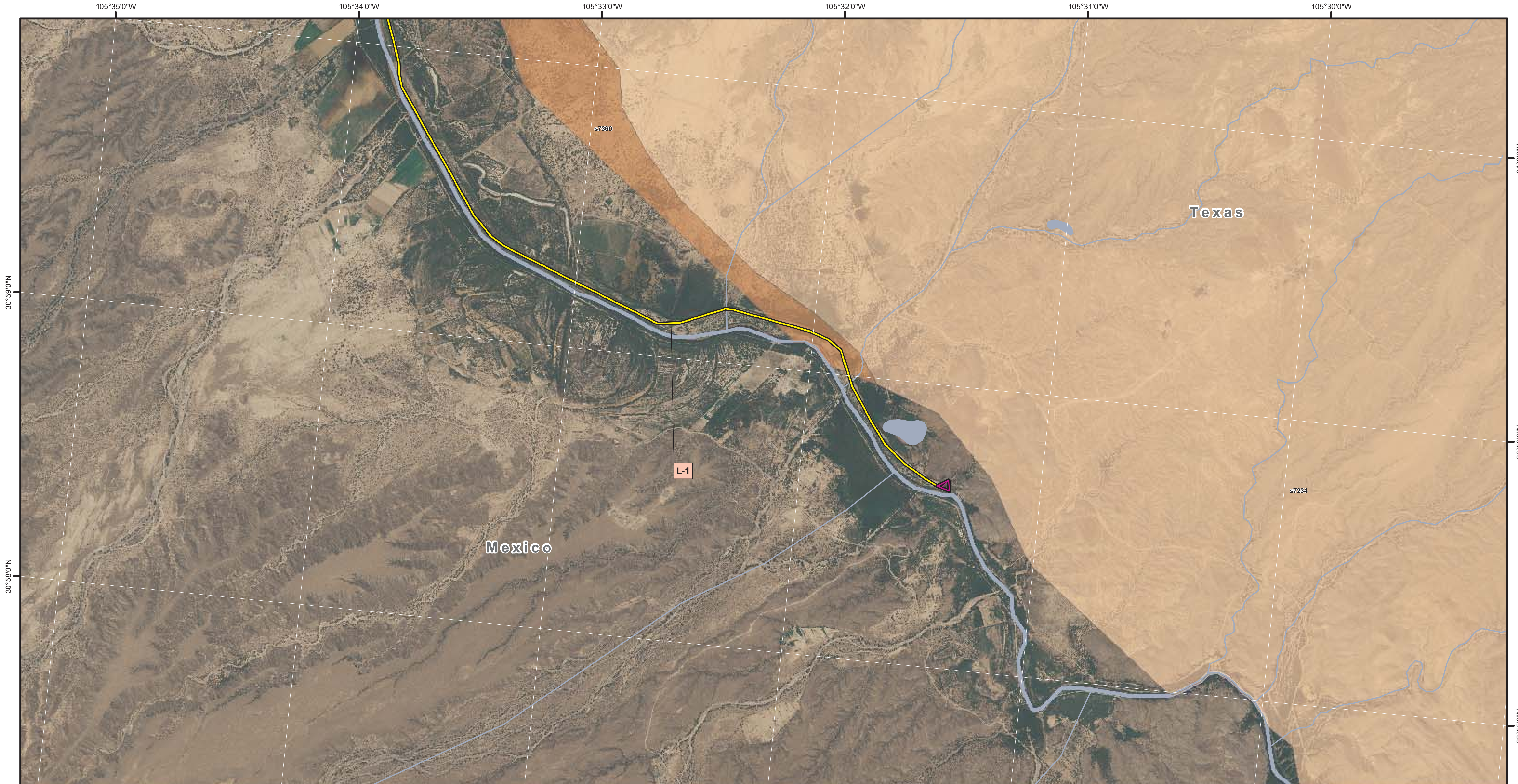
N



Environmental Stewardship Plan for the Contruction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Marfa Sector, Texas Soil Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

