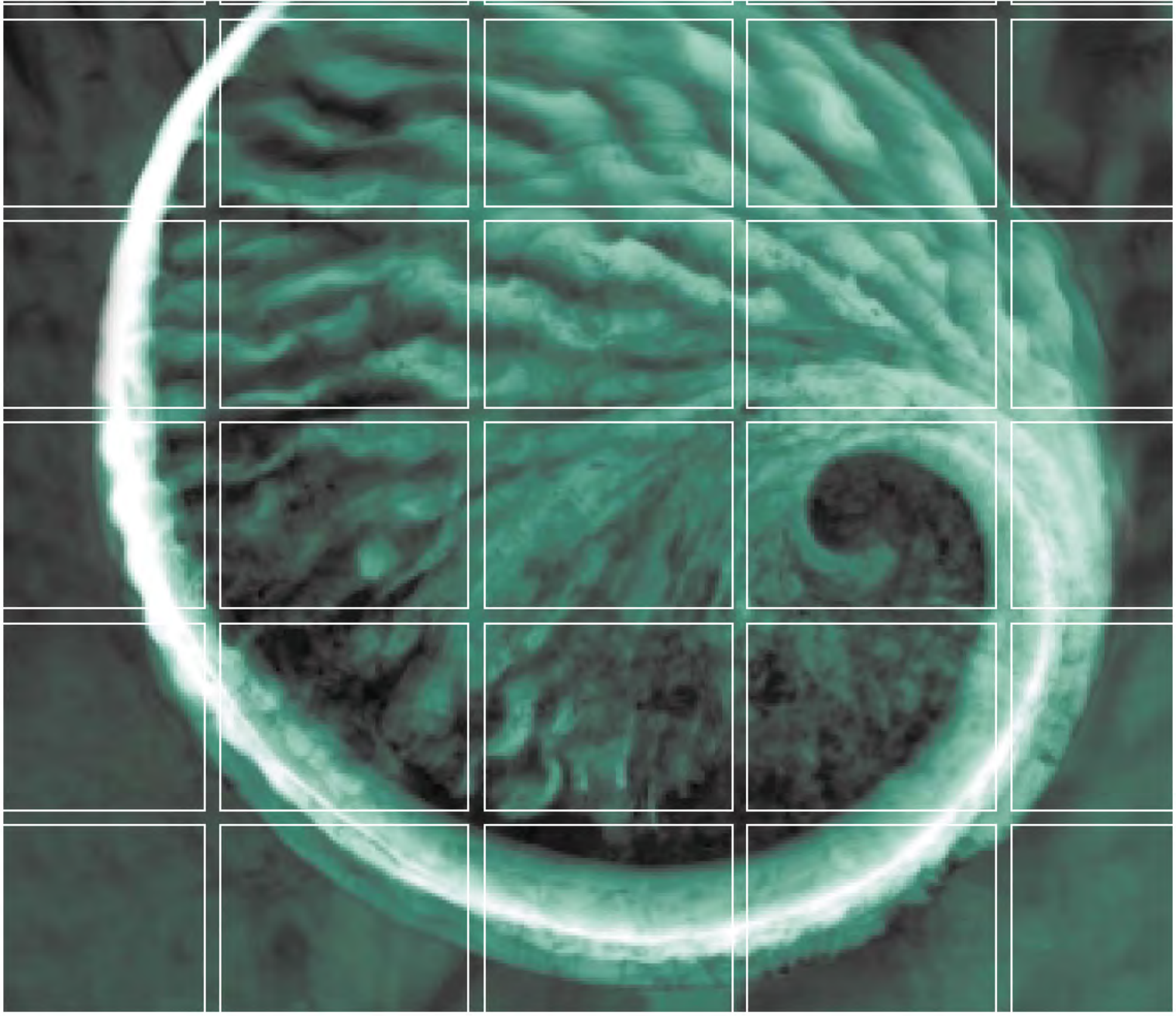
Part one of four

Identification of Historic Properties
within the Area of Potential Effects for
Tenaska Brownsville Partners'
Tenaska Brownsville Generating Station,
Cameron County, Texas



Cultural Resources Assessment: Tenaska Brownsville Generating Station

Tenaska Brownsville Partners, LLC
Cameron County, Texas

EPA Submission

December 18, 2013

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Tenaska Brownsville Partners, LLC

Cultural Resources Assessment: *Tenaska Brownsville Generating Station*

EPA Submission
December 18, 2013

Project No. 0185680
Cameron County, Texas

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Environmental Resources Management (ERM) completed cultural resources investigations for Tenaska Brownsville Partners, LLC (Tenaska) to support a Greenhouse Gas (GHG) Prevention of Significant Deterioration (PSD) Permit Application for a proposed electric generating station, (the Project) in Cameron County, Texas known as the Brownsville Generating Station (Generating Station). The GHG permit is authorized by the U.S. Environmental Protection Agency's (EPA's) Prevention of Significant Deterioration (PSD) program of the Clean Air Act (CAA). Because the Project will require a permit issued from the EPA, the Project is subject to Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended.

The purposes of information presented in this report are to:

1) Identify historic properties (archeological and aboveground) located within the Area of Potential Effects (APE) for the Project; and
2) Describe the effects of the Project on identified historic properties.

The information provided in this report is intended for utilization by EPA in the agency's compliance with Section 106 of the NHPA pursuant to the issuance of the GHG permit.

Section 106 Undertaking

Tenaska is planning to build and operate a natural gas-fueled, combined cycle electric generating station with a nominal capacity of approximately 800 megawatts. Additionally, Tenaska proposes an alternative version with a nominal capacity of 400 megawatts. The Project proposal includes two combustion turbines with supplementary fired heat recovery steam generators, one steam turbine generator, one cooling tower, auxiliary equipment, storm water retention structure(s), storm water outfall(s), one transmission interconnect line, access roads, and construction laydown area. These activities will occur within the 275-acre Project site, and are addressed in the main body of this report.

Tenaska submitted a cultural resources assessment report to EPA on August 6, 2013. The report addressed the direct and indirect effects associated with the proposed Generating Station primary facilities at the project site. Since that submission the precise locations of certain linear interconnect elements that are part of, or interrelated with, the proposed Generating Station have been defined. These include the transmission interconnect line and the short interconnects to the site for potable water, makeup water and wastewater. Cultural resources investigations were conducted for the below-listed associated activities that will outside the 275-acre Project site, and are addressed in Attachments 1-4 to this report:

- Transmission Interconnect Line;

- Natural Gas Transmission Pipeline;
- Water Discharge Pipeline and Outfall; and
- Water Reuse Pipeline.

According to the Brownsville Public Utilities Board (BPUB), the potable water and sewer interconnection line(s) between the generating station and the Southmost Regional Water Authority (SRWA) Desalination Plant will be located within previously constructed SRWA right-of-way. No additional cultural resources investigations for this activity were conducted.

BPUB will also own and operate a regional Natural Gas Transmission Pipeline and Water Reuse Pipeline for its broader economic development purposes. These BPUB regional projects are intended to serve multiple customers, not merely the Generating Station. Tenaska and BPUB believe these regional projects are independent, and not interrelated, actions and not properly considered part of the Project for purposes of this assessment, as set forth in letters from BPUB to EPA dated April 18 and 26, 2013.

Accordingly, the August 6, 2013 cultural resources assessment report did not address the Natural Gas Transmission Pipeline and Water Reuse Pipeline to be developed by BPUB. Notwithstanding the independent utility of these BPUB regional projects, Attachments 3 & 4 provide a supplemental assessment of the Natural Gas Transmission Pipeline and Water Reuse Pipeline for the purpose of advancing EPA's consideration of Tenaska's GHG PSD permit pending receipt of a formal determination that the scope of the Project does not include these independent regional projects. Tenaska and BPUB maintain that these regional projects are beyond the scope of the Project.

Identification of Historic Properties and Assessment of Effects

Cultural resources investigations were conducted on Tenaska's behalf by ERM and Coastal Environments, Inc. (CEI) for the generating station, the transmission interconnect line, the water discharge pipeline and outfall, and potable water and sewer interconnect line(s). Cultural resources investigations for the natural gas transmission pipeline and water reuse pipeline were conducted on behalf of the BPUB by Atkins.

The table below summarizes the findings of these investigations.

TABLE ES-1: Summary of Historic Properties within the Project Area of Potential Effects

Name	Location	NRHP Eligibility	Project Effect
Palo Alto Battlefield National Historic Site	Paredes Line Road, Cameron Co.	Listed (NHL, NRHP)	Indirect, Not Adverse
Cameron County Irrigation District No. 6	Highway 77, Cameron Co.	Eligible	Direct, Not Adverse; Indirect, Not Adverse
Cameron County Drainage District No. 1	Northeast of Brownsville, Cameron Co.	Potentially Eligible	Direct, Not Adverse; Indirect, Not Adverse
Port of Brownsville	Captain Donald L. Foust Road, Cameron Co.	Potentially Eligible	Direct, Not Adverse; Indirect, Not Adverse
Cementerio de las Burras (41HG82)	FM 491 and Willacy Canal, Hidalgo Co.	Undetermined	Indirect, Not Adverse due to Avoidance
La Feria de las Flores Cemetery	FM 506 and 472nd Road, Cameron Co.	Undetermined	Indirect, Not Adverse due to Avoidance
Cameron County Irrigation District No. 2	San Benito, Cameron Co.	Potentially Eligible	Direct, Not Adverse; Indirect, Not Adverse
Delta Lake Irrigation District	Edcouch, Hidalgo Co.	Potentially Eligible	Direct, Not Adverse; Indirect, Not Adverse

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ACRONYM

ACHP	Advisory Council on Historic Preservation
APE	Area of Potential Effect
CAA	Clean Air Act
CCDD1	Cameron County Drainage District No. 1
CCHC	Cameron County Historical Commission
CEI	Coastal Environments, Inc.
CRA	Cultural Resources Assessment
EPA	Environmental Protection Agency
ERM	Environmental Resources Management, Inc.
FHWA	Federal Highway Administration
GHG	Greenhouse Gases
GLO	General Land Office
HRSG	Heat Recovery Steam Generator
MD	Metal Detection
MG	Megawatts
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NOX	Nitrogen Oxides
NPS	National Park Service
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
PM	Particulate Matter
PSD	Prevention of Significant Deterioration
ROW	Right-of-Way
SCR	Selective Catalytic Reduction
SHPO	State Historic Preservation Officer
THC	Texas Historical Commission
TNRIS	Texas Natural Resource Information System
tpy	tons per year
TxDOT	Texas Department of Transportation
USGS	United States Geological Service
VOC	Volatile Organic Compounds

ABSTRACT

Report Title: Tenaska Brownsville Partners, LLC – Cultural Resources Assessment: Tenaska Brownsville Generating Station

Report Date: December 13, 2013

Sponsor: Tenaska Brownsville Partners, LLC (Tenaska)

Agency: U.S. Environmental Protection Agency (EPA)

Permit Number: n/a

Report Background: Environmental Resources Management (ERM) completed cultural resources investigations for Tenaska to support a Greenhouse Gas (GHG) Prevention of Significant Deterioration (PSD) Permit Application for a proposed electric generating station, (the Project) in Cameron County, Texas known as the Brownsville Generating Station (Generating Station). Coastal Environments, Inc., (CEI), under contract to ERM, assisted with the background research, Phase I intensive archeological survey, and metal detection survey of the Project site. The GHG permit will be issued by the U.S. Environmental Protection Agency (EPA) under the Prevention of Significant Deterioration (PSD) program of the Clean Air Act (CAA). Because the Project will require a permit issued from the EPA, the Project is subject to Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended.

The purposes of information presented in this report are to:

1) Identify historic properties (archeological and aboveground) located within the Area of Potential Effects (APE) for the Project; and
2) Describe the effects of the Project on identified historic properties.

The information provided in this report is intended for utilization by EPA in the agency's compliance with Section 106 of the NHPA pursuant to the issuance of the GHG permit.

Section 106 Undertaking: Tenaska is planning to build and operate a natural gas-fueled, combined cycle electric generation station with a nominal capacity of approximately 800 megawatts. Additionally, Tenaska proposes an alternative version with a nominal capacity of 400 megawatts. The Project proposal includes two combustion turbines with supplementary fired heat recovery steam generators, one steam turbine generator, one cooling tower, auxiliary equipment, storm water retention structure(s), storm water outfall(s), one transmission interconnect line, access roads, and construction laydown area.

Identification of Historic Properties: The Project is to be located on a 275-acre greenfield parcel located approximately 8.6 miles north of downtown

Brownsville on the north side of Highway 511 in Cameron County, Texas. Based on information provided by Tenaska, ERM considered the whole of the 275-acre parcel on which the Project will be constructed, with a potential 14.51-acre wetland area and a 24.4-acre transitional area at the east end of the site, as the area within which direct effect may occur (236 acres) for the purposes of the cultural resources investigations.

No extant buildings were observed within the Project site. An intensive archeological survey within the 236 acres consisted of surface inspection and shovel testing on 32 transects spaced at 60-m intervals across all portions of the site not exhibiting previous disturbances or overburden. Within the footprint of the generating station (to be located within the central 100 acres of the 275-acre Project site), shovel tests were spaced at 30-m intervals both along and in between 60-m transects. Metal detection survey was conducted within selected areas of the site exhibiting minimal vegetative cover and no obvious prior disturbance. The total area subjected to metal detection survey was 27.56 acres (11.15 hectares), representing a roughly 10% sample of the total Project area and a 14% sample when the disturbed parts of the Project site are subtracted.

The surface inspection and metal detection survey resulted in the discovery of eight (8) artifacts preliminarily identified as historic-period items more than 50 years old. Isolated artifacts found within the Project site are related to late 19th- to early 20th-century agricultural activities. These artifacts appear to be isolated and not part of a single site formed by the discard or abandonment of related items. It is unlikely that the sparse deposit of artifacts could provide significant data not already available in historical documents regarding the historic-period settlement and agricultural development of Cameron County, Texas. A State trinomial was not sought for this collection of non-diagnostic artifacts.

No additional cultural resources with the potential to be eligible for listing in the National Register of Historic Places (NRHP) were observed within the Project site.

ERM delineated the area within which indirect effects may occur through windshield survey and consideration of the expected visual, atmospheric, and audible effects from the Project, as well as the topography and existing visual obstructions in the area, resulting in an approximately 14-square mile APE that extends .4 to 2.8 miles out from the Project site. One historic property was known to be present within this area prior to conducting the cultural resources surveys: the Palo Alto Battlefield National Historic Site (Battlefield), a National Historic Landmark (NHL) also listed on the NRHP and historically significant as the site of the first battle of the U.S.-Mexican War on May 8, 1846.

ERM's cultural resources investigations resulted in identification of two other historic properties in the APE: Cameron County Irrigation District No. 6 (CCID6), determined eligible for listing in the NRHP through Section 106 consultation between the Texas Department of Transportation (TxDOT) on behalf of the Federal Highway Administration (FHWA) and the Texas Historical

Commission (THC) in 2009; and Cameron County Drainage District No. 1 (CCDD1). These systems were among the earliest to be established in south Texas (1902 and 1905, respectively), and are understood to be historically significant on a local level under NRHP Criterion A for their instrumental roles in the agricultural and residential development of the area.

In addition to conducting field survey and documentary research, ERM consulted THC, the National Park Service (NPS), and the Cameron County Historical Commission (CCHC) to identify historic properties in the APE. No additional historic properties were identified.

Coordination with Potential Stakeholders: At EPA's recommendation, Tenaska coordinated with THC, NPS, and CCHC. Face-to-face meetings were conducted with these three parties to solicit their input on the proposed Project, the approach to cultural resources investigations, and the effects of the project on these resources.

Recommendations: Based upon the results of the cultural resources investigations, ERM recommends no further cultural resources investigations to identify historic properties in the APE. In consideration of the presence of three historic properties in the APE, including one NHL, and the concerns raised by potential stakeholders, ERM recommends that EPA formally initiate Section 106 and engage the consulting parties regarding the identification of historic properties and assessment of effects. To facilitate the assessment of effects, ERM has provided information on the expected effects of the Project in Section 6.0 of this report.

Project Number: ERM Project No. 0185680

Project Location: Cameron County, Texas

Acres Surveyed: 236 (Archeology)
9,022 acres/14 square miles (Aboveground)

Identified Resources: 8 (Archeology)

- 8 Isolated Finds

4 (Aboveground)

- Palo Alto Battlefield National Historic Site
- Cameron County Irrigation District No. 6
- Cameron County Drainage District No. 1
- Southern Pacific Railroad

NRHP-Listed Properties: 0 (Archeology)
1 (Aboveground)

- Palo Alto Battlefield National Historic Site

NRHP-Eligible Properties: 0 (Archeology)
2 (Aboveground)

- Cameron County Irrigation District No. 6
- Cameron County Drainage District No. 1

NRHP-Ineligible Properties: 8 (Archeology)

- 8 Isolated Finds

1 (Aboveground)

- Southern Pacific Railroad

1.0 INTRODUCTION

Tenaska Brownsville Partners, LLC (Tenaska) is planning to build and operate a natural gas-fueled combined-cycle gas turbine (CCGT) power plant with a nominal capacity of approximately 800 megawatts (MW). Additionally, Tenaska proposes an alternative version with a nominal capacity of 400 megawatts. The Project proposal includes two combustion turbines with supplementary fired heat recovery steam generators (HRSGs), one steam turbine generator, one cooling tower, auxiliary equipment, storm water retention structure(s), storm water outfall(s), one transmission interconnect line, access roads, and construction laydown area.

The Generating Station, will be situated on an approximately 275-acre privately-owned tract in south central Cameron County, Texas, outside of Brownsville (Figures 1-1 and 1-2). Tenaska has retained Environmental Resources Management (ERM) to assist them in conducting investigations and preparing documentation expected to be required as part of the Federal permitting process for the proposed facility.

Beginning on January 2, 2011, the U.S. Environmental Protection Agency (EPA) began regulating GHGs through the PSD program of the Clean Air Act (CAA). EPA Region 6 is currently issuing GHG PSD permits for sources in Texas and, as a Federal action; the issuance of such permits requires compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. Section 106 of the NHPA requires Federal agencies to take into consideration the effects of their undertakings (including licensing and permitting actions) on historic properties (cultural resources listed in or eligible for listing in the National Register of Historic Places [NRHP]) consistent with the process presented in the Section 106 implementing regulations (36 CFR Part 800).

To facilitate their review of Tenaska's GHG PSD permit application for the Project, EPA has requested that Tenaska undertake cultural resources investigations within the project's Area of Potential Effects (APE) to identify historic properties and to conduct preliminary coordination with expected stakeholders in the Section 106 process. This cultural resources report summarizes these efforts and findings. A biological assessment is being prepared concurrently with this report to support EPA's compliance with the National Environmental Policy Act (NEPA).

1.1 SECTION 106 UNDERTAKING

Tenaska is proposing to permit two project designs: a 1-on-1 or a 2-on-1 combined cycle combustion turbine (CCCT) configuration. The Generating Station will be designed to have an estimated nominal power generation summer condition output capacity of approximately 400 megawatts (MW) for the 1-on-1 configuration and 800 MW for the 2-on-1 configuration. Tenaska intends to install Mitsubishi (MHI) 501GAC combustion turbine generator(s) which will be equipped with a heat recovery steam generator (HRSG) with supplemental 250

million British thermal units per hour (MMBtu/hr, higher heating value [HHV]) natural gas-fired "duct" burners. Steam from the HRSG(s) will serve a single steam turbine generator. Exhaust gases from each combustion turbine and associated duct burner will pass through the associated HRSG and exit a common exhaust stack. Therefore, these are represented as a single emission point for each CCCT. The CCCTs will be fueled by pipeline-quality natural gas only. Selective catalytic reduction (SCR) will be employed as the Best Available Control Technology (BACT) for emissions of nitrogen oxides (NO_X) from the CCCTs. Oxidation Catalyst will be employed as the BACT for emissions of carbon monoxide (CO) and volatile organic compounds (VOC) from the CCCTs. Construction of the proposed plant is projected to commence in early 2015 and the plant is proposed to begin commercial operations in mid-2017.

The Project will include the following emission sources:

- One (1) or two (2) Natural Gas-fired Combustion Turbines with duct burners, including planned maintenance, start-up, and shutdown (MSS) activities;
- One (1) Cooling Tower;
- One (1) Diesel Fire Pump Engine;
- One (1) Diesel Emergency Generator;
- One (1) Auxiliary Boiler; and
- Two (2) Diesel Storage Tanks.

Project components that will occur inside of the Project site boundaries include the following:

- Generating and Auxiliary Equipment;
- Storm Water Retention Pond(s);
- Storm Water Outfall Structure(s); and
- Construction Laydown Areas; and
- Access Roads.

These activities are addressed in the main body of this report.

Related Project components that will occur outside of the Project site boundaries include the following:

- Transmission Interconnect Line;
- Water Discharge Pipeline and Outfall; and
- Potable Water and Sewer Interconnect Line(s).

Cultural resources investigations were conducted for the transmission interconnect line and the water discharge pipeline and outfall. The results of these investigations are included as attachments to this report.