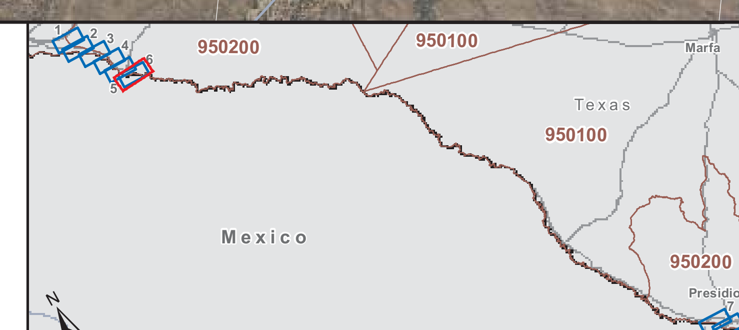
July 10, 2008	Scale 1" = 2000'	Map 5 of 8



- Fence Sections
- Access Roads
- Staging Areas
- Surface Water
- Nickel-Delnorte-Canutio-Badland (s7234)
- Tigua-Harkey-Glendale-Gila (s7360)

Feet
0 500 1,000 2,000
Scale

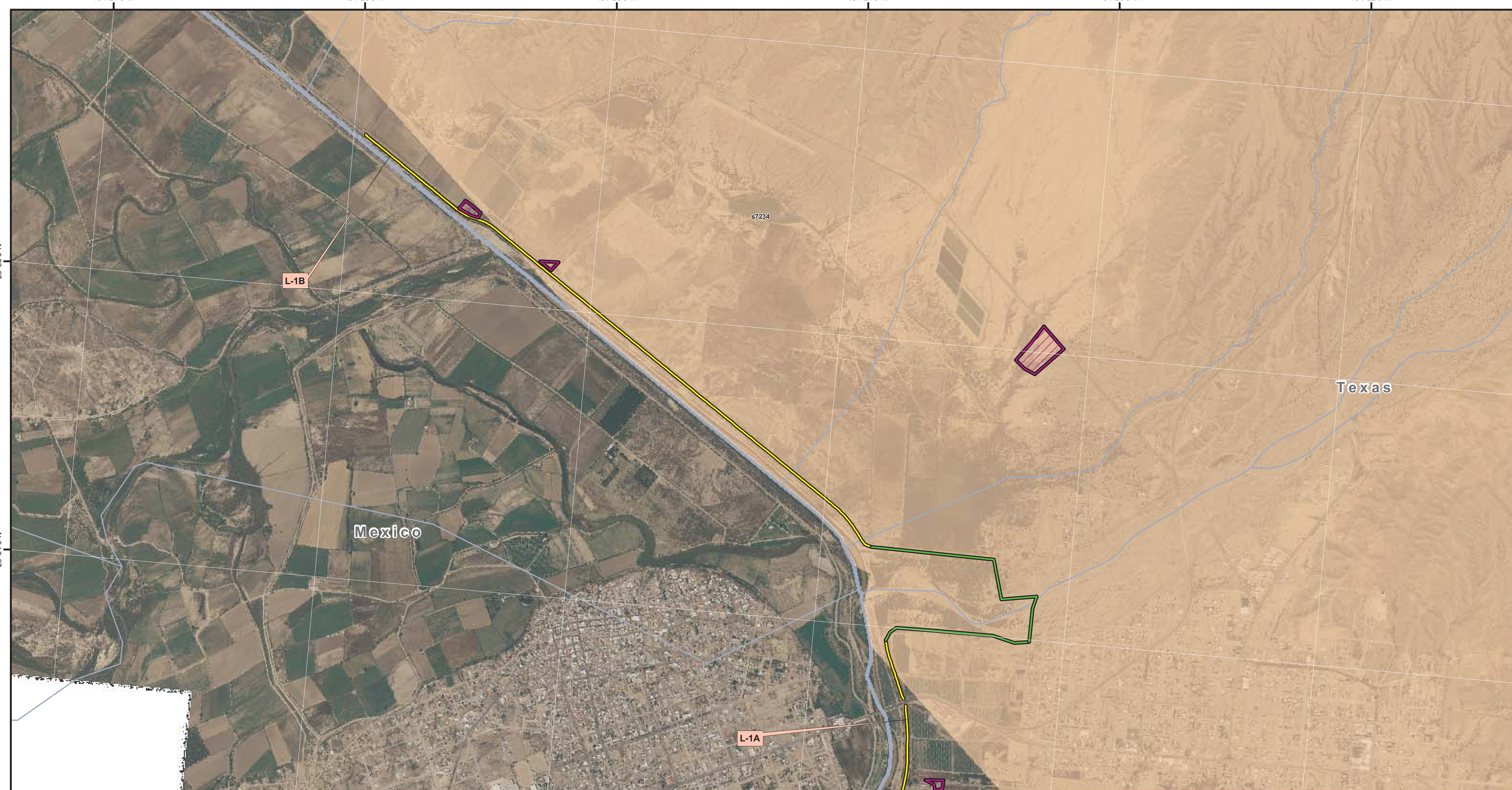
N



Environmental Stewardship Plan for the Contruction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Marfa Sector, Texas Soil Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

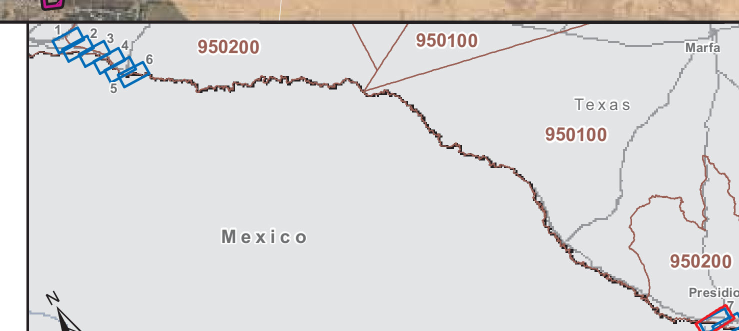
July 10, 2008	Scale 1" = 2000'	Map 6 of 8



- Fence Sections
- Access Roads
- Staging Areas
- Surface Water
- Nickel-Delnorte-Canutio-Badland (s7234)
- Tigua-Harkey-Glendale-Gila (s7360)