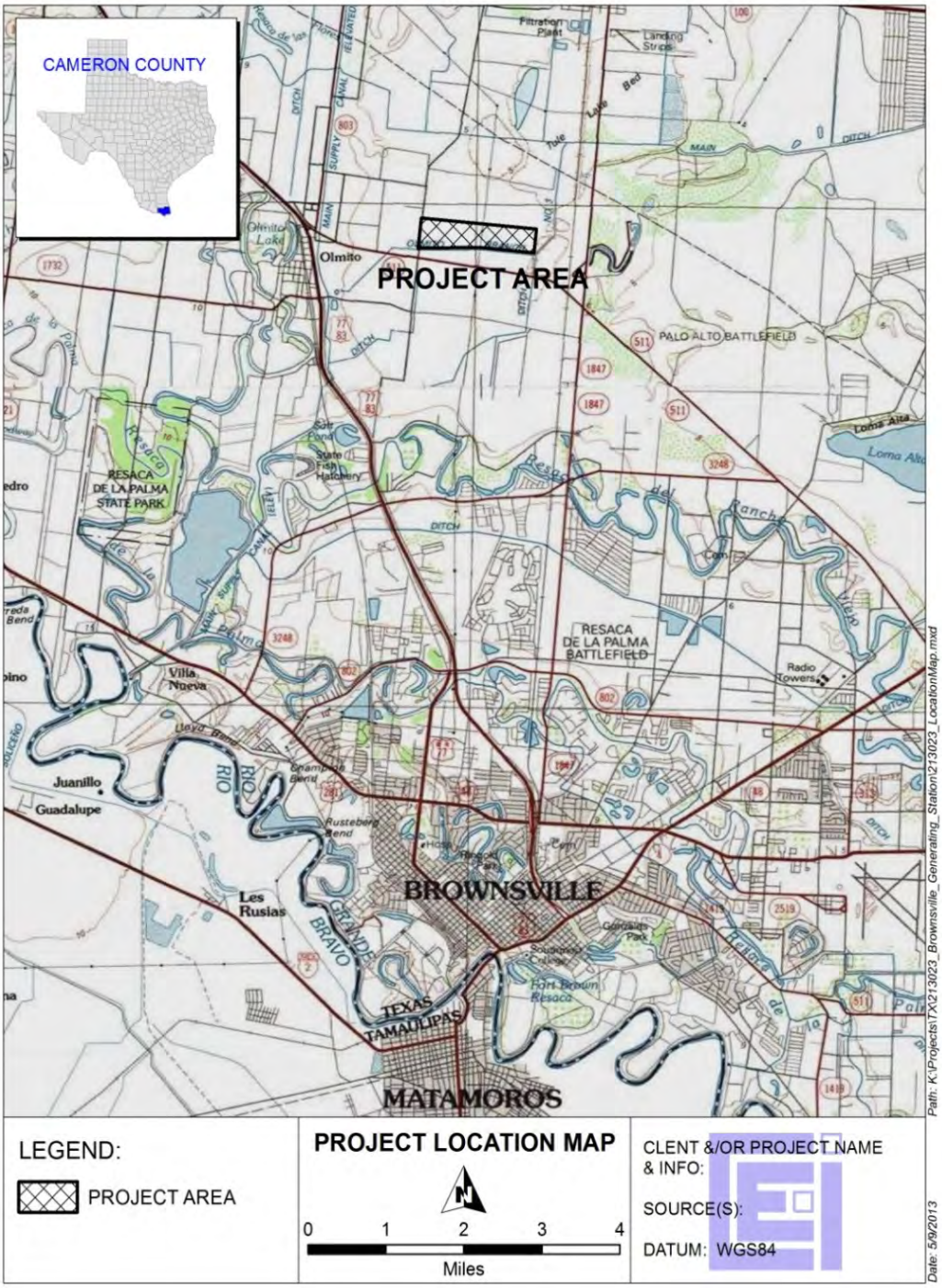
According to the Brownsville Public Utilities Board (BPUB), the potable water and sewer interconnection line(s) between the generating station and the Southmost Regional Water Authority (SRWA) Desalination Plant will be located within previously constructed SRWA right-of-way. No additional cultural resources investigations for this activity were conducted.

Independent regional infrastructure planned by BPUB that will occur outside of the Project site boundaries and provide services to the Project include the following:

- BPUB Natural Gas Transmission Pipeline; and
- BPUB Water Reuse Pipeline.

Notwithstanding the independent utility of these BPUB regional projects, Attachments 3 & 4 provide a supplemental assessment of the Natural Gas Transmission Pipeline and Water Reuse Pipeline for the purpose of advancing EPA's consideration of Tenaska's GHG PSD permit pending receipt of a formal determination that the scope of the Project does not include these independent regional projects.

FIGURE 1-1: Location of Proposed Tenaska Brownsville Generating Station (Source: CEI, 2013)



1.2 SITE LOCATION AND HISTORY

The Project site is centrally located within Cameron County in south Texas. which is approximately 140 miles south of Corpus Christi. The County is comprised of 906 square miles of land and 371 square miles of water and includes nine towns and eight incorporated cities. According to the Natural Resources Conservation Service (NRCS) soils survey, the county is dominated by clay and clay loam soils, specifically Laredo silty clay loam, Raymondville clay loam, Harlingen clay, Sejita silty clay loam, Lomalta clay, Barradda clay and Olmito silty clay. Hydrological features stem primarily from various tributaries of the Rio Grande River. Land cover surrounding the Project site is comprised predominantly by former agricultural croplands, shrubland, and developed lands. At the time of the site visit, the Project site consisted of undeveloped land that is dominated by mesquite on the western half of the property and herbaceous shrubland and grasses on the eastern half.

Based on review of historic aerial and topographic maps, the property has been associated with agricultural land use dating back to the 1900s. The earliest known point in time at which the site was no longer being used for agriculture is 1995. Over the last 10 years the property has been cleared and leveled for planned but unrealized residential development by other parties; however, within the last five years the land has become overgrown with shrubland and herbaceous vegetation. Research indicates that a previous landowner removed soil from the far eastern portion of the property in an effort to elevate and level another portion out of the 100-year floodplain. The area from which soil was taken is now characterized as a wetland area and transitional area and is depicted in Figure 1-2.

Evidence from topographic maps dating to 1928 suggests that the man-made drainage ditch (Olmito Branch) adjacent to and south of the property has been used to support cultivation in the area. Additionally, the ditch appears to have been modified to increase size and flow within the last five years, based on visual observations of existing conditions of the ditch. The ditch runs from approximately two miles west of the property from the town of Olmito to approximately nine miles east of the Project to San Martin Lake.

Environmental Resources Management			
DESIGN: A Ragatz	DRAWN: S King	CHKD.: K Schlicht	
DATE: 1/31/2013	SCALE: AS SHOWN	REVISION: 0	
FILE:			

Figure 1-2
Project Site Map
Tenaska Brownsville Generating Station
Cameron County, Texas

1.3 AREA OF POTENTIAL EFFECTS

As defined in 36 CFR §800.4(a)(1) and 36 CFR §800.16(d), the APE of an undertaking is "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist." According to the THC State Historic Preservation Officer (SHPO) *Request for SHPO Consultation* form, the APE includes "all areas of construction, demolition, and ground disturbance (direct effects) and the broader surrounding area that might experience visual or other effects from the project (indirect effects)." (THC nd)

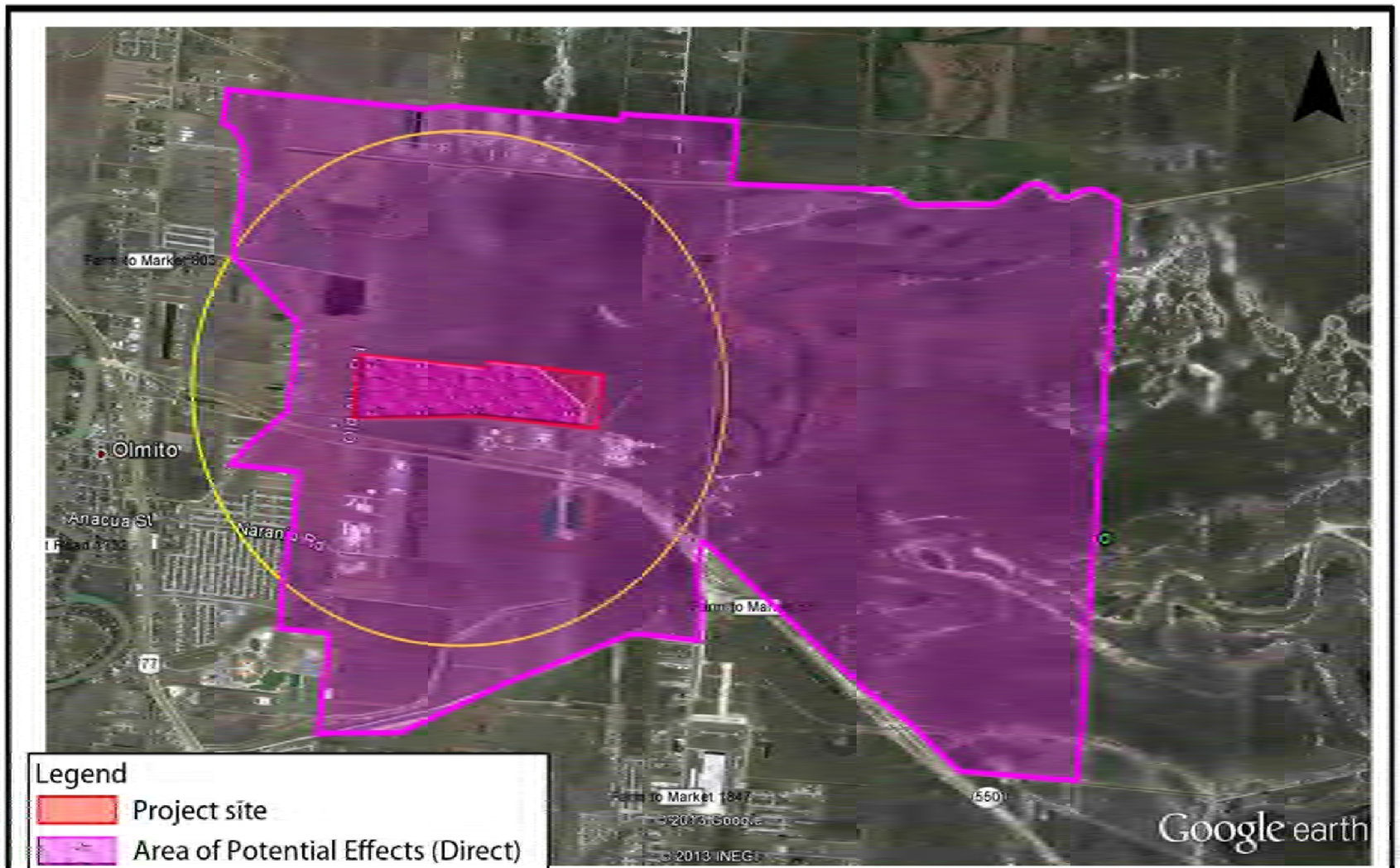
With an understanding of the Project and the expected direct and indirect effects, ERM conducted a site visit and a windshield survey of the Project area to delineate the APE for the undertaking. Based on information provided by Tenaska, ERM considered the whole of the 275-acre parcel on which the Project will be constructed, with the exception of a 14.5-acre potential wetland area and a 24.4-acre transitional area at the east end of the site, as the area within which direct effects may occur, consisting of 236.1 acres for the purposes of the cultural resources investigations (Figure 1-3).

On the eastern side of the Project site is an old channel of Olmito Creek. The channel has been extensively altered and is now represented by a rectangular depression that holds storm water runoff. The depression occupies about 20 acres and measures 1,550 feet (north to south) by 560 feet (east to west). This area contains the 14.5-acre wetland and is completely disturbed to a depth below likely Holocene deposits. Directly adjacent to the west of this depression is a 52-acre rectangular area measuring roughly 1,575 feet (north to south) by 1,424 feet (east to west). The northeastern corner of this area is a 24.4-acre transitional wetland area associated with the former creek channel. The wetland and the transitional area were not investigated, as no ground disturbance will occur there. Part of this wetland and the remainder of the 52-acre area are covered with fill up to 28 inches (70 centimeters) thick.

Excluding the 20-acre depression (disturbed) and the 52-acre fill area (disturbed), the remainder of the 275-acre Project site is approximately 203 acres. This area has been used for grazing and may have been plowed. There were no buildings of any type on the Project site or immediately adjacent to it. Vegetation in the Project area is very similar to the south Texas plains (Appendix A: Photo 1). Within the once-cleared Project site, mesquite trees, other acacia, various cactus, yucca, and range grass were observed.

As noted above, north-to-south transects were cut every 197 feet (60 meters) in advance of a previously planned but abandoned development. Currently these transects are partially cleared and vegetation along these transects is immature growth.

ERM determined the area within which indirect effects may occur through windshield survey of the Project area, accounting for the atmospheric, audible, and visual effects of the Project, which is expected to have two 95-foot HRSGs, two 160-foot stacks, and a 55-foot cooling tower with visible steam plumes under certain atmospheric conditions. The APE took into consideration existing visual obstructions and areas of recent development, including residential subdivisions to the west and southwest of the Project site, elevated highways to the west and south of the Project site, beyond which the Project may be seen but would not likely result in a change in character or use of historic properties, should they be present (Figure 1-3). The APE to the east of the Project site terminates at the east boundary of the 3,434-acre Palo Alto Battlefield National Historical Park, and includes the west half of the 6,600-acre Palo Alto Battlefield National Historic Site NHL (Figure 1-4).



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DATE: June 23, 2013	SCALE:	REVISION:

Figure 1-3
Project Area of Potential Effects
Tenaska Brownsville Generating Station
Cameron County, Texas

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1.4 GENERAL APPROACH

Cultural resources investigations conducted for compliance purposes are often divided into multiple phases to enable the consideration of information resulting from each phase in determining the need for and planning the next. Phase I is intended to identify archeological and aboveground resources within the APE. Phase I can include both:

1) information-gathering through literature searches and coordination with knowledgeable parties, and a subsequent assessment of the cultural sensitivity of the project area (sometimes called Phase IA); and
2) once the cultural sensitivity has been considered, field investigations designed to collect specific information about cultural resources in the project area, including the identification of resources with the potential to be eligible for listing in the NRHP (Phase IB).

Following completion of Phase I investigations, if it is determined that potential historic properties are located within the APE and effects to those resources cannot be avoided, then a Phase II investigation can be conducted to collect additional information to enable an assessment of the eligibility of the identified resources for listing in the NRHP.

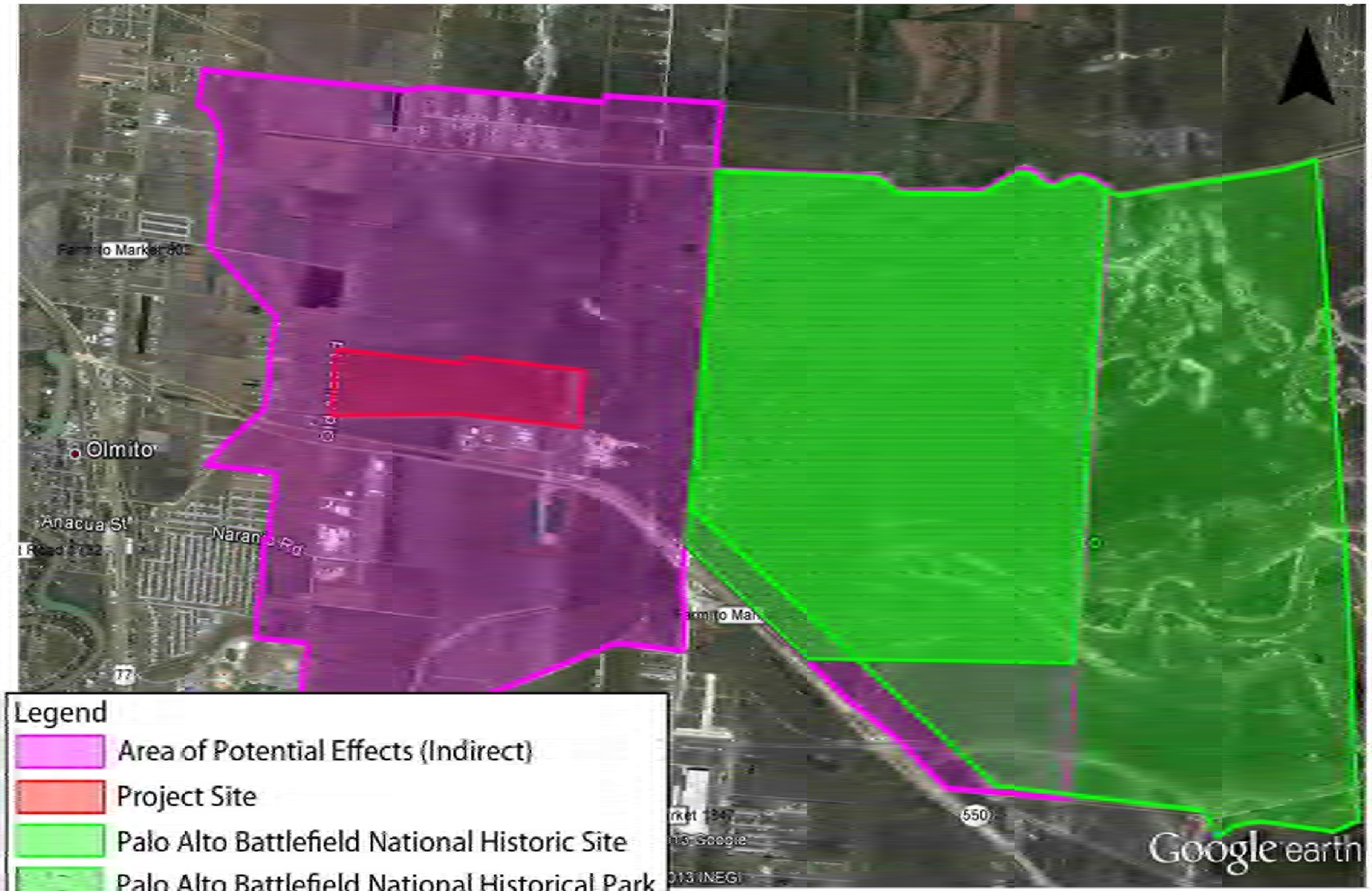
ERM's cultural resources investigations as summarized in this report consisted of a Phase I archeological survey within the Project site and a Phase I reconnaissance survey of aboveground resources within the APE. The Phase I archeological survey did not result in the identification of any resources with the potential to be historic properties, and no Phase II was conducted or warranted. ERM further determined that the Phase I reconnaissance survey of aboveground resources was sufficient to identify historic properties in the APE, and no Phase II intensive survey was conducted or warranted. It is ERM's opinion that these efforts represent a sufficient, good-faith effort to identify historic properties that may be affected by Tenaska's proposed Project.

Background research was conducted prior to, during, and after field investigations, and included review of: THC's Archeological Sites Atlas (Atlas) online database, site files and library; other cultural resources reports for projects in the area; NRHP data layers and other online inventories; historic maps; selected scholarly research; and desktop reference materials. One historic property was identified within the Project area prior to conducting the cultural resources surveys: the Palo Alto Battlefield National Historic Site (Battlefield), a National Historic Landmark (NHL) also listed in the NRHP and historically significant as the site of the first battle of the U.S.-Mexican War on May 8, 1846.

The boundaries of the park as designated in 1991 and amended in 2008 include approximately 3,434 acres of public and private lands. This large parcel borders the east side of Paredes Line Road for approximately two miles, comprising most of the APE east of the Project site. The Battlefield is partially owned and operated by the NPS.

Discussions with Battlefield and other NPS staff were conducted to evaluate the potential for cultural resources associated with the Battle of Palo Alto or other events to be located outside the park boundaries within the APE. These discussions, background research, and fieldwork summarized in this report indicate that activities related to the battle, the Civil War, or other notable historic events are not known to have occurred within the Project site. General historical trends noted in the APE were considered in identifying properties of interest in the aboveground survey.

The archeological survey and metal detection survey were completed between March 31 and April 19, 2013. The aboveground survey was conducted between January 16 and April 4, 2013. These efforts are in compliance with the *Secretary of the Interior's* (SOI's) *Standards and Guidelines for Archeology and Architectural History* (48 FR 44716).



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DATE: June 23, 2013	SCALE:	REVISION:

Figure 1-4
Palo Alto Battlefield Boundaries
Tenaska Brownsville Generating Station
Cameron County, Texas

ERM

2.0 NATURAL ENVIRONMENT

The Project site is depicted on the Los Fresno's (western half) and the Barreda (Olmito) (eastern half) United States Geological Survey (USGS) topographic quadrangle maps. The Project site lies within the Gulf Coastal Plain of Texas and specifically within the Coastal Prairie Physiographic Province as defined by the Bureau of Economic Geology (1996). Fenneman (1938) isolates the overall Project area as the Rio Grande Embayment of the Western Gulf Coast Physiographic Province (Terneny 2005). Johnson (1931) places the Project area in his Texas Gulf Coastal Plain natural region and Blair (1950) defines it as part of the Matamoran District of his Tamaulipan Biotic province. Locally, the area is commonly referred to as the Rio Grande Valley (Johnson 1931); however, Cameron, Willacy, and Hidalgo Counties are actually on the delta of the Rio Grande. The Project site is within the modern floodplain of the Rio Grande (Terneny 2005).

The property is also situated in the Lower Rio Grande Alluvial Floodplain within the Gulf Coastal Plain. The Gulf Coastal Plain is distinguished by its relatively flat topography and mainly grassland natural vegetation. Inland from this region the plains are older, more irregular, and have mostly forest or savanna-type vegetation potentials.

The Lower Rio Grande Alluvial Floodplain ecoregion includes the Holocene-age alluvial sands and clays of the Rio Grande floodplain that are now almost completely in cropland or urban land cover. The soils are deep, loamy and clayey. The Rio Grande's water is mostly diverted from its channel for irrigation and urban use, and little or no flow reaches the Gulf of Mexico.

Topographically, the highest part of the Project site is the western edge (approximately 6 meters above mean sea level [amsl]) and the lowest part is the eastern edge 5 meters amsl). The Olmito Branch with help from man is responsible for the low elevation of the eastern edge and the first and second terraces of the creek correspond to the slight rise in elevation of the western part. Soil changes accompany these landforms (SSS NRCS USDA 2013a).

2.1 GEOLOGY

The Gulf Coastal Plain is a relatively young area characterized by geologic formations that dip toward the Gulf of Mexico. USGS surface geology maps indicate the area is underlain by the geological formation known as "Alluvium in Rio Grande" predominately clay (Qac), which is a Quaternary deposit of flood-plain and backswamp mud deposited by the Rio Grande during periodic floods that accompany tropical storms (USDI 2013). A newer USGS map depicts the Project site within Holocene muddy floodplain alluvium (Page et al. 2005). This formation is believed to include Holocene deposition that is underlain by older distributary sands (Gustavson and Collins 1998, USDI 2013, Moore and Wermund 1993).

2.2 *GEOARCHEOLOGY AND GEOMORPHOLOGY*

In the *Environmental Geologic Atlas of the Texas Coastal/Zone: Brownsville-Harlingen Area* (Brown et al. 1980), the Project area is within the mapped Holocene/Modern meander belt of the Rio Grande (1980). The 1907 Brownsville Area Soil Map (USDA 1907) designates the entire Project area as swampy (Figure 2-1). Gustavson and Collins (1998) completed a general geoarcheological investigation of the terraces and floodplain alluvium of the lower Rio Grande Valley. Among their conclusions is that the delta plain is constructional south of Los Ebanos, Texas and contains late Quaternary deposits as deep as 30 meters that may hold archeological sites. According to this investigation, low areas are filled with late Quaternary silt and clay. However, the soils associated with these areas are poorly developed and have no B horizon. Soils on the Project site are formed in clay and silty clay but have more developed soil horizonation and, therefore, may be considerably older. The authors note that eolian deposition is common in the delta area. They also conclude that most archeological sites in the delta deposits are found shallowly buried on slight rises such as levees that may have eolian caps. These sites are typically Late Prehistoric (Gustavson and Collins 1998).