Feet
0 500 1,000 2,000
Scale

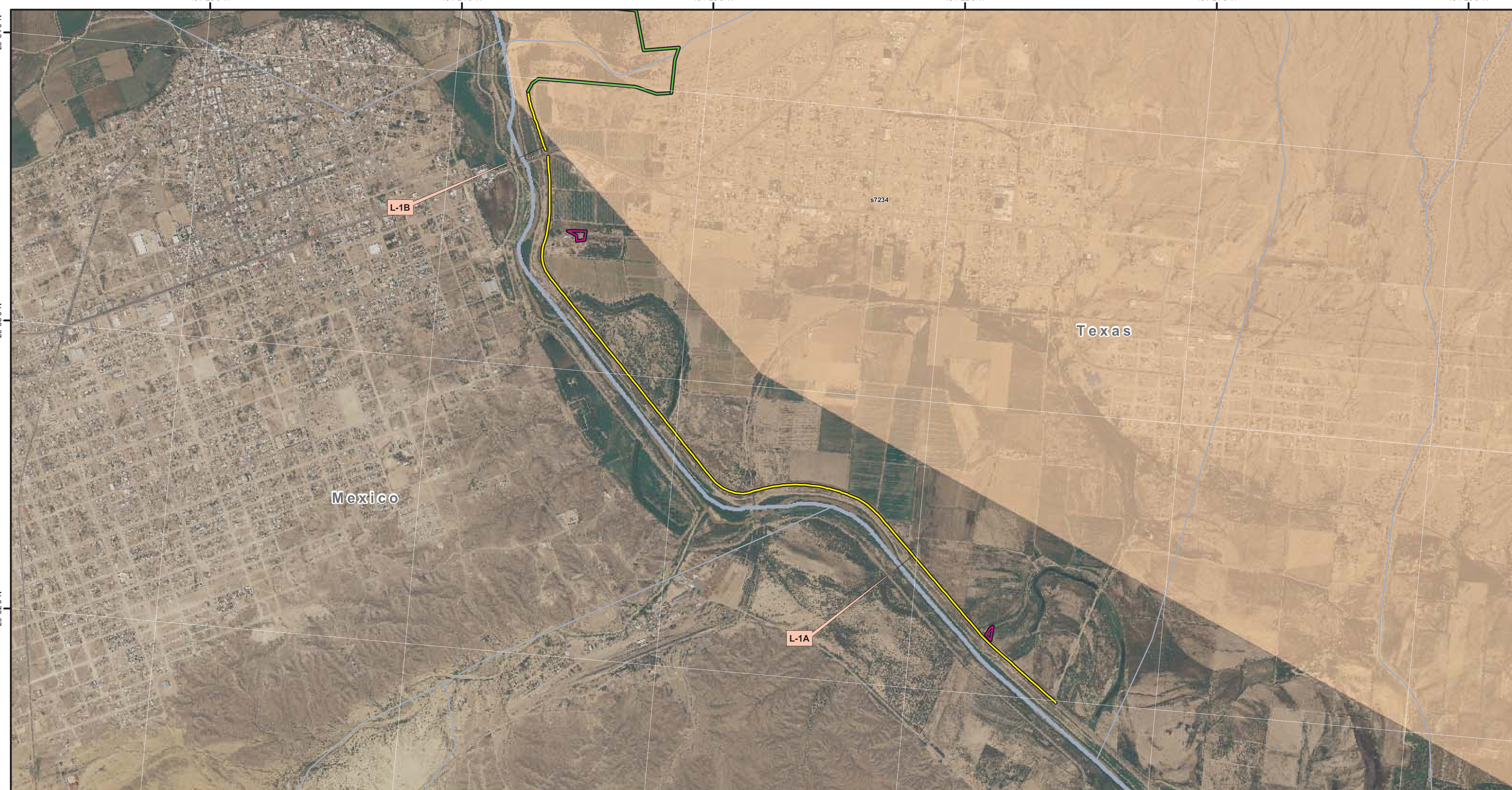
N



Environmental Stewardship Plan for the Contruction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Marfa Sector, Texas Soil Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

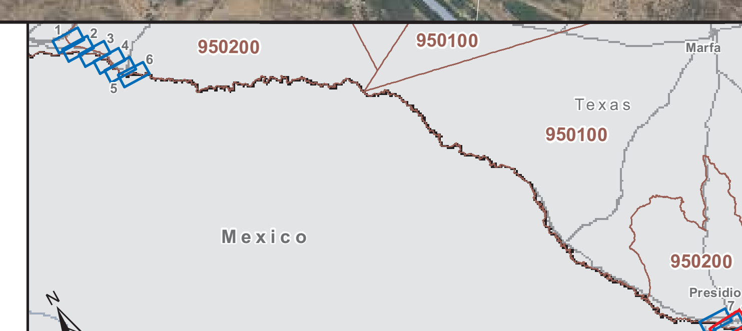
July 10, 2008	Scale 1" = 2000'	Map 7 of 8



Fence Sections
Access Roads
Staging Areas
Surface Water
Nickel-Delnorte-Canutio-Badland (s7234)
Tigua-Harkey-Glendale-Gila (s7360)

Feet
0 500 1,000 2,000
Scale

N



Environmental Stewardship Plan for the Contruction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Marfa Sector, Texas Soil Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

July 10, 2008	Scale 1" = 2000'	Map 8 of 8