Deltas, especially those in areas prone to massive flooding, are dynamic depositional environments. The formation and fluvial deltaic deposition of a stream has periods of deposition interrupted by periods of erosion. On the whole the deposition is much greater than the erosion but most surfaces will experience both. The Rio Grande has a river dominated delta and is nearly flat and has channels meandering through the plain. As sediments aggrade within the channels of these low energy streams they force the stream to develop a new channel, eroding a new path to the gulf.

All surfaces of the delta are likely to be truncated when massive flooding is caused by tropical storms that have been coming ashore in the region for millennia. In these storms the majority or possibly the entire delta may be submerged. As the channel periodically avulses, often in response to these tropical storms, parts of the developing delta may be stranded outside of the areas that are normally flooded. These surfaces remain stable and this seems to be the case for the Project area. The low terraces may be the result of a very recent downcutting by the Olmito Branch. Alternatively, the former channel may be a very old channel of the Rio Grande and the terraces have been truncated by flooding.

Shallow lakes and abandoned channels of the Rio Grande (resacas) are the most obvious features of the broad delta plain. Resacas are frequently filled with water that provides for relatively lush vegetation along the banks. At the coast these resacas support brackish water plants and sacahuiste grass (Terneny 2005). The windblown plain has high spots in the form of clay dunes made of eolian deposits along the east and north shores of inland lakes. Modern tributaries of the Rio Grande have built low sandy levees and other floodplain features.

FIGURE 2-1: 1907 Brownsville Area, Cameron County, USDA Soil Survey Map

Prehistoric sites are often found on sandy levees and clay dunes (THC Atlas 2003).

The Project site is located 21 miles (34 kilometers) east of the Gulf Coast. The closest point of the present Rio Grande channel is approximately 6.8 miles (11 kilometers) to the southwest. Oxbow lakes, resacas, creeks, bays, barrier islands, and lagoons lie between the Project area and the gulf coastline. The Palo Alto Resaca is located 1 kilometer to the east of the Project site. Other abandoned channels of the Rio Grande and its tributaries lie between the Project area and the modern river channel. A discontinuous paleochannel that once held the Olmito Branch crosses the western edge of the Project site. The channel has been altered to form a rectangular lake and fill has been spread out across the Project site between the edge of the lake and the current tree line. Olmito Branch is now channelized and runs along the southern boundary of the Project site.

2.3 SOILS

Three different soil series are mapped in the organic, saline, fine sediments of the Project site. These soils are distinct but texturally and structurally very similar. These separate soils have developed as a result of differences in the original deposition of the parent material. Because they were deposited as distinct landforms they have different histories of saturation and water table interactions. Animal burrows are common and locally the soils have a strong organic component. Fiddler crabs and their burrows are very common at the Project site.

From west-to-east these soils are Chargo, Benito, and Lomalta (SSS NRCS USDA 2013). Lomalta is mapped within the area disturbed by the excavation of the lake and the land where the excavated sediment was used as fill east of the shore. Benito series is mapped on the bulk of the rest of the Project site. The western-most 1,050 feet (320-meters) of the Project site are mapped as Chargo Series soils. All of the soils are very hard, very firm, and very sticky and have significant components of humus, and sodium and other salts. These landforms are all easily inundated by floods common to the region. Shrink-swell cracks frequently exceeded a meter in depth in the Benito and Chargo soils (SSS NRCS USDA 2013).

The Lomalta Series forms on level to slight depressions, typically, marshy surfaces. The A horizon is usually 0-12 centimeters (0-5 inches) thick and composed of gray to dark gray clay. This soil has a moderate fine and medium angular and subangular blocky structure. It is saline, strongly effervescent, and moderately alkaline. A gradual, smooth boundary separates the A horizon from the first B horizon. The first B horizon is gleyed due to frequent longterm saturation. The soil is a saline, gray clay (5Y 6/1) and displays a weak course prismatic structure that parts to medium blocky. This horizon is 12-36 centimeters thick and terminates in a gradual, smooth boundary. The next B horizon (Bssgz1 and 2) has two parts. Both are 10YR 5/1 clay, display a medium wedge structure, and have prominent slickensides. Both are also saline, strongly effervescent, and moderately alkaline. They are separated by a gradual, smooth boundary. In addition to these descriptors, the lower part includes 5% (by volume) salt masses and crystals. A gradual wavy boundary separates this 20-69 centimeters thick horizon from the next B horizon. The next B horizon is composed of a lighter and browner gray (2.5YR 6/2) clay loam 0-12 centimeters (0-8 inches) thick. Included in this horizon are yellowish brown concentrations of iron and gray sediment-filled land-crab krotovinas. Below a gradual, smooth boundary is a very pale gray (10YR 7/3), silt loam C horizon (SSS NRCS USDA 2013b).

Chargo series soils form on ancient stream terraces and typically have an Ap horizon 0-13 centimeter (0-5 inches) thick. This horizon is a mix of loose gray eolian sediment and dark grayish brown silty clay that create a massive and cloddy structured gray (10YR 5/1) silty clay. Below an abrupt, smooth boundary is a two part Az horizon totaling 10-40 centimeters (4-16 inches) thick. The upper part is dark grayish brown (10YR 4/2) silty clay and the lower part is grayish brown (10YR 5/2) and has the same texture. Both parts have moderate fine and medium subangular structure with a few wedge shaped peds. Like all the soils at the Project site this horizon is very hard, very firm, and very sticky. Threads and masses of salt are common. This horizon is strongly effervescent, moderately alkaline, and saline. Below a gradual wavy boundary are a Bz followed by a Bkz horizon. The Bz horizon is slightly browner (10YR 5/3) than the lowest part of the A horizon but otherwise share composition and structure. It is typically 13-40 centimeters (5-19 inches) thick. A gradual boundary separates the Bz and the Bkz horizon. The Bkz horizon is light brownish gray (10YR 6/2) silty clay and displays a weak, fine, angular blocky structure. This

horizon is 8-30 centimeters (3-12 inches) thick and displays a weak, fine angular blocky structure and common masses and concretions of calcium carbonate. Below a clear, wavy boundary are two C horizons. The Cz horizon is 10-40 centimeters (4-10 inches) thick and very pale brown (10YR7/3), massive, silt loam that is violently effervescent. The final horizon is a Ckz composed of massive, light brown (7.5 6/4) silty clay with common masses and concretions of calcium carbonate (SSS NRCS USDA 2013b).

Benito series soils form on level terraces at higher elevations than overflow would typically reach. All of the horizons are saline and all but the top A horizon have accumulation of salts more soluble than gypsum. The profile has three (3) A horizons that total (50-87 inches) thick. The top (5-12 inches) constitute an Az horizon comprised of gray (N 6/0) clay with a weak, fine granular and subangular blocky structure. Below a gradual smooth boundary is an Anz horizon that is light grayish brown (10YR 6/2) with a fine angular blocky structure. This horizon is 102-152 centimeters (40-60 inches) thick and is very hard, very firm, very sticky and very plastic. Salt threads are common and it is strongly effervescent and saline A diffuse, gradual boundary separates the Anz from the ACnz horizon. The ACnz horizon is a pale brown silt loam that is 13-38 inches (5-15 inches) thick. Iron concentrations and depletions are common and many calcium carbonate concretions and soft masses are present. Land crab krotovinas are common. An abrupt, smooth boundary separates this horizon from the lower 2CKnz horizon. The 2CKnz horizon is pale brown (10YR 6/3) silt loam and has inclusions similar to the ACnz horizon. This horizon is also burrowed by land crabs (SSS NRCS USDA 2013b).

2.4 FLORA AND FAUNA

During field observations in April 2013, the Project site was noted to contain areas of dense mesquite and grassland habitats on the west side of the site and herbaceous and grassland habitat on the east side of the site (Appendix A: Photos 1 and 2). A palustrine wetland and a transitional wet area were each also identified on the eastern portion of the Project site.

2.4.1 PALUSTRINE EMERGENT WETLANDS

During the site visit, one palustrine wetland was identified within the Project site. A transitional wet area (an area between the uplands and wetland not considered wetland) was also identified adjacent to the wetland. This area was characterized by wetland vegetation and wetland hydrology parameters that met the wetland criteria; however, the soils did not contain parameters that met the criteria. The area was not, therefore, determined not be a wetland at the time of the field survey.

The hydric soil indicator found in the wetland area consisted of a depleted matrix. No hydric soil indicators were identified in the transitional area. Note that soils in the transitional area are considered fill materials, which may have

resulted in the soils not meeting the hydric criteria and also resulting from the storm water/retainment pond's construction.

Dominant species observed the wetland included: camphor daisy (*Haplopappus phyllocephalus*), shoregrass (*Monanthochloe littoralis*) and slender seapurselane (*Sesuvium maritimum*).

The wetland feature is adjacent to a perennial man-made ditch that eventually flows into San Martin Lake.

2.4.2 DENSE MESQUITE

The majority of the Project site (approximately two-thirds) consists of dense mesquite habitat. This habitat encompassed the western portion of the Project site and the following dominant vegetation was observed during the site visit: honey mesquite (*Prosopis glandulosa*), prickly pear (*Opuntia stricta*), crucita (*Eupatorium odoratum*), Dahlia hedgehog cactus (*Echinocereus poselgeri*), torpedo grass (*Panicum repens*), fall panicum (*Panicum dichotomiflorum*), Kleberg bluestem (*Dichanthium annulatum*) Angleton bluestem (*Dichanthium aristatum*) and buffelgrass (*Pennisetum ciliare*).

2.4.3 HERBACEOUS TO LOW SHRUBLAND HABITAT

This habitat was observed on the eastern portion of the Project site. This habitat was found in a transition area between the wetland and the dense mesquite. Dominant vegetation encountered in the herbaceous to low shrubland habitat included: sea ox-eye daisy (*Borrichia frutescens*), gulf cordgrass (*Spartina spartinae)*, honey mesquite (*Prosopis glandulosa*) and huisache (*Acacia farnesiana*).

2.4.4 OLMITO BRANCH

One waterbody was identified during the field survey. The waterbody was a large man-made drainage ditch (Olmito Branch) located adjacent to and south of the property. Flow within the ditch is from the east to the west and is considered ephemeral based on drainage patterns and standing water in the ditch. An ordinary high water mark identified within the ditch was determined using vegetation growth patterns and distinct water lines. Further evaluation of the ditch approximately 1,000 feet downstream of the survey location indicated that the ditch has a continuous flow of water generated from a wastewater outfall from the SRWA Treatment Plant.

The following species were observed while on-site: kingfisher, tri-color heron, great egret, and deer. Additional fauna observed or heard during the survey included coyotes, wood rats, tortoises, lizards, fiddler crabs, indigo snakes, and tarantulas.

3.0 CULTURAL SETTING

3.1 PREHISTORY

Generally, information about the prehistory of the Rio Grande Delta area is limited. Within the larger south Texas archeological region, more work has been done, but it is still considered one of the least known regions in Texas (Hester 1995, Black 1989). Studies at Loma Sandia and Choke Canyon have provided substantial data about the south Texas region Late Prehistoric Period and to a lesser extent the Late Archaic. Paleoindian artifacts have been found in association with Rancholabrean fossils at the Buckner Ranch site (41BE2) (Nash 2001). Still these are essentially data points and they provide only very general understanding of prehistoric lifeways. However, a 2005 dissertation by Terneny reviewed all of the work completed to date and provided a new chronology based primarily on Thomas R. Hester's work and reviewed models for diet and settlement. The focus of this dissertation is on mortuary traditions and radiocarbon assays, biochemical and bioarcheological analyses of burials to provide data on diet and chronology (Terneny 2005).

In general, the lack of agricultural related sites, artifacts, and domesticated flora, suggests a hunter-gatherer lifeway that included fishing and shell fish exploitation (Weinstein et al. 2005, Terneny 2005). The few recorded inland prehistoric sites that are in close proximity rarely have diagnostic artifacts. However, the majority of sites including 41CF195, 41CF98, 41CF 85, 41CF15, and 41CF14 have been found to have clay balls or lumps associated with the site. At 41CF158, groups of these clay lumps have been interpreted as hearths (THC 2013). Burials and/or human remains have been found at most of these same sites and other sites in the area including 41CF2 (Floyd Morris Site), 41CF13, 41CF111 and 41CF183 (THC Atlas 2013). Lithic tool assemblages are geared toward hunting, fishing, and gathering.

Few well-stratified sites have been found in the south Texas Archeological region and none are known in the Rio Grande delta. Isolated finds and stratified sites such as 41UV2, 41BE2, 41LK31/32 and 41VT98, among others, suggest that the chronology of human occupation in the region follows the Paleoindian-Archaic-Late Prehistoric pattern seen in other parts of Texas where agriculture never replaced hunting and gathering (Black 1989).

3.1.1 PALEOINDIAN PERIOD (11,500 to 8000 B.P.)

People living in the south Texas archeological region during the Paleoindian Period relied on a hunter-gatherer subsistence that allowed significant time for social interactions. Populations were likely small, and bands ranged large territories (Terneny 2005). Pleistocene megafauna were exploited for food and presumably clothing and other daily needs. Folsom technology specifically is geared toward hunting and butchering mega-fauna. Paleoindian researchers now believe that smaller game and gathered plants were also important resources (Collins et al. 1998).

Paleoindian material culture is identified by Plainview points, Folsom points, and Clovis points and blades/blade cores. Later Paleoindian points include San Patrice, Angustura, Golondria, Wilson, and possibly Lerma (Hester 1995, Turner and Hester 2011). The earlier points are fluted lanceolate points and later points are unfluted lanceolates and stemmed points in the case of Wilson points and an unnamed stemmed point found at 41BE2 in Bee County (Nash 2001). Ovate scrapers and large bifacial Clearfork tools are also associated with this earliest archeological period (Nash 2001).

3.1.2 ARCHAIC PERIOD (8000 to 1200 B.P.)

The extinction of the megafauna resulted in a shift to a subsistence strategy that emphasized smaller animal and plant resources (Black 1989). Coastal areas including the Project area, exploited marine resources to a greater extent. The Archaic Period can be divided into Early, Middle, and Late subperiods. The Early Archaic is poorly understood in the Rio Grande Delta. Data from surrounding areas suggests this was a time of greater dependence on plant resources and smaller game. Hester (1995) identifies an "Early Corner Notched Horizon" consisting of the Martindale-Uvalde-Baker point type continuum and the later "Early Basal Notched Horizon" consisting of Bell and Andice points. Abasolo points span from the Late to the Middle Archaic. Early triangular points although difficult to distinguish from other similar triangular points, have been dated to the end of Middle Archaic. Clearfork tools change from bifacial to unifacial beginning in this period. Early Archaic sites in the South Texas Archeological Region are found on terraces and upland areas and often include stone lines hearths (Black 1989).

Sites from the Middle Archaic are more common and are believed to represent a population increase based on data recovered from Loma Sandia and the Choke Canyon Reservoir and other sites. Large cemeteries such as the Loma Sandia site and extensive plant processing at Choke Canyon suggest significant changes in culture (1986 Hall et al.). A wider range of lithic tools, and increased frequency of ground stone tools, specifically manos and mutates suggests a new range of subsistence technologies possibly inspired by resource depletion. Common Middle Archaic markers include a continuation of Abosolo, and the addition of Tortugas, Carrizo, and Bulverde points. Point types like Bulverde and Pedernales from central Texas, Langtry from the Lower Pecos region, and Morhiss from the lower reaches of the Guadalupe River, suggest a pattern of exchange between disparate regions (Weinstein 2005). Although sites from this subperiod are found in many different parts of the landscape, proximity to water and constructive landforms continue to be reliable predictors of site locations.

Continued trends of population increase and cultural adaptations to reduced resource availability continue into the Late Archaic. Remains of earth ovens are more common than any previous period. Cemeteries continue to be common suggesting increased territorialism. Late archaic sites are commonly found in the south Texas archeological region and have been found mixed with Late Prehistoric artifacts in the Rio Grande Delta. Smaller corner-notched points

including Ensor, Fairland, Frio, and Marcos are markers of this subperiod (Black 1989, Turner et al. 2011). Refugio, Tortugas and possibly Lerma represent un-notched (triangular and lanceolate) points from the same time. Small distally beveled tools and bifacial blades including corner tang knives have been found at a number of sites. Although heat-treating artifacts occurs through all the time periods it is prevalent in Late Archaic collections (Black 1989).

3.1.3 LATE PREHISTORIC PERIOD (1200 to 400 B.P.)

The Late Prehistoric Period artifact assemblage and cultural adaptation in the Rio Grande Delta is known as the Brownsville Complex. However, based on radiocarbon assays, biochemical and bioarcheological analyses of burials from south Texas sites, Terneny (2005) has concluded that Brownsville Complex hallmarks first appear in the Middle Archaic. The same manifestation south of the Rio Grande is called the Barril Complex. Late Prehistoric period sites are the most common sites in the south Texas archeological region and the Rio Grande Delta. Within the Rio Grande Delta this is at least partly because of preservation dynamics and specifically the potential for massive erosion and deep burial caused by tropical storms that frequently strike the area. The Late Prehistoric sees the emergence of ceramics and the bow and arrow. Edwards, Scallorn, Cameron (sometimes made of bottle glass), bulbar-stemmed and Fresno (both found at Oso Creek [41NU2]), Perdiz, and Starr points are typical of Late Prehistoric site collections in the south Texas archeological region (Turner et al. 2011, Black 1989). The Brownsville Complex does not have stemmed points or an associated unique pottery type (Brown 1989). However, shell tools and adornments, and bone tools and adornments are part of the twin complexes. Haustecan pottery is frequently found at Brownsville-Barril sites. Clearfork tools from this period are small and unifacial although many exhibit a few large flake removal scars from the ventral face. The Brownsville Complex includes arrow points made from European bottle glass and is therefore considered to survive into the historic period (Weinstein 2005). Guerrero points comprise two technologically separable types based on a statistical comparison. They are commonly referred to as "Mission points" because of their association with Native Americans living in Spanish Missions and they are considered a single historic type.

3.2 HISTORY

3.2.1 SPANISH PERIOD

Spanish explorers, officials, missionaries, soldiers, and settlers were the earliest Europeans to come to the area. Alonzo Álverez de Pineda and Álvar Nũnez Cabeza de Vaca may have been the first Europeans in the area in 1519 and 1528, respectively, but the routes of these men were not well-documented and are the subject of debate (Weedle 2013, Hester 1999). What is clear, however, is that Cabeza de Vaca lived and worked among south Texas Native Americans and his writings about the peoples he encountered are among the best ethno-historic data available in the region. A later Spanish explorer, José Garcia de Sepulveda,

crossed the Rio Grande in 1638 and followed the left (northern) bank from Mier to the present day Brownsville-Matamoros area (Garza and Long 2013). José de Escandón rafted down the Rio Grande this same area in February of 1747. A year later, Nuevo Santander Province was first colonized. The province included the present-day province of Tamaulipas and lands north of the Rio Grande including the Project area. A royal inspection in 1757 brought a fact-finding commission under José Tienda de Cuervo and Agustín López de la Cámara Alta, to visit each settlement in the new province (Weedle 2013). The fact-finding commission was charged with reporting on progress and making recommendations on further development. Tienda de Cuervo, however, rarely traveled north of the Rio Grande. Only the settlement of Loredo and a very small village called Nuestra Señora de los Dolores were located north of the Rio Grande. Tejon Indians likely ranged over both sides of the Rio Grande at this time (Campbell 2013). It would be 10 more years before the Ortiz Parrilla Gulf Coast expedition visited and mapped the Texas coast south of the Nueces River (Weddle 2013).

José Salvador de la Garza and his wife María Gertrudis de la Garza Falcón started two ranches that likely included the Project site around 1770. Ranches Espíritu Santo and El Tanque, were later renamed El Rancho Viejo. Two years later, de la Garza petitioned to the Spanish government for ownership of the land. In 1779, the 261,275-acre Potrero del Espíritu Santo land grant (also known as El Agostadero del Espíritu Santo) was granted to de la Garza and his heirs. He received title to the land in 1781 and died soon after. He left the land to his wife and three children who owned the land until 1848. James Grogan purchased 500 acres at that time and by 1877, the rest of the property had been sold (Garza 2013c). An historical marker erected to commemorate El Rancho Viejo is located 2.56 miles (4.1 kilometers) south of the Project site (outside the APE) along Highway 77. No extant aboveground cultural resources associated with ranch are known to remain.

3.2.2 AMERICAN INDIANS DURING THE CONTACT PERIOD

According to *Texas Beyond History* (2013), our overall knowledge of the historic American Indians of the South Texas Plains remains a complex puzzle in progress. Hundreds of native bands lived in the region at the time of contact, with hundreds of different names for them but only fleeting accounts of some of their territories remain. Our modern understandings of the native peoples of the South Texas Plains are complicated by the fact that a single over-arching, or collective, linguistic name has been applied to them all: *Coahuiltecans*.

Coahuila comes from the part of the northeastern frontier of New Spain which once included most or all of the area occupied by the modern state of Texas on the north side of the Rio Grande, as well as portions of the Mexican states of Coahuila, Nuevo Leon, and Tamaulipas on the south. As applied to native peoples, the term Coahuiltecan comes from Coahuilteco, coined by a 19th-century Mexican linguist for one of the major native languages spoken in the area. But other unrelated languages were also spoken in south Texas and

northeastern Mexico such as Sanan. Therefore it is clear that the peoples of the region represented many different ethnic groups, tribes, and nations.

The term Coahuiltecan has unfortunately been interpreted by nonspecialists as implying that the native peoples of south Texas and northeastern Mexico (Coahuila) were one large, genetically- and/or ethnically-related culture, who spoke the Coahuilteco language.

Researchers today see the cultural milieu on the South Texas Plains in Late Prehistoric/Early Historic times as far more complicated. Many of the native groups of the region practiced similar ways of life, yet were ethnically distinct and with different names for themselves as well as the languages they spoke, including Coahuilteco, Sanan, Comecrudo, Cotoname, and others. Today we realize the term Coahuiltecan is only valid in a geographic sense as a broad reference to the many native groups that once ranged across the Spanish province of Coahuila in northeastern Mexico and throughout the South Texas Plains. Alternatively, the Lipan Apaches were among the "intrusive" Plains groups entering south Texas in the early Historic Period. Indigenous peoples were alternately pushed into Mexico by the frequently hostile invaders or, in some cases, assimilated into the existing "Coahuiltecan" tribes (*Texas Beyond History* 2013).

3.2.3 MEXICAN AND TEXIAN PERIOD

The Cameron County area was included in the state of Tamaulipas when it was part of Mexico. After the revolution ended in 1821 the Mexican government continued to issue land grants. However, the population remained very low until after the Texas Revolution in 1836. With the signing of the treaties of Velasco the area became part of San Patricio County. The treaties were negotiated and signed by Santa Anna while he was a captive of the Texians and the government of Mexico never recognized the treaties. Mexican rancheros continued to graze their cattle on the land through the early 1840s. By 1840, many small, isolated settlements were founded in the area. Most of these settlements were in the fertile, easily irrigated lands of the Rio Grande flood plain (Garza and Long 2013).

3.2.4 UNITED STATES FEDERAL PERIOD

Texas became a state in 1845 and the Mexican War began on May 13, 1846 when President James Polk decided to force Mexico to recognize the Rio Grande as the official border of the United States. The Battle of Palo Alto was the first major engagement of the war and it was fought 0.97 kilometer (0.6 miles) east of the Project site. The Americans quickly pushed the Mexican forces across the Rio Grande. The Texas legislature redrew county boundaries and created Cameron County on February 12, 1848. On July 4 the same year, the Treaty of Guadalupe-Hidalgo was signed ending the Mexican War and the resolving the border dispute. The formerly disputed lands including Cameron County were now part

of the state of Texas. Soon after the War, Charles Stillman bought 4,676 acres adjacent to Fort Brown and established Brownsville (Garza and Long 2013).

Historic Texas General Land Office (GLO) county maps showed that the Project area had been surveyed prior to 1913 and remained rural, with exception to the St. Louis, Brownsville, and Mexico Railway. The Project area was historically part of the tracts of lands that belonged to the heirs of José Salvador de la Garza (Figure 3-1) (Garza 2013a). Los Fresnos, located about 3 miles north of the subject property, was established as a ranch in the early 1770. The land on which Los Fresnos stands today was part of the El Portero del Espiritu Santo (El Agostadero del Espiritu Santo) land grant issued by Spain to José Salvador de la Garza in 1781. Garza and other local residents conducted open-range grazing on their ranches until after the Mexican War. During this time, four settlements, the farm Los Cuates, Charco Hondo, Tres Norias, and Agua Negra, developed in the area that later became Los Fresnos. There were enough people in the area in 1904 that a school called Los Fresnos had 16 students and 1 teacher (Garza 2013a).

The introduction of the railroad into South Texas during the early 1900s led to an influx of settlers from the north. Among these was Lon C. Hill, Jr. who on August 6, 1907, purchased more than 14,000 acres of the Espiritu Santo land grant and divided it into lots. Hill and other entrepreneurs formed a development company in order to develop and sell the land, and in 1913, Lon C. "Mose" Hill III and Clyde Tandy established a townsite on the old Alice Stage Road. The new town was located two miles west of Los Fresnos and became known as Moseville. In 1915 the developers established Los Fresnos. The Hills are credited for naming the town for the ash trees that grew there in abundance. During the same year, a school and a church were built. A post office opened in 1919, closed in 1927, and reopened in 1929. By 1931, Los Fresnos had an estimated population of 400 and 20 businesses. Through the 1960s Los Fresnos remained a farming community and its population steadily rose to about 1,500 in 1966. In the late 1980s, Los Fresnos received attention as a result of the Immigration and Naturalization Service Los Fresnos Processing Center located just outside the city. El Corralón (The Corral) was used to house undocumented aliens seeking work visas or political asylum. By 1990 Los Fresnos was surrounded by three colonias. In 2000 the population reached 4512 (Garza 2013a).

Olmito, Texas is located approximately 1.35 miles west of the Project site. The town opened a post office in 1905, and a railroad station was established in 1911 when the St. Louis, Brownsville, and Mexican Railway was constructed. In 1914, the small community had a population estimated at 50, a post office, a grocery store, and a cotton gin. By 1915, a school was also in operation. The school system of Olmito was consolidated with the Los Fresnos Independent School District in 1970 (Garza 2013b).

FIGURE 3-1: Texas FLO Map of Cameron County, CA. 1913

3.2.5 *BATTLE OF PALO ALTO AND THE MEXICAN WAR IN THE RIO GRANDE DELTA*

The following narrative summary of the Battle of Palo Alto is based entirely on *The Mexican War 1846-1848* by K. Jack Bauer (1992). The Battle of Palo Alto, the first major engagement of the Mexican War, was fought on May 8, 1846, on a battlefield just east of the project area. American forces were commanded by General Zachary Taylor and General Mariano Arista led the Mexican troops. Palo Alto was the first American victory in the war with Mexico. The battlefield is located 0.6 miles (970 meters) east of the Project site.

President James Polk took the position that the Rio Grande is Texas' southern border and had sent diplomats to seek acquiescence from Mexico. Frustrated in his attempts, the president sent General Zachary Taylor and 2,228 troops from Corpus Christi to the Rio Grande. On April 23, Mexico declared its intentions to forcibly defend their claim to disputed lands north of the Rio Grande. Taylor moved to the border across from Matamoros and Mexico placed artillery within range of his troops. This prompted the building of Fort Taylor, nicknamed Fort Texas, and later renamed Fort Brown to protect critical supplies. On May 3, after

Taylors troops had gone to Port Isabel where Mexican forces were, the fort came under fire and Taylor marched to the scene. His troops camped for 4 nights from March 24, 1846 at Rancho Viejo waiting for supplies before heading east-southeast (Bauer 1992).

Mexican forces met Taylor's on the road just east of the Project Area on May 12, 1846 and the Battle of Palo Alto began. At Palo Alto, General Taylor employed the "flying artillery" tactic developed by Major Samuel Ringgold. Cannon mounted on light carriages were drawn by teams of horses specially trained for the task. Traditional tactics were abandoned and artillery exchanges including American Howitzers were the central to the battle. Arista's final maneuver was an attempt to flank the Americans that evening. With the coming of the night Arista's troops withdrew to find a more easily defended position (Figures 3-2 and 3-3). Taylor followed Arista's retreating troops and won the Battle of Resaca de la Palma (Site 41CF3) the next day. Eventually the Americans took the fight into Mexico and won the war in 1848. The victory added the territory from the Nueces to the Rio Grande including the Project area to the United States (Bauer 1992).

FIGURE 3-2: Bauer (1992) Sketch of the Battle of Palo Alto

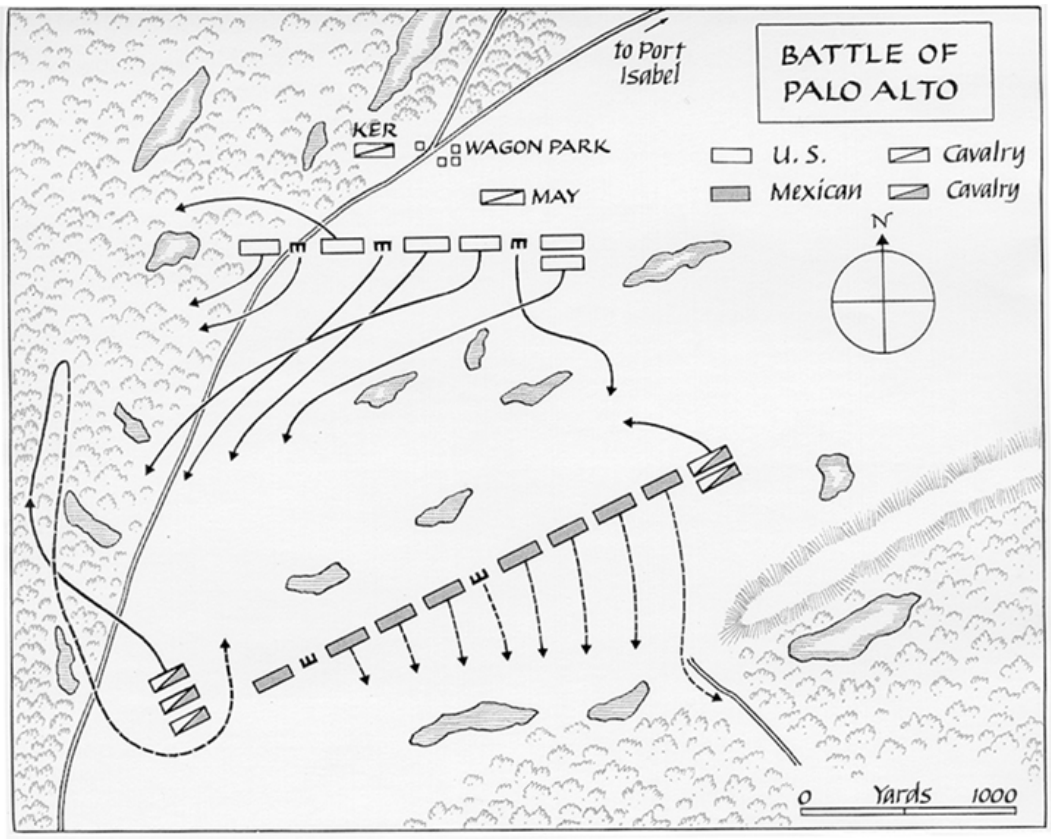
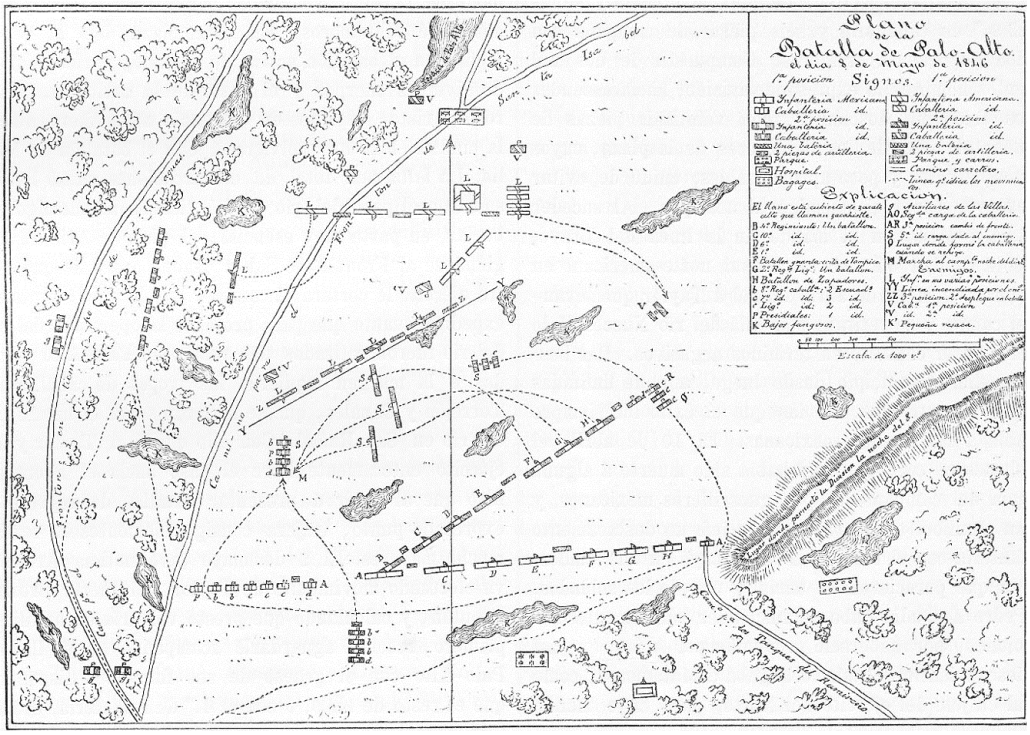


FIGURE 3-2: Field Map of Battle of Palo Alto, 1846



Cultural resources investigations were conducted to determine if historic properties, defined as those listed in or eligible for listing in the NRHP, are present in the APE for the proposed Project. For a property to be eligible for listing in the NRHP, it must possess historical significance under at least one of the NRHP Criteria – A, B, C, or D – and retain integrity, often described as the physical characteristics of the property that convey the historical significance. The NRHP Criteria as defined in 36 C.F.R. §60.4 include properties:

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or

B. That are associated with the lives of persons significant in our past; or

C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. That have yielded or may be likely to yield, information important in prehistory or history.

Integrity may be defined as the authenticity of a property's historic identity, demonstrated by the survival of physical characteristics that existed during the historic property's period of significance. The seven aspects of integrity are:

- Location: the place where the historic property was constructed or the place where the historic event occurred;
- Design: the combination of elements that create the form, plan, space, structure, and style of a property;
- Setting: the physical environment of a historic property;
- Materials: the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property;
- Workmanship: the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory;
- Feeling: a property's expression of the aesthetic or historic sense of a particular period of time; and
- Association: the direct link between an important historic event or person and a historic property.

As explained in the NPS *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*, "The evaluation of integrity is sometimes a subjective judgment, but it must always be grounded in an understanding of a property's physical features and how they relate to its significance. To retain historic integrity a property will always possess several, and usually most, of the

aspects. The retention of specific aspects of integrity is paramount for a property to convey its significance. Determining which of these aspects are most important to a particular property requires knowing why, where, and when the property is significant." (NPS 1990)

4.1 SITE FILE AND LITERATURE REVIEW

ERM performed background research including a site file research and a review of literature to determine if any known cultural resources existed within or adjacent to the APE and within a 3.2-kilometer (2-mile) radius of the Project site (Project site). The research looked specifically for properties listed on the NRHP, State Archeological Landmarks, other archeological sites, historical markers, cemeteries, and previously conducted surveys. Additionally, this research was conducted to understand the nature of sites in the area; the prehistory and history of the Project area; and the broader archeological region. Specific sources for background research included:

- Texas GLO
- The University of Texas (Austin) Briscoe Center Map Collection
- The University of Texas (Arlington) Special Collections Library
- Texas State Historical Association Archives
- THC Archeological Sites Atlas
- Texas State Archeological Landmarks
- NPS – NRHP Properties
- Texas State Library and Archives Commission Collection – Texas Heritage Online
- U.S. Library of Congress
- USGS 7.5 minute series, Topographic, Historic Quadrangle Maps
- Texas Natural Resources Information System (TNRIS)
- Handbook of Texas Online
- Regional archeological reports and syntheses

Based on a review of these sources and other scholarly research, ERM identified archeological sites and previously conducted cultural resources investigations adjacent to the Project site. Data from the sites and surveys in the overall Project area were synthesized with the results of the literature review and informed the cultural background section above.

Background research and discussions conducted with Battlefield staff members focused on the possibility that archeological sites and artifacts associated with the battle may be located within the Project site. However, NPS archeologist Rolando Garza and Superintendent Mark Spier indicated that they were not

aware of any activities related to the Battle of Palo Alto, the Civil War, or any other notable historic events that occurred on the Project site. The review of the THC Atlas confirmed that no cultural resources were recorded within and immediately adjacent to the site's boundaries. USGS topographic maps dating back as far as 1928 were reviewed for the presence of historic-period buildings and none are depicted in the Project site.

The THC Atlas depicted 14 cultural resources surveys (identified by the THC's Atlas GIS Polygon ID Nos.) within two miles of the Project site, and four previously recorded cultural resources, including the NHL/NRHP-listed Palo Alto Battlefield National Historic Site (Table 4-1; Figure 4-1). Research revealed no recorded cultural resources within the Project site. Site file research confirmed the presence of the four cultural resources within two miles of the Project site.

TABLE 4-1: Recorded Cultural Resources within 2 miles of the Project Site

Site No.	Description	Period of Significance	Designations
41CF92	Palo Alto Battlefield National Historic Site	Historic; Mexican War, Republic of Texas Period	NRHP-listed; NHL
41CF107	Brownsville Rail Relocation	Historic; Mexican War, Republic of Texas Period	NRHP ineligible
41CF207	FM 511 Road Expansion Project	Historic; Mexican War, Republic of Texas Period	NRHP-ineligible
Historic Marker 4181, Rancho Viejo	Placed in 1936 to mark the general location of Rancho Viejo, the first European settlement in Cameron County in 1771	Historic; Colonial	State Landmark

Map Redacted

Additional archival research began prior to fieldwork and was conducted to determine the former presence of buildings within or in the vicinity of the Project site. The earliest historic topographic quadrangle images for the Project area include both the Los Fresnos (western half) and the Barreda (Olmito) (eastern half) USGS Topographic Quadrangle maps (7.5' series [NAD 1927]) each dating back to 1930. Additional quad maps were examined and these include: Harlingen 1928; Barreda 1936; Los Fresnos 1936; East Brownsville 1955 (Photorevised [PR] 1983); Los Fresnos 1955 (PR 1983); Olmito 1956 (PR 1983); and West Brownsville 1956 (PR 1983).

The majority of the project area falls within the lower portion of the Barreda (Olmito) and Los Fresnos quad maps. All of the quad maps showed that the Project area remained rural, undeveloped, and agricultural from the earliest date of 1928 and with only a few isolated agricultural buildings that appeared intermittently.

In addition to conducting research, ERM consulted with THC, NPS, and the Cameron County Historical Commission (CCHC) to request information on known historic properties in the APE. No additional historic properties were identified in the APE.

4.2 ARCHEOLOGICAL INVESTIGATIONS

4.2.1 FIELD METHODS

The archeological field investigations associated with the current undertaking were designed to identify and assess all sites, historic and prehistoric, within the project's Project site. Potential, buried (subsurface), surface archeological resources and/or structural ruins fell within the purview of this investigation. In addition to site identification, the investigation was intended to provide sufficient data to determine whether or not additional investigations were required to evaluate fully the potential eligibility of any newly defined site location for inclusion in the NRHP or as a State Archeological Landmark (SAL).

A Texas Antiquities Permit was not needed since the archeological fieldwork investigation is confined within the Project site, which is on private land.

The filled area was subject to shovel testing along three transects spaced 30 meters apart starting at the edge of the depression at the eastern end of the Project area. Shovel tests were excavated every 30 meters along each of the three transects. Shovel tests were dug through the fill to a depth of approximately 60 to 80 centimeters (23.6 to 31.5 inches) and then an additional 10 to 20 centimeters (4-8 inches) into the original surface, if possible, beyond the dense clay fill and clayey soils.

The remainder of the Project area was divided into transects spaced 60 meters apart and shovel tests were excavated every 60 meters along each transect. Within the central area, where new construction will be focused, additional transects were placed midway between the original transects. Shovel tests along

these new transects were placed every 60 meters starting 30 meters past the first shovel test of the original transects. This method had the effect of staggering the shovel tests within the central part of the Project area and providing the same coverage as placing 30-meter spaced shovel tests along 60-meter spaced transects.

All shovel tests were excavated by hand and were 30-40 centimeters (12-16 inches) in diameter and 30-80 centimeters (12-31 inches) deep. Twenty-centimeter (8-inch) arbitrary levels were screened and hand-sorted separately. Notes were taken describing levels in terms of soil horizons, color, texture, soil structure, and presence of artifacts. Additional notes were taken describing vegetation and general environment.

The metal detection survey employed Fisher model F2, with a 10-inch coil. According to the owner's manual (2013), these metal detectors are self-calibrating and effective to 25 centimeters (10 inches) below the surface. Using sweeping 1-meter (3.3-foot) arcs of the metal detector, the coil was kept within 10 centimeters (4 inches) of the surface as the surveyor walked slowly along each transect. The survey crew chose metal detection survey areas (MDs) that were clear or largely clear of vegetation (Appendix A: Figures 3 and 4). Once an MD was chosen, a surveyor swept the area by following transects that were spaced sixty centimeters (23.6 inches) apart. A second surveyor re-surveyed each of the MDs to confirm the results. All hits were excavated but modern trash was not collected or recorded.

Surveyors were careful to maintain a 20-meter buffer from other metal detectors and avoided other metals such as the steel toes of boots, shovels, and other equipment. The position of each center point of each MD was recorded on a Trimble GPS with sub-meter accuracy and each area was assigned a unique number. All MD unique numbers are listed in Table 4-2 and the area of each is provided. The total area subjected to metal detection survey is 27.56 acres (11.15 hectares), representing a roughly 10% sample of the total Project area and a 14% sample when the disturbed parts of the Project site are subtracted. Each MD location was also recorded on field maps. All artifacts were plotted and mapped using the same methods.

TABLE 4-2: Metal Detector Log

Number	Area (sq m)	Artifacts
MD-1	25100.00	0
MD-2	2374.62	0
MD-3	20075.00	0
MD-4	22755.00	0
MD-5	1256.00	0
MD-6	1800.00	0
MD-7	1100.00	0
MD-8	1875.00	0
MD-9	1350.00	0
MD-10	3066.40	6
MD-11	6875.00	0
MD-12	1800.00	0
MD-13	2640.74	0
MD-14	12500.00	0
MD-15	3900.00	0
MD-16	3066.40	0
MD-1	25100.00	0
Total Area = 27.56 acres (11.15 hectares)	Total Area = 27.56 acres (11.15 hectares)	Total Area = 27.56 acres (11.15 hectares)
Total Artifacts = 6	Total Artifacts = 6	Total Artifacts = 6

4.2.2 RESULTS OF ARCHEOLOGICAL INVESTIGATIONS

Intensive Archeological Survey

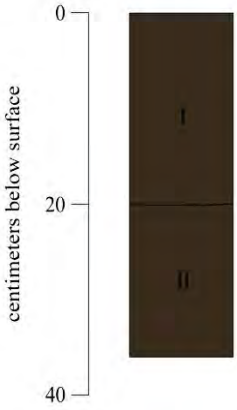
Surface inspection resulted in two (2) surface finds: a whiteware fragment, and a fragment of an aqua colored glass telephone pole insulator (Table 4-3). The whiteware fragment does not have a maker's mark or any other features that could provide a reasonably well-bracketed date of manufacture. The paste is fine, white, and hard. The surface finish is a clear, crackled glaze and the shape suggests it is a saucer fragment. The telephone pole insulator likely dates to the late 19th- to mid-20th-century, but the small, largely interior fragment cannot be confidently dated. These isolated finds do not represent an archeological site.

All shovel tests in the filled area confirmed the existence of pedogenically unaltered sediment over a disturbed natural surface. All other shovel tests encountered soils consistent with those mapped by soil service staff in the Project area (SSS NCRS USDA 2013). A photograph of a typical shovel test and profile is provided in Figure 4-2. A total of 342 shovel tests (1.26 per acre) were excavated and none were positive for artifacts (Figure 4-3). A complete log of shovel tests including location, depth, and result are included as Appendix B.

TABLE 4-3: Phase I Archeological Survey Artifact Inventory

Location	Material	Time Frame	Association
Surface (near T2.5-6.5)	White ware	Late 19th - Early 20th Century	Domestic
MD 10	Metal Spike Fragment	Late 19th - Early 20th Century	Domestic
Surface (near MD 4-3)	Glass (aqua) Insulator Fragment	Mid-19th – Mid-20th Century	Telegraph/Telephone
MD 11	Metal Spike Fragment	Late 19th - Early 20th Century	Domestic
MD 10	Brass Cartridge	20th Century	Domestic
MD 10	Metal Wire Fragment	20th Century	Agriculture
MD 10	Metal Wire Fragment	20th Century	Agriculture
MD 10	Metal Wire Fragment	20th Century	Agriculture

FIGURE 4-2: Typical shovel Test Profile and Depth



Shovel Test Profile

I Dark grayish brown (10YR 3/2) silty clay, dry; columnar structure, hard, plastic; roots and rootlets throughout.

II Dark grayish brown (10YR 3/2) clay, dry; medium subangular blocky structure, hard, plastic; sparse roots throughout.

FIGURE 4-3: *Shovel Test Pit Results*

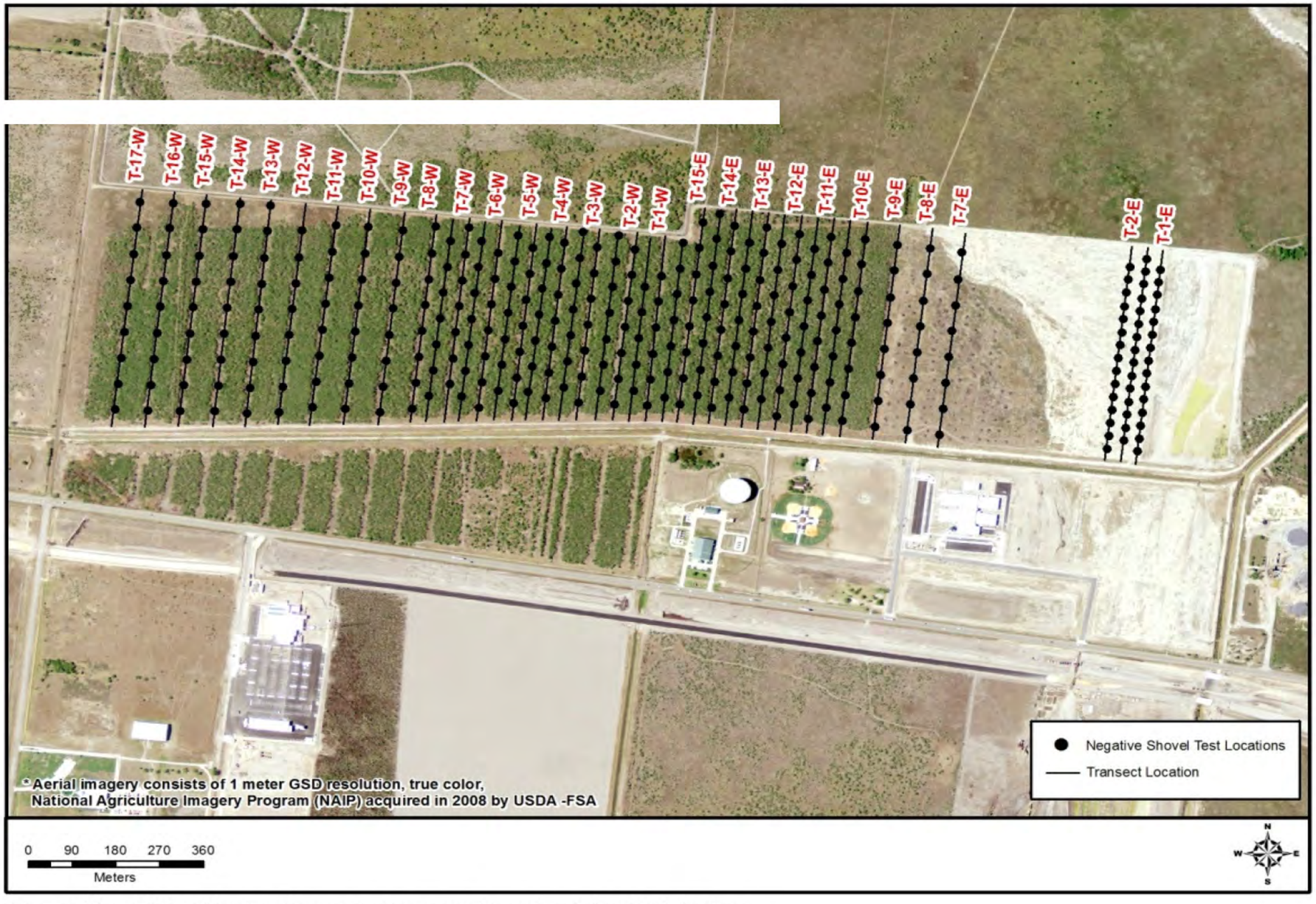


Figure 2. Map of APE and location of reconnaissance survey transects and shovel tests locations.

FIGURE 4-4: *Metal Detection Areas*

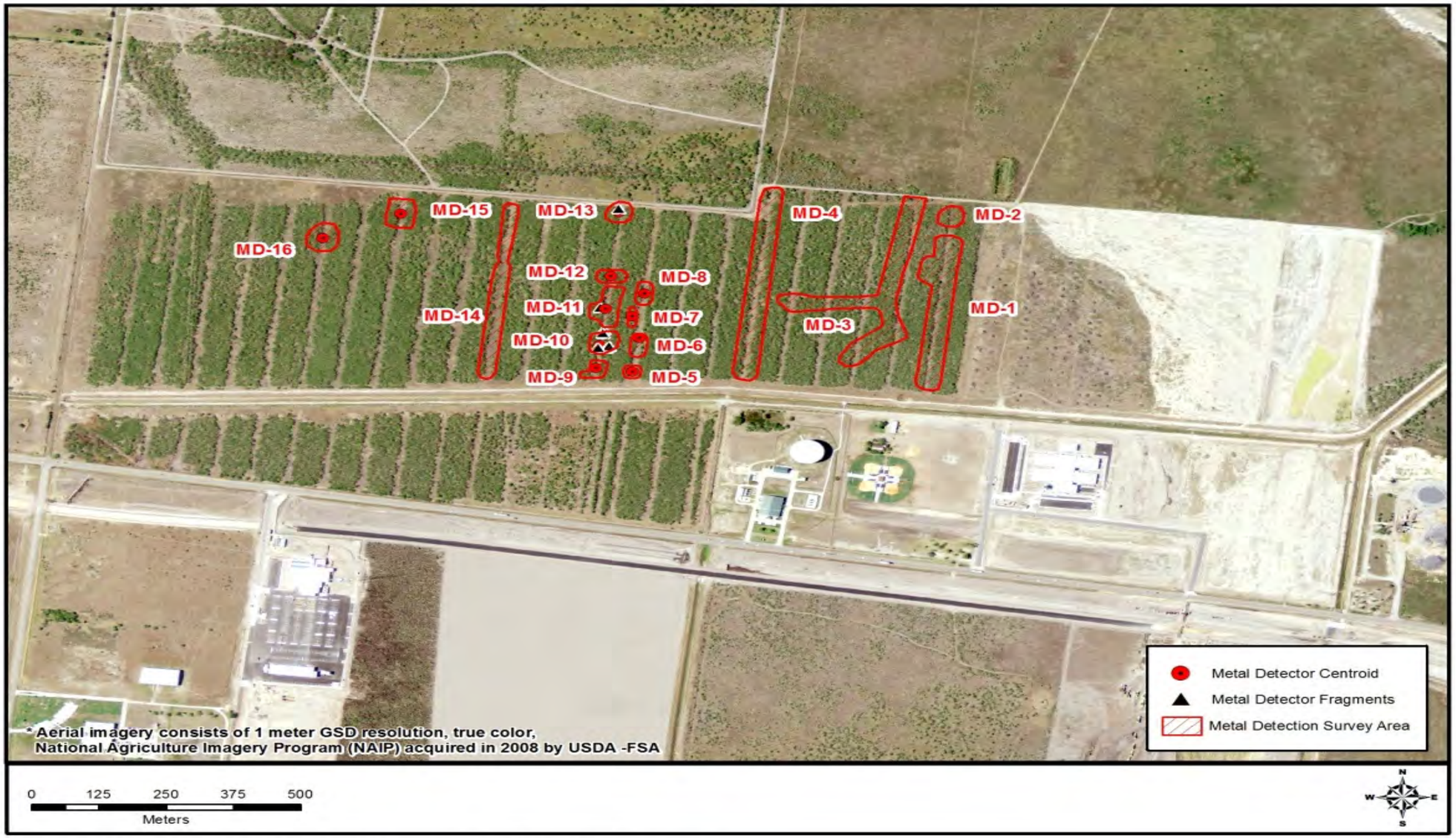


Figure 2. Map of APE and location of reconnaissance metal detection survey areas.

Metal Detection Survey

The total area subjected to metal detection survey was 27.56 acres (11.15 hectares), representing a roughly 10% sample of the total Project area and a 14% sample when the disturbed parts of the Project site are subtracted (Figure 4-4). A number of modern artifacts comprised primarily of modern shotgun cartridges and aluminum can fragments were found during the metal detection survey. This modern trash was not collected. A total of six (6) historic-period artifacts were found during the metal detection survey. Three (3) of these were wire fragments. The other three (3) were a .410 bore – 12 gauge brass shotgun cartridge fragment and two (2) metal spike fragments. All of these artifacts were found within 15 centimeters (6 inches) of the surface. Five (5) of the artifacts were found in MD 10, the sixth was found 393 feet (120 meters) away in MD 11.

Artifacts

A total of eight (8) artifacts were found during the field investigations. All of the artifacts except the whiteware fragment were found along Transect 4. The two (2) spike fragments have some similarities but are distinct from each other. One spike fragment from MD 10 is 7.5 inches long and almost complete. It appears that just the tip is missing (Figure 4-5). The other spike fragment from MD 11 is short (2.17 inches) and its original length is not apparent. Both have square/rectangular shanks that are approximately the same dimensions from just below the head to the terminus. The heads are well-formed. The longer spike head flares out from the shaft to a flat rectangular platform. The smaller fragment's head is nearly a cube that sets off-center of the shaft. Both spikes are heavily corroded and a positive identification of type and use is uncertain.

The shotgun cartridge is a Peters High Velocity .410 bore – 12 gauge, brass cartridge fragment with the base and intact headstamp. The Peters Cartridge and Shotgun Ammunition company was founded in 1887 (Shotgunworld.com 2013). The headstamp, however, indicates that the cartridge was manufactured after the Peters Company was bought by Remington Arms Company ca. 1934 (Shotgunworld.com). The Peter's High Velocity cartridge was very popular and Remington continued to produce them into the 1960s (Shotgunworld.com 2013). The wire fragments were indistinct and approximately the gauge of bailing wire. No effort was made to assign a date or association beyond the inference that they are related to agriculture and are likely related to fencing.

The manufacturing date of the insulator cannot be narrowed down to an informative span. It is also difficult to pinpoint the possible date of manufacture of the whiteware fragment because whiteware has been manufactured for over 100 years and is still made today. This collection of artifacts seems incongruous and only the spikes have any possibility of dating to middle 1800s. It seems likely that these are isolated artifacts and are not part of a single site formed by the discard or abandonment of related items. A State trinomial was not sought for this collection of non-diagnostic artifacts.

FIGURE 4-5: Two Spikes Identified During the MD Survey

4.2.3 EVALUATION OF ARCHEOLOGICAL RESOURCES

Following an intensive archeological field investigation within the Project site, sediments identified within the Project site are likely relatively deep Holocene deposits (Gustavson and Collins 1998, Brown et al. 1980). The fact that no sites were found during an intensive survey suggests the land may have been unsuitable for longer term occupation. At some time during the Holocene, the Rio Grande channel avulsed and construction of the delta underlying the Project area slowed or stopped. Data suggests the low-lying Project area was a marsh or mud flat situated inland of bays and lagoons at that time. The location of the Project area relative to the shoreline and the lakes and salt flats that were once the subaerial limit of the delta supports this possibility. Because of its low elevation the Project site was prone to remaining swampy and to being flooded during tropical storm events.

The 1907 Soil Survey Map of the Brownsville area depicts the area as swampy (Mangum and Lee 1907). Other historic descriptions also describe marshes in the area at the time of the Battle of Palo Alto (Caran et al. 2005). Soils in the Project site were found to be clayey with high humic content. These soils display coarse, laminated prismatic structure, suggesting they were formed when long saturated clayey sediment dried out. Any prehistoric human activities in the Project area are likely to have been brief and the evidence of the site was lost to flooding. Further, sites in the area are typically located on high spots and there are no locations within the Project site that conform to this description.

Only eight (8) artifacts were found in the 236-acre undisturbed portion of the Project site. All of these were either surface finds collected during the archeological survey or metal detector finds uncovered within 15 centimeters of the surface. The artifacts found during the investigation are not from a single activity or occupation and therefore do not constitute a site. No State-issued trinomial will be sought for this broad, sparse scatter of historic-period artifacts.

Criterion A of the NRHP may have been applicable if any evidence of the Battle of Palo Alto had been found but only a handful of artifacts were recovered and none of these are associated with the battle or any other historic event. A complete chain-of-title search was not conducted during the cultural resources investigations to assess whether any individuals of historic significance are associated with the tract of land. However based on the research, no known activities related to Palo Alto, the Civil War, or any other notable historic events occurred within the Project site. Likewise, archival maps dating back as far as 1928 were reviewed for the presence of historic buildings and structures within the Project site and none are depicted.

Historic research and fieldwork did not identify any individual associated with the Project site to support NRHP eligibility under Criterion B, nor did they reveal extant physical features that would suggest historical significance under Criterion C. Additionally, it is unlikely that the sparse deposit of artifacts could provide significant data under Criterion D not already available in historical documents regarding the historic period settlement and development of Cameron County, Texas.

The archeological survey did not identify any cultural resources eligible for listing in the NRHP within the Project site. ERM's opinion is that these investigations represent a sufficient good-faith effort to identify archeological historic properties that could be affected by the proposed Project, and no additional archeological investigations are recommended at this time. It is recommended that Tenaska implement a general chance finds protocol to address any archeological resources that are found during Project construction.

4.3 ABOVEGROUND INVESTIGATIONS

4.3.1 FIELD METHODS

An ERM architectural historian conducted the aboveground resource reconnaissance survey on January 16 and April 3, 2013. Efforts were focused on: 1) determining an APE for the proposed undertaking; 2) identifying and documenting any readily identifiable cultural resources that have the potential to be eligible for listing in the NRHP in the APE; and 3) gaining an understanding of the physical and developmental character of the area for the purpose of informing the cultural resources work. Aerial photography of the Project area and road maps were taken into the field, and notations made regarding the APE and resources of interest. Digital photographs were taken to document the general character of the APE and resources of interest.

On January 16, 2013 ERM conducted the reconnaissance survey by conducting a general visual inspection of the Project site from roads accessible by vehicle, beginning on the west side of the 275-acre parcel via Old Alice Road (Appendix A: Photos 5 through 10). The general character of the project site and the immediate vicinity was observed. No extant buildings were observed on the Project site. From there, ERM visually inspected the project area to the west (east of Olmito North Road), northwest, and north (south of West Ocean Boulevard/Highway 100) of the proposed project site for the purpose of considering an appropriate west and north APE boundary, noting open, undeveloped land, the nature, density, and age of extant built resources (e.g., residential subdivisions, commercial properties), and obstructions to the view from and to the proposed Project site.

Specific features noted included: recent (ca. 1990) one-story, single-family residential suburban development to the west of the Project site; undeveloped land to the north of the Project site that is currently or has recently been utilized for livestock grazing; a pair of communications towers northwest of the Project site; and the town of Los Fresnos. While driving through these areas, the visibility of a communications tower on the U.S. Border Patrol Brownsville Station property on the south side of Highway 511 was noted, as well as a large water storage tank associated with the SRWA Treatment Plant immediately south of the Project site, on the north side of Highway 511.

The town of Los Fresnos was observed as an area of increased building concentration along West Ocean Boulevard, primarily between Old Alice Road and Paredes Line Road. In this area, ERM noted: an increased concentration of mid-20th -century buildings along and extending outward from Los Fresnos/West Ocean Boulevard, laid out in a grid plan; railroad tracks running north-south through downtown Los Fresnos, and an adjacent early 20th-century depot; the mid-20th-century, Modern-style Whipple library on the north side of West Ocean Boulevard; and several early 20th-century commercial buildings at the intersection of West Ocean Boulevard and Paredes Line Road, including a Spanish Mission-style Wells Fargo bank to the north of the intersection and a vernacular two-story commercial building at the southeast corner. A few early 20th-century dwellings were observed in the Los Fresnos vicinity, including one along Lemon Drive south of Los Fresnos that initially appeared to predate the mid-20th-century development associated with Los Fresnos.

The survey continued with a visual inspection of the east side of the Project area, which consists primarily of the Palo Alto Battlefield National Historic Site (Appendix A: Photos 28 through 36). As the survey was conducted while the park was open to the public, ERM reviewed the interpretive materials on display in the Visitor's Center, and walked from the designated parking area to the battlefield overlook – a contemporary pavilion oriented southeast over the remnants of the historic road to Matamoros and the portion of the battlefield where the height of the conflict occurred.

The entrance to the park is off of Paredes Line Road, and the Visitor's Center is a low-rise neutral-toned, relatively small building amid dense vegetation that largely masks the building from the west and south. The views north and northeast of the Visitor's Center towards the battlefield and areas of interpretation are mostly open. A vehicular drive leads from the entrance to a parking area, where pedestrian paths lead to the overlook and beyond in a loop, along which are interpretive panels and scattered cannon. The overlook faces southeast, but is fully open enabling 360 degree views of the battlefield. ERM observed that the general character and approach to the interpretation of the battlefield as a historic site is minimalist: the battlefield is largely left as an open, natural area and interpretive panels, structures, paths, etc., are limited. ERM also observed a utilitarian metal prefabricated shed, presumably for maintenance, to the north of the main entrance to the park.

Upon leaving the park, ERM continued the survey by driving along the south edge of the 275-acre Project site, from the existing school, past the SRWA Treatment Plan, back to Old Alice Road (Appendix A: Photos 1 through 18). ERM then visually inspected the area south of the Project site, observing: an industrial facility to the east of the school that appears to be an asphalt plant; tracts of undeveloped open land south of Highway 511; the recently constructed U.S Border Patrol Brownsville Station on the south side of Highway 511; a detention center on the east side of Old Alice Road; railroad tracks to the south of Highway 511 and running north-south; the public recreational complex occupying a large parcel to the southwest of the project site; and recent (ca. 1990) one-story, single-family residential suburban development, also to the southwest.

ERM then drove east along Highway 100 past Los Fresnos and the park, observing that development diminishes quickly once leaving Los Fresnos.

On April 3, 2013, ERM revisited the reconnaissance survey are for the purpose of refining the northwest corner of the APE, and to take additional photographs of the APE and resources of interest.

4.3.2 EVALUATION OF ABOVEGROUND RESOURCES

Buildings over Fifty Years of Age

The aboveground survey suggested that a small percentage of extant buildings in the APE were over fifty years of age – primarily modest one-story wood-frame dwellings and agricultural outbuildings. Analysis of USGS maps from 1928, 1936, 1955 (PR in 1983), and 1956 (PR in 1983), a highway map from 1940, and aerial imagery from 1950 revealed that resources identified in the field were largely built after 1950. While the 1928, 1936, and 1940 maps showed a few buildings widely dispersed throughout the APE, many of these resources do not appear on the 1950 aerials. Of those resources suspected of being over fifty years of age, none appeared to possess historical significance as required to be eligible for listing in the NRHP.

Closer consideration was given to two primary resources that appeared to be over fifty years of age located within the APE: a dwelling located at 32381 Lemon Drive, approximately 1.2 miles north of the Project site; and a dwelling on the west side of Old Alice Road, approximately .9 miles south of the Project site (Figure 4-6). Architectural features noted at the Lemon Drive property, and its location at the south edge of the denser residential development of Los Fresnos initially suggested that the building may date to the second quarter of the 20th century and as such be one of the older buildings in the APE (Appendix A: Photos 19 and 20). The dwelling on Old Alice Road appeared to be part of a larger agricultural property with secondary shed-type support resources within close proximity to the main dwelling (Appendix A: Photos 21 through 23). The vernacular form of the dwelling and cladding materials suggested that it, too, may date to the second quarter of the 20th century, and be among the older extant agricultural properties in the APE. However, neither dwellings appear on 1950 aerials from TNRIS, indicating that they were constructed after that date. Lemon Drive appears on the 1955 (PR 1983) Los Fresnos USGS quad map in purple, denoting that it was a subsequent revision to the original 1955 survey. USGS quad maps from 1928 and 1936 show buildings in the vicinity of the Old Alice Road property, but they could not be directly linked to the extant building. Neither resource is known to possess historical significance as required to be eligible for listing in the NRHP.

Irrigation and Drainage Structures

Several structures were identified in the APE and their eligibility for listing in the NRHP considered. Throughout the APE are steep drainage ditches that fall within the jurisdiction of Cameron County Drainage District No. 1 (CCDD1) (Figure 4-6). Along the west edge of the APE several irrigation ditches under the jurisdiction of Cameron County Irrigation District No. 6 (CCID6) extend into the APE. Maps confirm that most of these ditches are present by 1928, including the ditch along the south boundary of the Project site, shown on current maps for Cameron County Drainage District No. 1 as Olmito Branch, a primary district drain (Appendix A: Photos 24 through 26).

In discussions with THC, agency staff observed that irrigation systems in south Texas were resources of interest because of their significant role in the agricultural history of the area, and that some irrigation systems had been found eligible for listing in the NRHP. THC provided ERM with copies of Lila Knight's *A Field Guide to Irrigation in the Lower Rio Grande Valley*, a historic context and NRHP evaluation guide prepared in 2009 for the Texas Department of Transportation (TxDOT) Environmental Affairs Division and some records relating to THC's findings regarding irrigation system eligibility (Knight 2009). According to Knight's report, irrigation systems were essential in converting the open, dry, sparsely settled landscape of south Texas into viable land for intensive agricultural and residential development in the late 19th and early 20th centuries.

Knight's report indicates that the history of the CCID6 goes back to 1902, when the privately-owned Rio Grande Canal Company was established, then one of

only four private irrigation companies in the county on record at the time. In 1922 the Rio Grande Canal Company was purchased through public bond and reestablished as the Cameron County Water Improvement District No. 6, now the CCID6. Information provided in Knight's report suggests that the CCID6 possesses historical significance on a local level sufficient for listing in the NRHP under Criterion A for Agriculture as one of the earliest irrigation systems in the region and instrumental in the agricultural development of the area with a period of significance from 1904 to 1953 (completion of the Falcon Dam). In consultation between TxDOT and THC in 2009, THC provided its opinion that CCID6 was eligible for listing in the NRHP. Documentation of THC's decision was provided to ERM in the form of a summary spreadsheet, and no additional details of the consultation were included.

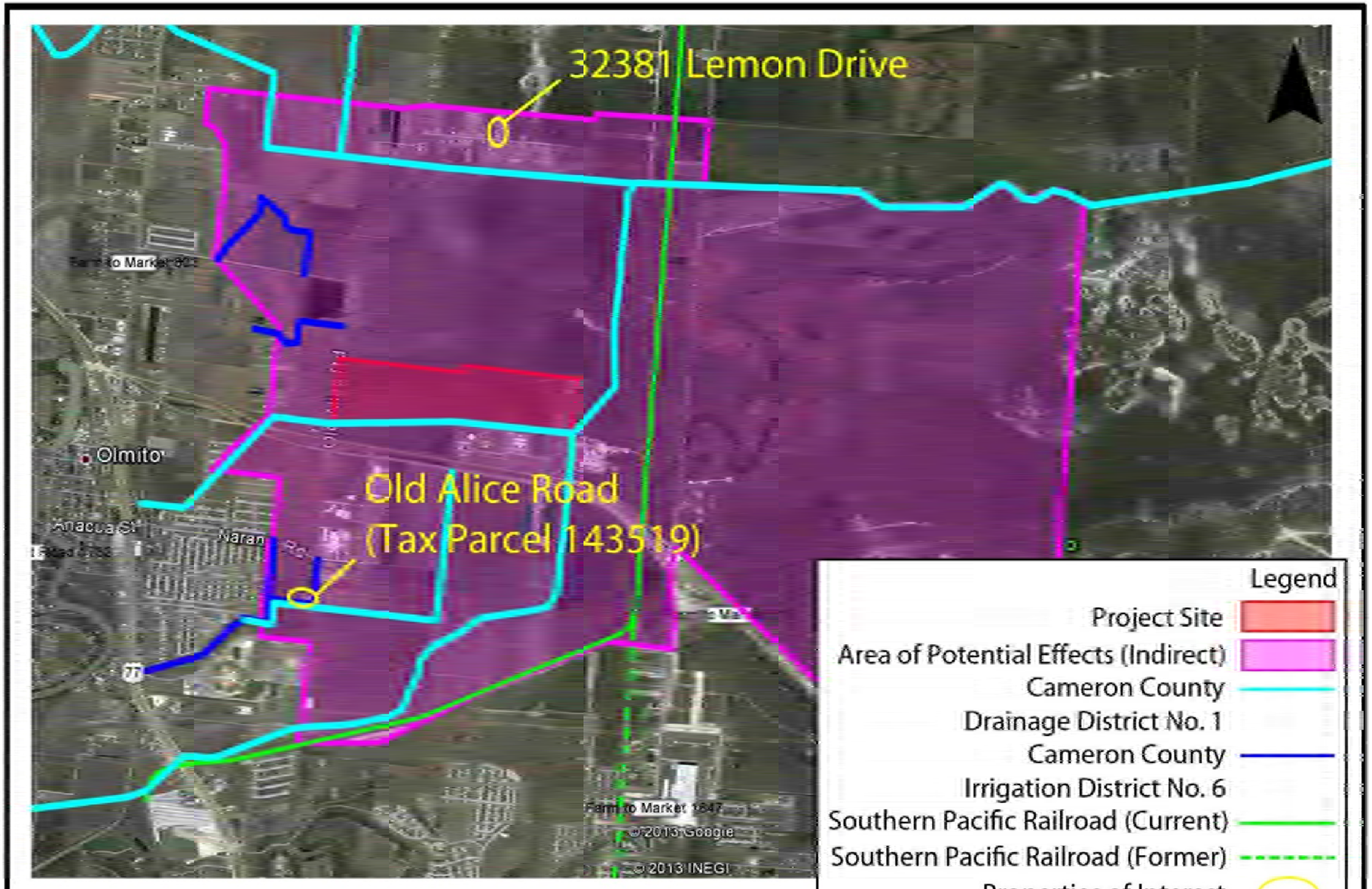
Olmito Branch and most of the ditches in the APE are part of CCDD1. The first county-managed drainage district in the Cameron County, CCDD1 was established in 1905 to improve soils in the area for rice cultivation following authorization by the Texas Legislature in that year (Knight 2009). While Knight's historic context and NRHP evaluation framework are intended for irrigation systems, Knight addresses the symbiotic relationship of drainage and irrigations systems, classifying drainage ditches as a property type integral to irrigation systems. According to Knight:

> Drainage ditches allow for either the return of water from agricultural fields back to the irrigation system or to provide for disposal of the remaining water from the fields. The earliest irrigation systems did not provide for drainage ditches. But the accumulation of alkali, or salts, in the soils of irrigated farmland that was not properly drained quickly led to the practice of installing drainage ditches throughout an irrigation system. Depending upon the alkali content of the soil, it is not uncommon for the drainage ditch of one field to serve as the irrigation ditch for the next field. Due to the topography of South Texas, the drainage ditches run from west to east, emptying into the Gulf of Mexico (Knight 2009).

THC did not provide any documentation of previous NRHP evaluations of CCDD1. Given the age of the extant ditches, their proximity to and interconnection with ditches of the NRHP-eligible CCID6, and the functional interrelationship between irrigation and drainage ditches, it is possible that what is now the CCDD1 would be found to be partially or wholly within the NRHP boundaries of the CCID6.

A full survey and analysis of the NRHP integrity of either the CCID6 or the CCDD1 was not within the scope of ERM's cultural resources investigations. As noted above, the segment of the Olmito Branch adjacent to the Project site appears to have been modified to increase size and flow. However, without a more thorough study of the extant condition of the larger systems it is difficult to assess the NRHP integrity of the Olmito Branch.

For these reasons, as a conservative measure, ERM recommends that all ditches in the APE be treated as eligible for listing in the NRHP.



Environmental Resources Management

DESIGN: C. Albee	DRAWN: C. Albee	CHKD.:
DATE: June 23, 2013	SCALE:	REVISION:

Figure 4-6
Aboveground Survey
Tenaska Brownsville Generating Station
Cameron County, Texas

ERM

Southern Pacific Railroad

One additional structure considered by ERM is the Southern Pacific Railroad, located less than a half mile from the east boundary of the Project site, running parallel to Paredes Line Road (Figure 4-6). The railroad branch line originally ran approximately 28 miles from Brownsville through Los Fresnos to Harlingen, where it linked up with a main line to San Antonio. Like the irrigation systems, railroads were critical to the economic development of south Texas in the early 20th century, as they enabled the efficient and cost effective transportation of goods and passengers in an area long proven to be inhospitable to road travel. While not the first railroad in the area – that was the St. Louis, Brownsville & Mexico Railway, completed in 1904 and located west of the Project area adjacent to Highway 83 – the Southern Pacific Railroad did spur economic development following its construction in 1927, as well as the relocation of Los Fresnos' town center east to its current location on West Ocean Boulevard from Old Alice Road to the railroad crossing and the newly completed Paredes Line Road from Brownsville (Keillor nd) (Appendix A: Photo 27). The line traversed a sparsely developed area previously without rail service, between Brownsville to the south, Port Isabel to the east, and Harlingen to the northwest. Background research suggests that the railroad line from Brownsville to Harlingen possesses historical significance on a local level under Criterion A one of the earliest railroads in the area and instrumental in its development.

Although survey of the entire length of the railroad between Brownsville and Harlingen was beyond the scope of this study, analysis of the segment within the APE suggests that the resource does not retain integrity sufficient to convey its historical significance.

The presence of a railroad that has been actively used for an extended period of time and/or since an important period in local history is not sufficient justification for listing in the NRHP. A linear transportation resource, railroads are similar to roads in that they often play a central role in the development of towns and rural areas. And like roads, railroads that remain in service to the present day have been continuously upgraded to accommodate changing needs, resulting in a loss of materials, workmanship, and design aspects. While they frequently retain their original path and active use into the present day (i.e., location, association), setting and feeling undergo considerable change over time as a result of adjacent development and the loss of associated secondary buildings and structures such as stations, storehouses, and roundhouses, rendering the resource ineligible for listing in the NRHP.

The Southern Pacific Railroad line remains active, and its path appears unchanged between Harlingen and Highway 511 since construction in 1927. Approximately 2,500 feet south of the intersection with Highway 511, the railroad splits with one line heading west to link in with the main line running parallel to Highway 83, and the other proceeding southeast towards Port Isabel. The former railroad branch line south to Brownsville has been removed, and the berm paved for the Brownsville Historic Battlefield Hike and Bike Trail. The date

of this diversion is unknown, but USGS quad maps show the railroad intact in 1955, and THC correspondence indicates that the Port Isabel diversion was in the planning stages in 1977. Visual inspection of the railroad in the vicinity of the general Project area indicated that some directly associated buildings (e.g., a much-altered station and adjacent store houses in Los Fresnos) remain along its path, although the gravel track bedding and crossing structures appear to be modern.

Because the railroad branch line to Brownsville is no longer in place or operating, and in further consideration of the loss of integrity of materials, ERM recommends the Southern Pacific Railroad as ineligible for listing in the NRHP.

5.0 SECTION 106 COORDINATION

On March 4, 2013 Tenaska and ERM representatives met with EPA Region 6 environmental staff Tina Arnold and A.C. Dumaual to discuss Tenaska's GHG permit application, including the timeline for review and issuance, Tenaska's progress in collecting information on environmental and cultural resources in the Project area, and the outstanding information needs required by EPA to process the application. EPA indicated that they would consult with the Tribes consistent with government-to-government procedures, but that Tenaska should coordinate with other potential stakeholders to the process, including THC and NPS, and obtain their preliminary feedback prior to formal initiation of the Section 106 process.

During the general discussion, potentially connected actions were discussed. These discussions remain ongoing.

To date, Tenaska has coordinated with THC, NPS, and the CCHC. In identifying cultural stakeholders, ERM has referred to 36 CFR §800.2(c), the Section 106 implementing regulations. Coordination with these parties is summarized below. As noted above, CCDD1 currently has jurisdiction over the Olmito Branch. Because of the proximity of the ditch to the Project, it may be appropriate to engage a representative of this agency in the Section 106 consultation process moving forward. Because the ditches of the CCID6 that fall within the APE will not be directly affected, it is not expected that the CCID6 would elect to participate in the Section 106 consultation process. Additional parties that may be considered in the Section 106 process are listed in Section 7.0.

5.1 TEXAS HISTORICAL COMMISSION

An ERM architectural historian and archeologist participated in an in-person meeting with THC staff members Kim Barker, Bill Martin, and Linda Henderson on February 11, 2013 at the THC offices in Austin. The purpose of the meeting was to obtain THC's informal preliminary perspective on the proposed project prior to EPA's formal initiation of the Section 106 process. In that meeting, ERM presented the general project scheme, shared observations made during the site visit and informed by background research, including preliminary thoughts on the APE and potential historic properties within the APE, and discussed the approach and potential level of effort to complete identification of historic properties under Section 106, including archeological and aboveground investigations. ERM requested THC's preliminary opinion on the Project, and initiated discussion of potential sensitivities and key issues for the Section 106 process moving forward, including the potential role of NPS in Section 106 consultation for the project.

5.2 PALO ALTO BATTLEFIELD NATIONAL HISTORIC SITE

On April 4, 2013 Tenaska and ERM representatives met with Mark Spier, Battlefield Superintendent and Rolando Garza, Battlefield Archeologist, at the

park Visitor's Center. A sit down meeting was followed by a walk to the battlefield overlook led by Mr. Garza. Tenaska described the Project and briefly discussed the potential, primarily visual, effects of the Project on the Battlefield aided by digital visualizations. ERM presented the approach to identifying cultural resources within the APE for the Project, including the archeological investigations then underway on the Project site, as well as the general approach to the environmental resources considerations. ERM requested NPS's preliminary opinion on the Project and in particular their input on the approach to archeological investigations.

5.3 CAMERON COUNTY HISTORICAL COMMISSION

Following the NPS meeting, ERM's architectural historian met with the CCHC on April 4, 2013 in Harlingen. Participating on behalf of the CCHC were the Chair Betty Agado, Vice Chair Mary Torres, Secretary Norman Roseff, and Wilson Bourgeois, Chair of the Civil War Sesquicentennial Committee. ERM presented the Project plans and shared the digital visualizations prepared by Tenaska for the NPS meeting. ERM then provided a summary of the approach to cultural resources investigations in the Project area, and explained in brief the Section 106 process and CCHC's potential role in that process.

5.4 INDIAN TRIBES

Consultation with Indian tribes is specifically required under Section 106 of the NHPA (USC 16, §470, et seq.) and the Native American Graves Protection and Repatriation Act (NAGPRA) (U.S. Code 25, §3001, et seq.); and it is encouraged for compliance with the Texas Health and Safety Code (Title 8, Chapters 711–714). Federal law and policy requires consultation to occur with Indian tribes that have been federally recognized. Federally recognized Indian tribes are those that have been formally acknowledged by the Bureau of Indian Affairs' Office of Federal Acknowledgment, the U.S. Congress, or a federal court as descendants of an historical Native American tribe. Federally recognized Indian tribes have rights of self-governance and are eligible to receive services and participate in programs offered by the federal government. Non-federally recognized Indian tribes may also be included in the Section 106 process if they have a demonstrated interest in the undertaking.

Currently, Texas has three (3) tribal communities living within State boundaries and at least 24 other communities with historic ties to Texas. Most of the tribes with historic ties to Texas do not reside within the State; however, they may still have a cultural interest in lands within the State. Note that tribal interest areas may change as new discoveries provide information about historic tribal territories. For additional information the following may be consulted:

- NPS NAGPRA database or tribal websites for contact information;
- Southern Plains Regional Office of the Bureau of Indian Affairs; and
- THC's State Archeologist.

According to the THC's Tribal Consultation Guidelines, the below federally recognized Native American Tribes are known to have interests in south Texas. Please be aware that tribal interest areas may change as new discoveries provide information about historic tribal territories. In addition, state-recognized Tribes that are not listed may have an interest in Tenaska's activities. Contact information on these additional Tribes can be provided for the specific Project site at the request of the EPA and coordinated through the THC. These state-recognized Tribes will be contacted on the advice of the EPA and/or Tenaska in those instances if and where human remains are potentially identified within the Project site and if the THC's State Archeologist recommends a broad stakeholder engagement program.

Federally-Recognized Tribal Contacts (last updated July 2013)

Alabama-Coushatta Tribe of Texas
Kyle Williams, Chairman Alabama-Coushatta Tribe of Texas
571 State Park Rd. 56
Livingston, TX 77351
Phone: 936.563.1100 Fax: 936.563.3184

Alabama-Quassarte Tribal Town
Tarpie Yargee, Chief
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Wetumka, OK 74883
Phone: 405.452.3987 Fax: 405.452.3968

Apache Tribe of Oklahoma
Donnie Donald Cabaniss, Jr., Chairman
P.O. Box 1220
Anadarko, OK 73005
Phone: 405.247.9493 Fax: 405.247.2686

Caddo Nation
Brenda Edwards, Chairperson
P.O. Box 487
Binger, OK 73009
Phone: 405.656.2344 Fax: 405.656.2892

Robert Cast, Tribal Historic Preservation Officer
P.O. Box 487
Binger, OK 73009
Phone: 405.656.2901 Fax: 405.656.2386

Cherokee Nation of Oklahoma
Bill John Baker, Principal Chief
P.O. Box 948
Tahlequah, OK 74465
Phone: 918.456.0671 Fax: 918.458.5580

Comanche Nation of Oklahoma
Wallace Coffey, Chairman
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Lawton, OK 73502
Phone: 580.492.4988 Fax: 580.492.3796

Jimmy Arterberry, Tribal Historic Preservation Officer
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Lawton, OK 73502
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Coushatta Tribe of Louisiana
Kevin Sickey, Chairman
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Phone: 337.584.2261 Fax: 337.584.2998

Linda Langley, Tribal Historic Preservation Officer
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The Delaware Nation
C.J. Watkins, Acting President
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Kialegee Tribal Town
Tiger Hobia, Town King
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Wetumka, OK 74883
Phone: 405.452.3262 Fax: 405.452.3413

Kickapoo Traditional Tribe of Texas
Juan Garza, Jr., Chairman
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Eagle Pass, TX 78852
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Kickapoo Tribe of Oklahoma
Gilbert Salazar, Chairperson
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McLoud, OK 74851
Phone: 405.964.2075 Fax: 405.964.6211

Kiowa Tribe of Oklahoma
Amber Toppah, Chairperson
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Carnegie, OK 73015
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Mescalero Apache Tribe
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Holly Houghten, Tribal Historic Preservation Officer
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Poarch Band of Creek Indians
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Phone: 251.368.9136 Fax: 251.368.1026

Robert Thrower, Tribal Historic Preservation Officer
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Quapaw Tribe of Oklahoma
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Jean Ann Lambert, Tribal Historic Preservation Officer
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Thlopthlocco Tribal Town
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Tonkawa Tribe of Oklahoma
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Tunica-Biloxi Tribe of Louisiana
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Phone: 318.253.9767 Fax: 318.253.9791

Earl J. Barbry, Jr., Tribal Historic Preservation Officer
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Marksville, LA 71351
Phone: 318.253.8174 Fax: 318.253.7711

United Keetoowah Band of Cherokee Indians
George Wickliffe, Chief
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Tahlequah, OK 74465
Phone: 918.431.1818 Fax: 918.431.1873

Wichita and Affiliated Tribes
Terri Parton, President
P.O. Box 729
Anadarko, OK 73005
Phone: 405.247.2425 Fax: 405.247.2430

6.0 EFFECTS OF THE PROJECT ON HISTORIC PROPERTIES

The Section 106 implementing regulations state that "an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association."

The word "diminish" in the regulations has left room for interpretation in the assessment of what constitutes an adverse effect, ranging from the position that any diminishment whatsoever is an adverse effect, to the interpretation that the diminishment must be such that the property is no longer eligible for listing in the NRHP. However, both Federal agencies and cultural resources professionals generally interpret "diminish" to mean an effect of some significant severity or intensity. ERM has taken this latter approach throughout this report.

At EPA's request, ERM has presented the below discussion of the expected effects of the proposed Project on the three historic properties identified within the APE: the Palo Alto Battlefield National Historic Site; CCID6; and CCDD1. This information is intended to provide EPA with information that will aid them in applying the Section 106 Criteria of Adverse Effect in accordance with 36 CFR §800.5.

6.1 IRRIGATION AND DRAINAGE DITCHES

Tenaska is currently considering utilizing the Olmito Branch for storm water point-source discharge, which would constitute a direct effect on the Olmito Branch and the CCDD1. These activities would affect the materials and design of the ditch in the Project site, potentially falling under Adverse Effect Criterion I, physical destruction of or damage to all or part of the property. They would also affect the setting and feeling of the ditch in the Project site, and as such would potentially fall under Adverse Effect Criterion V, introduction of visual, atmospheric or audible elements.

The Olmito Branch is currently used for outfall from the SRWA Treatment Plan, requiring the installation of an outfall pipe and a stair along the interior south bank. This use has compromised the materials and design of the Olmito Branch within the Project site. Project outfall(s), if any, is (are) expected to be a much less substantial structure(s). As previously noted, it is likely that this drainage ditch has been altered since its original construction to accommodate the increased runoff from the expanding development, and that its current design and appearance do not represent its historic condition.

As shown in Figure 4-6, ditches associated with the CCDD1 and CCID6 are located throughout the APE. Indirect effects from the Project have the potential to fall into two categories of the Adverse Effect Criteria outlined in the Section 106 implementing regulations:

- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance (Adverse Effect Criterion iv, 36 CFR §800.5[a][2][iv]); and
- Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features (Adverse Effect Criterion v, 36 CFR §800.5[a][2][v]).

The Project will not change the character of the property's use, but it will affect the physical features within the property's setting that contribute to its historic significance. The Project will also result in the introduction of visual, atmospheric, and audible elements. These two categories of effects relate to two primary aspects of integrity: setting and feeling.

In assessing the effects of the Project on these resources, it is important to understand the physical nature of the resource, as well as those characteristics that are most important in conveying their historical significance. Irrigation and drainage systems in south Texas are utilitarian works of engineering that were designed for function rather than aesthetics. As such, the aspects of integrity that are expected to be most important to convey historical significance are design, location, and association. These aspects of integrity, and the aspects of materials and workmanship, will not be affected by the proposed Project.

Setting and feeling also contribute to the NRHP integrity of these resources. In Knight's irrigation system context, she explains the importance of setting:

> Historic photographs from the period clearly depict these irrigation structures in a rural setting surrounded by the agricultural fields they serve. This is the historic setting that conveys the character of the irrigation system and its significance in providing water for the agricultural development of the Valley. Moreover, this rural setting is essential in defining the relationship of the resource to the surrounding agricultural features and the open space. The presence of agricultural fields and vegetation contribute substantially to an irrigation system's sense of time and place... Modern day intrusions compromise the pastoral setting of irrigation systems in South Texas. The burgeoning suburbanization of South Texas has left many stretches of both abandoned and functioning canals surrounded by modern homes and commercial strips rather than agricultural fields (Knight 2009).

The proposed Project will affect the setting of the CCDD1 and CCID6, and in the case of those features closest to the Project site – Olmito Branch and Ditch No. 3 of the CCDD1 and one ditch of the CCID6 – feeling. Once completed, the generating station will be an additional feature visible from the districts and from the individual contributing resources (e.g., ditches) within the districts. However, this effect must be considered within the larger context of the

substantial growth and development that has occurred in the area since the mid-20th century that has radically altered the Project area reducing the amount of land remaining in agricultural use, especially in the last 20 years.

When originally constructed in 1902 and into the 1950s, the Project area outside of Los Fresnos was characterized by open land utilized for ranching and agriculture: buildings were few and widely dispersed, and the roads were not paved. Since that time, and particularly in the last 20 years, the areas south (Brownsville), west (Olmito), and north of the Project site (Los Fresnos) have experienced considerable development, including numerous residential subdivisions. Many of the large tracts of formerly agricultural land in the immediate Project vicinity is currently vacant and/or for sale in anticipation of further development. These changes have compromised the setting, feeling, and integrity of the irrigation and drainage systems. Within this context, the effects of the Project on the setting and feeling of the CCDD1 and CCID6 and contributing resources will be minimal.

The Project will have a more intense impact on those resources closest to the site: Olmito Branch and Ditch No. 3 of the CCDD1; and the CCID6 ditch that crosses Abelardo Road. Their setting and feeling have been compromised by adjacent construction that has altered the formerly rural, agricultural context. The Abelardo Road ditch runs through a modern residential subdivision and across a vacant field, no longer actively cultivated. Along the full length of Olmito Branch there is modern development: beginning in Olmito with residential subdivisions; continuing parallel to Highway 511 along the Project site south boundary, past the SRWA Treatment Plant, Rancho Verde Elementary School, and the asphalt plant to its connection point with Ditch No. 3. Ditch No. 3, entering the APE south of the Brownsville Sports Park, a massive recreational facility designed to accommodate 200,000 visitors a year, continues along a path through vacant land north between the Rancho Verde Elementary School and the asphalt plant, past the Project site and through vacant land where it eventually connects with Ditch No. 2. Of the three ditches in close proximity to the Project site, the setting and feeling of Ditch No. 3 is most intact, as a significant portion of its path is through open fields, albeit not actively cultivated.

Also a factor in assessing the effects of the Project on the Olmito Branch is the current condition and use of the ditch, which have diminished the integrity of the resource such that its current design and appearance do not represent its historic condition.

6.2 PALO ALTO BATTLEFIELD NATIONAL HISTORIC SITE

Background research revealed the presence of the Palo Alto Battlefield National Historic Site NHL within 0.6 miles of the Project site east boundary prior to cultural resources fieldwork (Appendix A: Photos 28 through 36). Further investigation into the history and boundaries of the NHL revealed two overlapping management units within the NHL:

- Palo Alto Battlefield National Historic Site National Historic Landmark, designated in 1960; and
- Palo Alto Battlefield National Historical Park, established in 1992.

The Palo Alto Battlefield National Historic Site, originally consisting of 50 acres, was designated an NHL on December 19, 1960 under the authority of the Historic Sites Act of 1935, which enabled the Secretary of the Interior to "make a survey of historic and archaeologic [sic] sites, buildings, and objects for the purpose of determining which possess exceptional value as commemorating or illustrating the history of the United States" (16 U.S.C. 462[b]). This list was the beginning of the NHL Program, which was formalized and expanded by the NHPA in 1966. NHLs were automatically included in the NRHP when it was established in 1966, so the Palo Alto Battlefield NHL also became a NRHP-listed property at that time.

In 1975, the NPS formally documented the NHL through survey and completion of a NRHP Inventory-Nomination Form. In addition to a history and physical description, the nomination form attempted to better define a boundary that encompassed the core of the conflict as well as the movements and associated landscape features. The initial recommended boundary was 8,176 acres. However, this boundary was refined over the next few years to the 6,600-acre tract that is the current NHL/NRHP boundary (Figure 1-4).

In 1991, the Palo Alto National Historic Site Act was signed into law, formally establishing the Palo Alto National Historical Park (16 U.S.C. 461). This law enabled the NPS to use Federal funds to acquire land for the purposes of establishing and operating a national park. The Act designated 3,400 acres for the park. That was expanded in 2008 to 3,434 acres, the current legislated boundaries (Figure 1-4).

Prior to 1998, all of the land within the National Historical Park was privately owned. In 1998 the NPS acquired the first parcel along Paredes Line Road. By 2000 approximately 1,400 acres were in NPS ownership. The NPS is in the process of acquiring additional parcels, with the goal of eventually acquiring all of the land within the legislated boundaries.

The distinction between the Palo Alto Battlefield National Historic Site NHL and the Palo Alto Battlefield National Historical Park is relevant within the Section 106 context, as the NHPA requires the consideration of historic properties, defined as those that are listed in or eligible for listing in the NRHP. Therefore, the Project's effects on the 6,600-acre NHL (rather than the 3,434-acre park) must be assessed.

As shown in Figure 1-4, the Palo Alto Battlefield NHL is located within the APE. The Project as defined in Section 1.1 is not expected to have direct effects on the property, and the special provisions for NHLs in the NHPA, which state that "Prior to the approval of any Federal undertaking which may directly and

adversely affect any National Historic Landmark, the head of the responsible Federal agency shall, to the maximum extent possible, undertake such planning and actions as may be necessary to minimize harm to such landmark," are understood not to apply to this undertaking.

Indirect effects from the Project have the potential to fall into two categories of the Adverse Effect Criteria outlined in the Section 106 implementing regulations:

- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance (Adverse Effect Criterion iv, 36 CFR §800.5[a][2][iv]); and
- Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features (Adverse Effect Criterion v, 36 CFR §800.5[a][2][v]).

The Project will not change the character of the property's use, but it will affect the physical features within the property's setting that contribute to its historic significance. The Project will result in the introduction of visual, atmospheric, and audible elements. These two categories of effects relate to two primary aspects of integrity: setting and feeling. Given the distance of the NHL on the east side of Paredes Line Road, the effects of the Project on the NHL are expected to be moderate. A discussion of the visual, atmospheric, and audible effects of the Project is presented below.

It should be noted that the CAA affords special protection to national park and wilderness areas across the U.S. designated as "Class 1" areas, for which additional focused analyses are required to assess proposed new emissions sources for both visual and atmospheric impacts. The Palo Alto Battlefield National Historic Site/National Historical Park is not a designated Class 1 resource under the CAA, and the additional requirements do not apply.

6.2.1 VISUAL EFFECTS

To enable an understanding of the potential for visual effects of the Project on the NHL, Tenaska prepared graphic renderings of the facility (Figures 6-1 and 6-2). As determined through these digital renderings, the Project will be visible from the key areas of public interpretation of the Palo Alto Battlefield National Historical Park (e.g., the overlook and pedestrian pathways accessing it). Project features that will have the most significant visual impact are the (up to) two HRSGs and (up to) two emissions stacks, and the cooling tower steam plume. As shown in Figure 6-2, however, the distance of the facility results in moderate visibility from the nearest point (west boundary) of the NHL. Given the flat topography of the area, visibility will decrease moving east from Paredes Line Road.

Tenaska plans to minimize visibility to the extent feasible through the paint color scheme. The visual effects of the Project on the NHL are further minimized by the presence of existing intrusions to the viewshed (Figure 6-3), including:

- Between the park and the Project site, two structures associated with an asphalt facility;
- Just south of the Project laydown area, a liquid holding tank at the SRWA Treatment Plant;
- On the south side of Highway 511 from the Project site, a 350-foot communications tower at the U.S. Border Patrol Brownsville Station;
- Overlooking and abutting the park at its southwest corner, the Highway 511 overpass and associated traffic;
- Forming the south boundary of the park, Highway 511 with its associated monopole lighting; and
- 1.7 miles from the park overlook, a large-scale industrial storage facility formerly utilized by Titan Tire Corporation.

These existing intrusions are of an industrial or utilitarian character and have diminished the setting and feeling of the NHL.

FIGURE 6-1. VISUALIZATION OF BIRD'S EYE VIEW FROM THE BATTLEFIELD WEST TOWARDS THE PROPOSED PROJECT

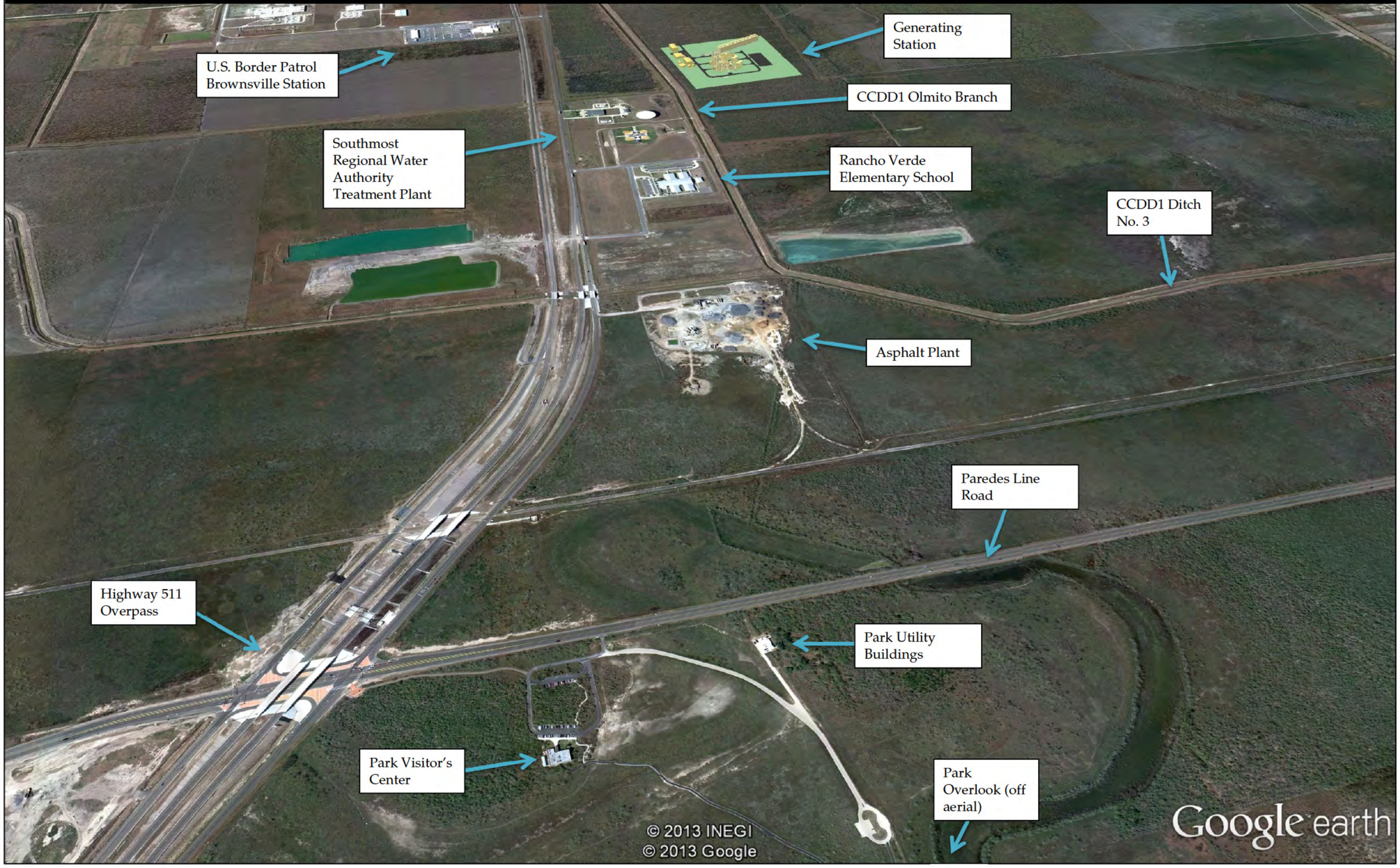
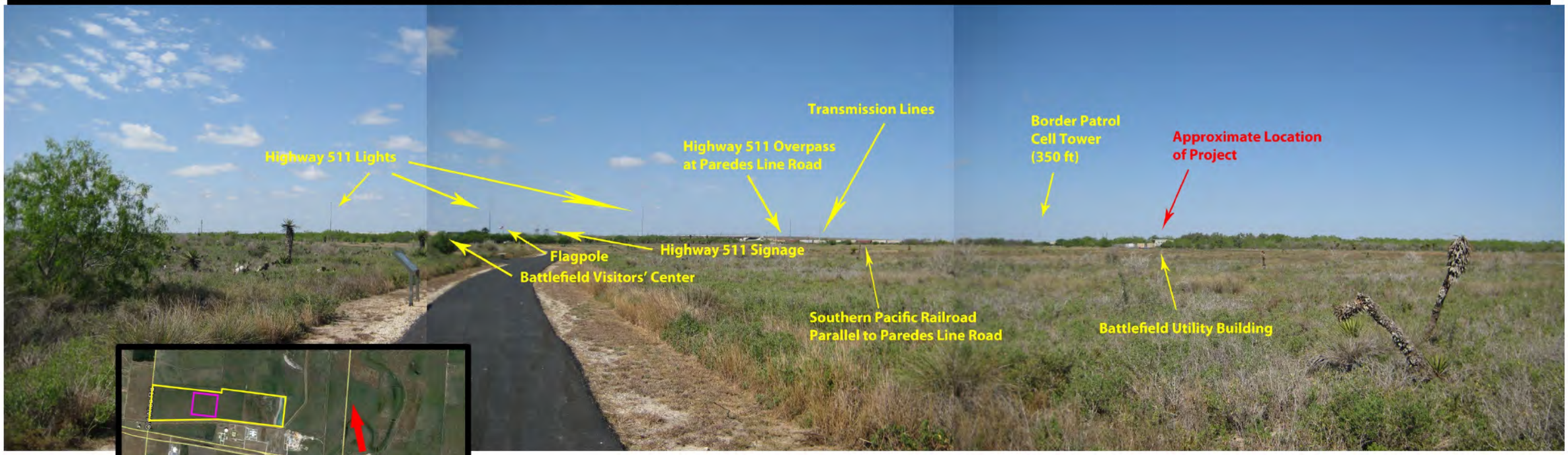
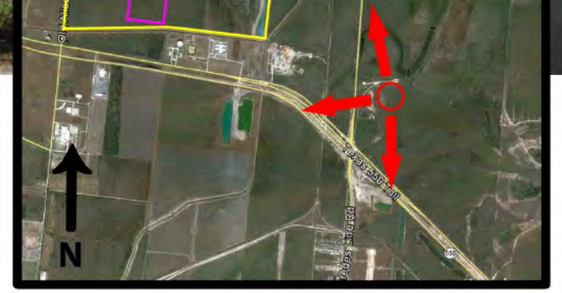


FIGURE 6-2. VISUALIZATION OF VIEW TOWARDS THE PROJECT FROM EAST SIDE OF PAREDES LINE ROAD NEAR PALO ALTO BATTLEFIELD NATIONAL HISTORICAL PARK ENTRANCE

FIGURE 6-3. EXISTING 180-DEGREE VIEW FROM PEDESTRIAN PATH LEADING TO OVERLOOK





During operation, the Generating Station cooling tower will produce a visible steam plume during certain atmospheric conditions (i.e., cooler temperatures), and emissions will be subject to strict federal and state opacity limits. To determine how often conditions would produce a visible steam plume, Tenaska prepared the analysis shown in Table 6-1, below. The table shows the probability in percentage of the presence of a visible steam plume during the specified hour of the day by month during a single year. Cells shown in yellow correspond to the operating hours of the Palo Alto Battlefield National Historical Park. The table shows that a visible plume is most likely to be seen during cooler winter months (January, February, March, November, December) when the sun is not out (i.e., overnight, early morning, evening). During the warmer months from April through October, a plume will rarely be visible during daylight hours. Note that this table does not account for prevailing winds, which will further reduce the visibility of the steam plume.

TABLE 6-1: Frequency of Visible Plume from Cooling Tower

TENASKA BROWNSVILLE GENERATING STATION

Frequency of Visible Plume from Cooling Tower[1]

Hour - CST	Hour - CDT	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
0	100	100	93	97	83	65	60	55	55	57	55	90	94
100	200	100	100	94	90	61	63	65	71	80	65	90	90
200	300	100	100	87	87	71	77	87	74	87	65	90	90
300	400	100	100	90	97	77	77	87	87	83	71	87	94
400	500	100	100	94	93	84	90	94	84	80	68	83	97
500	600	97	100	97	93	90	87	94	87	87	77	87	97
600	700	97	100	97	93	74	57	68	84	83	74	87	94
700	800	97	96	87	50	39	10	10	19	43	58	87	94
800	900	97	82	55	7	6	3	6	3	3	19	67	68
900	1000	84	68	23	3	6	0	3	0	3	6	10	52
1000	1100	48	43	13	3	3	0	0	3	3	6	0	32
1100	1200	29	29	13	0	0	0	0	3	3	6	0	29
1200	1300	29	29	10	0	0	0	3	3	3	6	0	16
1300	1400	29	29	10	0	0	0	3	6	0	3	0	13
1400	1500	29	29	10	0	0	0	3	6	3	3	0	16
1500	1600	32	25	10	3	3	0	3	0	0	10	0	16
1600	1700	39	32	10	3	3	0	0	3	0	10	0	32
1700	1800	39	36	13	0	3	0	0	3	0	6	0	35
1800	1900	100	75	42	3	3	0	3	3	0	16	30	61
1900	2000	100	93	68	23	6	0	3	6	7	29	70	74
2000	2100	100	96	81	47	26	10	0	10	23	32	83	74
2100	2200	100	96	87	60	32	27	6	10	30	45	87	87
2200	2300	100	93	90	70	42	37	16	19	53	48	90	94
2300	0	100	93	100	83	55	43	29	45	50	52	90	87

[1] values represent the percentage of hours for the respective month and hour of day with a visible plume from the cooling tower, based on 1981 Brownsville weather data and SPX Cooling Technologies fogging curve for 17.9 °F range (conservatively corresponding to summer baseload fired operating condition)

Yellow is approximate hours of daylight

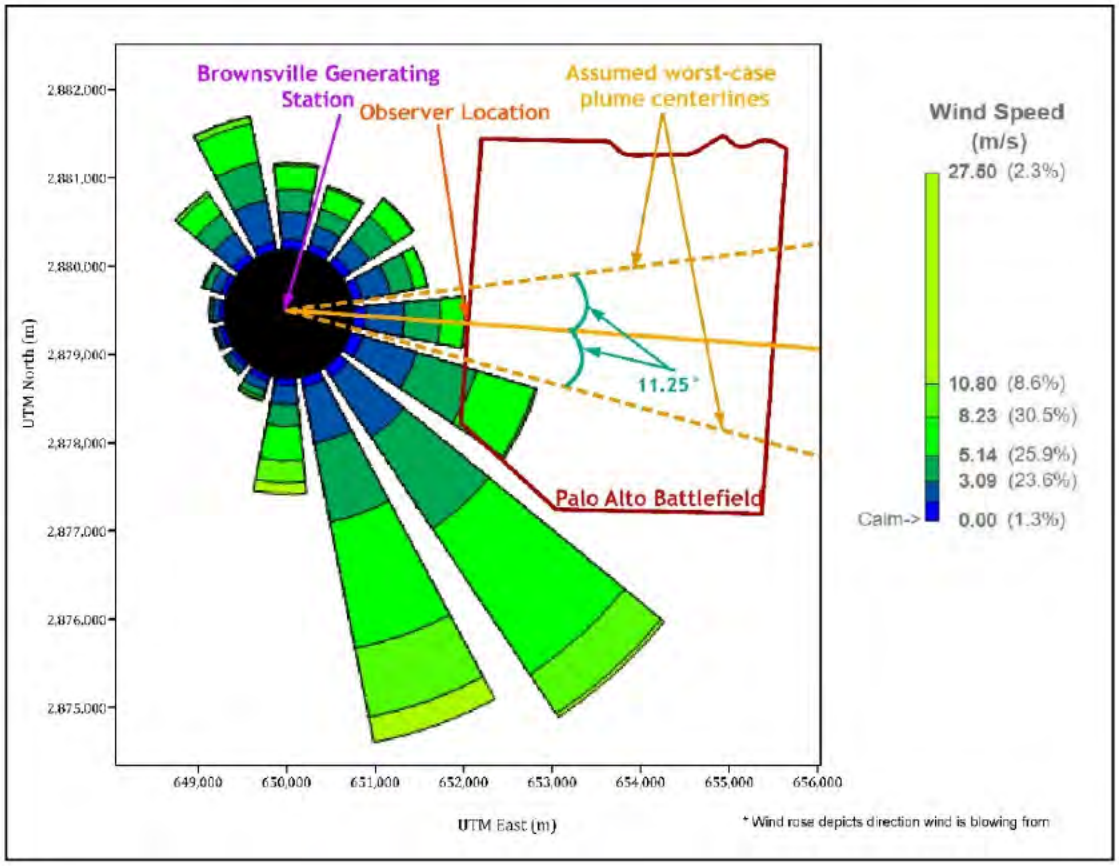
Blue is approximate daylight savings time (2013 dates are March 10 through November 3)

To assess the potential for emissions from the Project to affect visibility within the park, Tenaska retained Trinity Consultants to prepare a visibility analysis using the VISCREEN model. As summarized in a memo from Trinity Consultants to Tenaska dated July 17, 2013, the study indicated that it is highly unlikely that visibility at the park will be affected by Project emissions because it

is very rare that winds blow in that direction (Kambham 2013b). However, in order to provide a more concrete demonstration of visibility impacts, a VISCREEN analysis and a VISCREEN Level 2 analysis were conducted. The results of the VISCREEN Level 2 analysis, as well as the very infrequent winds in the direction of the Palo Alto Battlefield National Historical Park from the proposed site of the Generating Station, revealed that impacts at the park will be negligible.

The analysis followed the guidelines published in the *Workbook for Plume Visual Impact Screening and Analysis (Workbook)* (EPA 1988). As an initial screening analysis, a Level 1 VISCREEN analysis was conducted. This screening analysis assumes worst-case meteorological conditions of category F stability and 1.0 m/s wind speed (a combination which occurred less than 0.1% of the time over the evaluated meteorological period). Results from the Level 1 analysis were above the screening criteria values. Therefore, a Level 2 screening analysis, which allows user-specific meteorological conditions, was conducted.

FIGURE 6-4: Location of Brownsville Generating Station and Palo Alto Battlefield National Historical Park Relative to Wind Rose for Cameron County (2006-2010)



To determine the meteorological conditions specific to the site and Palo Alto Battlefield National Historical Park, the frequency of designated stability class and wind speed pairings occurring for the wind direction that would affect the park (i.e., winds blowing from the west) was evaluated using ISC formatted meteorological data for Cameron County for 2006-2010. Guidelines for conducting a VISCREEN Level 2 analysis specify that the wind speed and stability class representing the worst 1% of meteorological conditions should be chosen. For meteorological conditions specified in the *Workbook*, a table displaying the joint frequency of occurrence of wind speed, wind direction, and stability class is created, and conditions are sorted from worst-case to best-case dispersion. The cumulative frequency for each condition is determined, and the worst-case conditions showing a cumulative frequency of greater than 1% are chosen. However, because winds from the west only occurred for 321 hours (0.73%) of the 5 years of meteorological data evaluated, this approach was infeasible as the 1% criteria is never met. Per the *Workbook*, the cumulative frequency analysis is to be conducted for stability classes D, E and F (at varying wind speeds). In the case of the Cameron County meteorological dataset, a stability class/wind speed combination of D8 yielded the cumulative frequency closest to 1%. As such, to confirm that visible plume impacts at the Battlefield will be negligible, VISCREEN was run using stability class D and a wind speed of 8 m/s.

VISCREEN output values for viewing a plume against the sky for plume parcels located inside the boundaries of the Palo Alto Battlefield National Historical Park were below the screening criteria, therefore the analysis is complete. Results of the Level 2 analysis are summarized below in Table 6-2. Note that although VISCREEN calculated a higher critical value for Delta E, Tenaska has conservatively compared the Delta E value corresponding to a theta of 140° to the lower default contrast threshold value of 2.0.

Table 6-2: ***VISCREEN Level 2 Results for Inside Palo Alto Battlefield National Historical Park***

					Delta E		Contrast	
Background	Theta	Azi	Distance	Alpha	Critical Value	Plume	Critical Value	Plume
Sky	10	162	5.6	6	2.00	0.794	0.05	0.013
Sky	140	162	5.6	6	2.00	0.607	0.05	-0.018

6.2.2 *ATMOSPHERIC EFFECTS*

The NPS prepared a Cultural Landscape Inventory (CLI) for the Palo Alto Battlefield National Historic Site NHL in 2010 (NPS 2010). The CLI identified categories of contributing and non-contributing features of the NHL: archeological sites; buildings and structures; circulation; constructed water features; land use; natural systems and features; small scale features; spatial organization; topography; vegetation; and views and vistas. However, the impact of the Project on natural resources has been analyzed in a separate Biological Assessment, prepared consistent with the requirements of NEPA concurrently with this cultural resources report. Further, because some natural resources of the NHL are important within a cultural context, the impact of the Project is conservatively presented for the Section 106 process, as well. Accordingly, a brief discussion of the atmospheric impacts of the Project on natural resources in general is provided below, followed by a summary of expected particulate matter deposition at the park.

The Palo Alto Battlefield National Historical Park is located approximately 0.6 miles east of the Project. Direct impacts to cultural landscape features are not expected during construction or operation due to their distance from the Project. Noise has not been shown to impact natural communities or habitats (see further noise discussion, below). Dust accumulation can affect vegetation by covering the surface of the plant and impeding biological processes, but best management practices will be used to minimize dust. Further, air emissions dispersion modeling can show how pollutants are carried downwind. Wind direction throughout the year is most commonly from the southeast (31%) and south (22%). Wind direction from the west (2%) or southwest (1%) would carry dust from the Project towards the park (Weatherspark 2013). Because the wind is blowing towards the park on average 3% of the year, no indirect impacts are expected on the Palo Alto Battlefield due to dust or air emissions. Indirect impacts to these cultural landscape features are not expected due to construction or operation.

FIGURE 6-5: Average Annual Wind Directions for the Period from 1974-2012

The fraction of time spent with the wind blowing from the various directions over the entire year. Values do not sum to 100% because the wind direction is undefined when the wind speed is zero.

To assess the potential impact of particulate matter (PM) emitted from the Generating Station on the Palo Alto Battlefield National Historical Park, Tenaska retained Trinity Consultants to undertake a limited analysis of expected deposition. As summarized in a memo from Trinity Consultants to Tenaska dated July 19, 2013, the Project is not expected to contribute significantly to deposition at the park.

The Generating Station will be fueled exclusively with pipeline quality natural gas. Direct emissions of PM and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) from the Project are not expected to exceed 92.34 tpy and 69.37 tpy, respectively. In addition to direct PM, secondary PM may occur as a result of emissions of gaseous NO_x and SO_2 which can be chemically converted in the atmosphere to PM species nitrates and sulfates, respectively. Nitrate and sulfate particles are small, and therefore fall under the classification of $PM_{2.5}$. The transformation of NO_x to nitrates is a slow process. Therefore, nitrate formation is not expected to occur close to the Project. As the park is located approximately 0.6 miles from the Project, deposition of nitrates at the park are expected to be negligible. The conversion of SO_2 to sulfates occurs much more rapidly. However, the Project utilizes a very clean fuel with low sulfur content, and therefore will emit less than 19 tons of SO_2 annually. As such, it is expected that sulfate deposition at the park will be insignificant.

To further demonstrate the minimal effects of particle deposition at the park, concentrations of direct $PM_{2.5}$, nitrates, and sulfates occurring at the park were estimated using an AERMOD modeling analysis and an evaluation of the ratio of NO_x to nitrates at a representative background monitor.

Concentrations of NO_x, sulfates, and direct $PM_{2.5}$ over the entire modeled receptor grid (which encompasses the park) were determined through an AERMOD analysis. Note that the use of these values is conservative because the maximum values may not occur within the boundaries of the park, and likely do not all occur at the same location (i.e., maximum concentrations of direct $PM_{2.5}$ and nitrates/sulfates do not occur at the same time or location). Additionally, modeled emissions for determining sulfate concentrations were based on the conservative assumption that all SO_2 is converted to ammonium sulfate ($(NH_4)_2SO_4$). Maximum ground level concentrations for these pollutants were also evaluated within the park area.

A representative monitor was used to determine that for the most recent full year of data (2012) the ratio of nitrates to NO_2 is 5.52% based on an annual average. Using these ratios, the contribution of nitrates to $PM_{2.5}$ was estimated. The resulting concentrations of direct $PM_{2.5}$, nitrates, and sulfates are shown below in Table 6-3. As this conservative analysis yields relatively low concentrations of $PM_{2.5}$, the Project is not expected to contribute significantly to deposition at the park.

TABLE 6-3: Maximum Estimated Concentrations

Pollutant	Annual Concentration (µg/m³)	
	Inside Park Boundary	Entire Modeled Grid
$PM_{2.5}$ (direct)	0.0124	0.4383
Nitrates	0.0025	0.0974
Sulfates $[(NH_4)_2SO_4]$	0.0051	0.1744
Total $PM_{2.5}$	**0.0200**	**0.7101**

6.2.3 AUDIBLE EFFECTS

As part of Tenaska's efforts to assess the audible effects of the proposed Project on the surrounding area, Tenaska retained Burns & McDonnell Engineering Company, Inc. (BM) to conduct an ambient noise survey to establish a baseline for existing sound levels in the area. BM personnel performed ambient sound-level measurements near the proposed generating station. This was followed by predictive modeling to determine the noise impacts the Project may have on the surrounding areas. The baseline study included a receptor on Ditch No. 3 of the CCDD1, approximately 2,400 feet west of Paredes Line Road and the west edge of the Battlefield (MP3 on Figure 6-1). The audible effects of the Project on the Battlefield, and three points specifically – Paredes Line Road, the Battlefield overlook, and the east park boundary (Figure 6-1) – were modeled.

Project construction activities will be temporary and will occur over a period of approximately 30 months. Noise levels from such activities will vary with the level of activity, number and pieces of equipment operating, and the location of the construction activity.

To predict overall sound levels once the generating station is in operation, the modeled sound levels from the facility were logarithmically added to the existing ambient sound levels. The ambient sound levels measured at MP3 are shown in Table 6-3 below.

TABLE 6-4: Measured Sound Levels at MP3

Measurement Point	Date	Time Period	Existing Ambient Noise Levels (Leq dBA)
MP3	March 19, 2013	12 P.M. – 2 P.M.	42.1
MP3	March 19, 2013	6 P.M. – 8 P.M.	44.5
MP3	March 20, 2013	12 A.M. – 2 A.M.	38.7
MP3	March 20, 2013	6 A.M. – 8 A.M.	38.8

To evaluate the expected sound pressure levels from operation of the generating station, ambient background measurements need to be logarithmically added to

the model-predicted sound levels. Because the distance between the nearest sound source (Highway 511) and the Battlefield points are the same or greater than that between the highway and MP3, we can assume the ambient measurements at MP3 will be the same or louder than those at the Battlefield points. Taking the sound levels measured at MP3, and logarithmically adding the model-predicted sound levels from each point will provide a conservative estimate of noise at the Battlefield during operation of the generating station. The expected sound levels at the three points during steady-state operation are shown in Table 6-5 below. Figure 6-7 illustrates a graphical representation of the sound generated from the new facility as predicted sound level contours in 5 dBA increments propagating across the Battlefield.

TABLE 6-5: Estimated Noise Levels from Project

Receiver Location	Receiver UTM Coordinates (NAD 1983)*	MP3 Ambient Noise Level (dBA)	Time Period	Estimated Noise Level from Project (dBA)	Overall Projected Noise Level (dBA)	Noise Level Increase (dBA)
Paredes Line Road	652,064 m E 2,879,462 m N	42.1	12 P.M. – 2 P.M.	45.7	47.3	5.2
		44.5	6 P.M. – 8 P.M.		48.2	3.7
		38.7	12 A.M. – 2 A.M.		46.5	7.8
		38.8	6 A.M. – 8 A.M.		46.5	7.7
Battlefield Overlook	652,785 m E 2,878,967 m N	42.1	12 P.M. – 2 P.M.	42.7	45.4	3.3
		44.5	6 P.M. – 8 P.M.		46.7	2.2
		38.7	12 A.M. – 2 A.M.		44.2	5.5
		38.8	6 A.M. – 8 A.M.		44.2	5.4
East Park Boundary	653,644 m E 2,879,404 m N	42.1	12 P.M. – 2 P.M.	41.0	44.6	2.5
		44.5	6 P.M. – 8 P.M.		46.1	1.6
		38.7	12 A.M. – 2 A.M.		43.0	4.3
		38.8	6 A.M. – 8 A.M.		43.0	4.2

*Zone 14.

The projected worst-case sound pressure levels at the three points during steady state operation of the facility range from 43.0 dBA to 48.2 dBA. The three points show increases in sound levels from 1.6 dBA to 7.8 dBA based on location and time of day. All three points remain below the strictest Brownsville noise limit of 50 dBA for dwelling zones. It is expected that the NPS would be most concerned with daytime sound level increases as the park is open only from 8:00 am to 5:00 pm. Less than a 3-dB change in continuous broadband sound is generally considered "not noticeable" to the average listener. A 5-dB change is generally considered "clearly noticeable" and a 10-dB change is generally considered a

doubling (or halving) of the apparent loudness. Paredes Line Road shows a noticeable increase in sound during the mid-day time period. This point however is located close to the road where traffic would normally dominate sound. The Battlefield overlook would see an increase of 3.3 dBA during the mid-day time period which would be considered barely noticeable to the average listener. The east boundary point would see an increase of 2.5 dBA which is considered "not noticeable" to the average listener.

The peak sound levels from the generating station would be the result of short-duration events such as startup, shutdown, emergency, or steam-blow operations. Otherwise, the facility will operate at relatively constant sound levels. During the times when electricity is not being generated, some equipment on site may still be operating. The equipment may produce small amounts of noise, but will be very quiet compared to normal operation.

FIGURE 6-6. SOUND RECEPTOR LOCATIONS

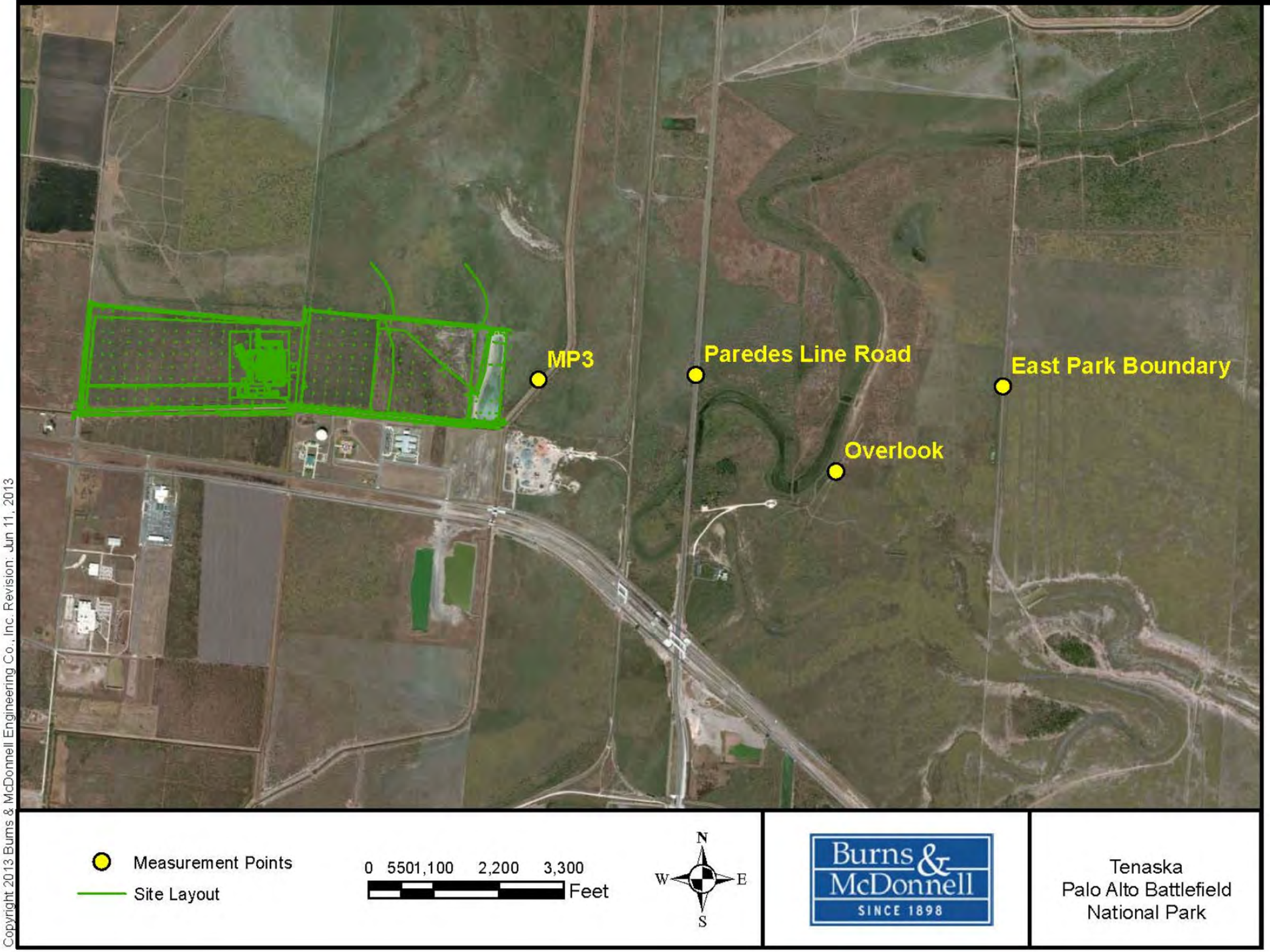
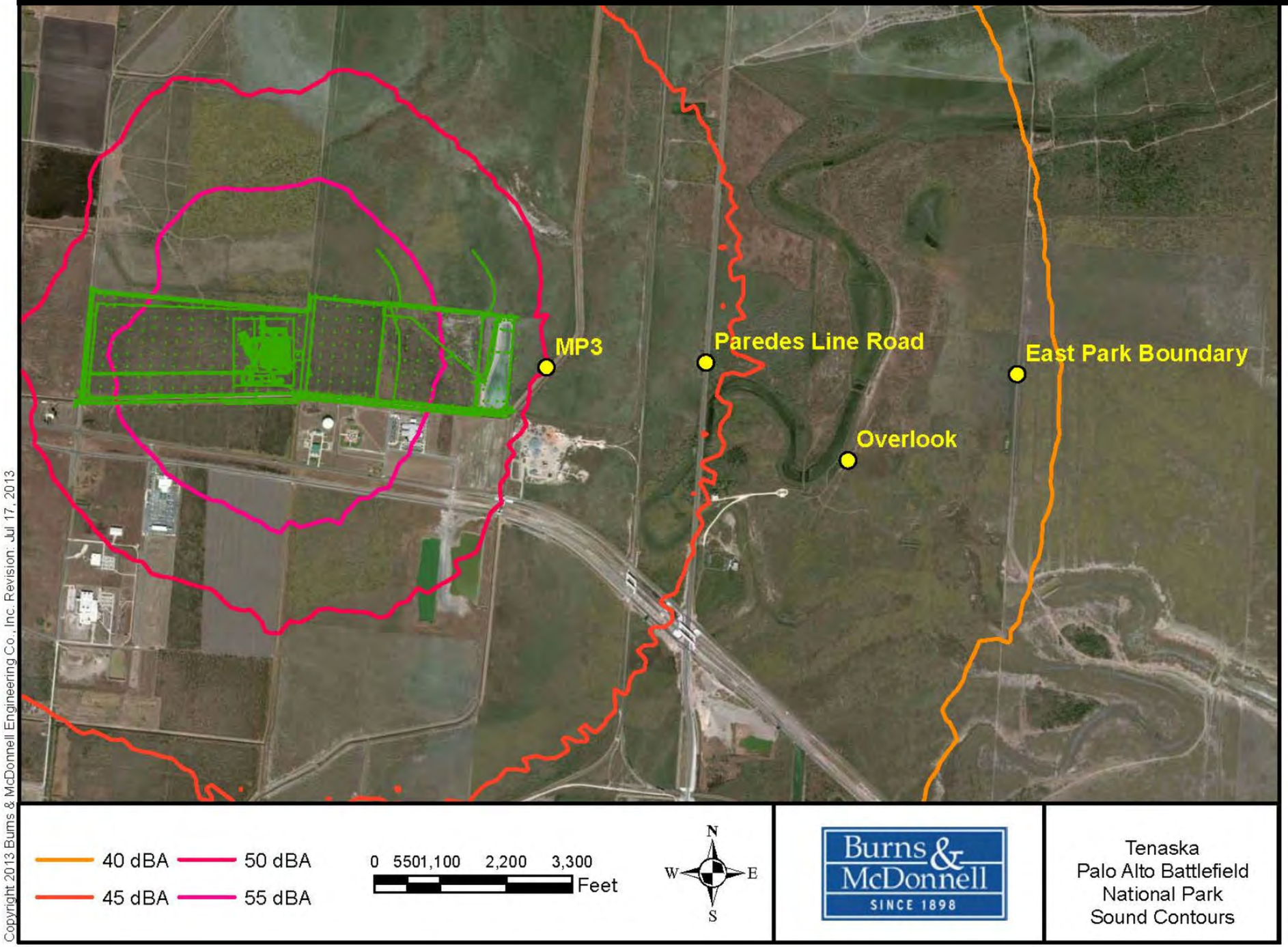


FIGURE 6-7. SOUND CONTOURS



6.2.4 SPECIAL CONSIDERATIONS

Effects to National Historic Landmarks

As stated above, the Project as defined in Section 1.1 is not expected to have direct effects on the property, and the special provisions for NHLs in the NHPA are understood not to apply to this undertaking. Other special provisions in the NHPA and the Section 106 implementing regulations do apply to Section 106 undertakings affecting an NHL.

- The agency (i.e., EPA) must notify the Secretary of the Interior (SOI) (36 CFR §800.10[c]);
- If an adverse effect is possible, the agency must invite the SOI to participate in Section 106 consultation (36 CFR §800.10[c]);
- If an adverse effect determination is made, the agency must request the Advisory Council on Historic Preservation (ACHP) to participate in Section 106 consultation to resolve those adverse effects, and the ACHP shall give special consideration to the NHL in doing so (36 CFR §800.6[a][1][i][B], §800.10[a], and [b]);
- The ACHP may request a report from the SOI presenting the significance of the NHL, the effects of the undertaking, and recommendations of ways to avoid, minimize, and mitigate adverse effects (36 CFR §800.10[c] and 16 U.S.C. 470u); and
- If the ACHP participates in consultation, they shall report the outcome of the Section 106 process to the SOI and the head of the lead agency (i.e., EPA).

Whether a specific requirement listed above applies to this Project, it is clear that NHLs are to be given special consideration in the Section 106 process.

Effects to Battlefields

The American Battlefield Protection Program (ABPP) within the NPS promotes the preservation of significant historic battlefields associated with wars on American soil (16 U.S.C 469k–1) (NPS 2013). The goals of the program are:

- to protect battlefields and sites associated with armed conflicts that influenced the course of our history;
- to encourage and assist all Americans in planning for the preservation, management, and interpretation of these sites; and
- to raise awareness of the importance of preserving battlefields and related sites for future generations.

The ABPP focuses primarily on land use, cultural resources and site management planning, and public education. While the ABPP has no defined regulatory role in the Section 106 process, they may participate in the Section 106 as an "additional consulting party" consistent with 36 CFR §800.2 (c)(5), which states

that "certain individuals and organizations with a demonstrated interest in the undertaking may participate as consulting parties due to the nature of their legal or economic relation to the undertaking or affected properties, or their concern with the undertaking's effects on historic properties."

On their website, the ABPP provides an explanation of their interest in participating in Section 106 consultation, stating that the ABPP may participate in the Section 106 process when a Federal undertaking:

- Has substantial impacts on battlefields of national significance;
- Has substantial impacts on more than one battlefield;
- Clearly contributes to substantial future (cumulative) impacts on a battlefield;
- Has substantial impacts on battlefields that have received ABPP grants;

  Presents important questions of policy such as cases where the outcome will set a precedent affecting ABPP policies or program goals, or when there is the development of a programmatic agreement that alters the way the Section 106 process is applied to a group or type of undertakings that routinely have adverse effects on battlefields; and
- Has the potential for presenting procedural problems such as cases with substantial public controversy that is related to battlefield preservation issues, or cases with disputes among or about consulting parties which the ABPP's involvement could help resolve (NPS 2013).

Although the proposed Project is not expected to trigger any of these criteria for ABPP participation, an awareness of the group and their potential interest in the Section 106 process is beneficial.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Tenaska has completed cultural resources investigations to support the EPA Region 6 GHG Permit Application for the Generating Station, presently designed to have a nominal capacity of 800 megawatts in combined-cycle operation. For the purposes of these cultural resources investigations, the Section 106 undertaking was determined to be the construction and operation of an electric generation station, including natural gas generation unit(s), a cooling tower, storm water pond(s), storm water outfall structure(s), access road(s), and construction laydown area(s).

Linear interconnect elements that are part of, or interrelated with, the Project are addressed in Attachments 1 and 2:

- Transmission Interconnect Line;
- Water Discharge Pipeline and Outfall;

BPUB will also own and operate a regional Natural Gas Transmission Pipeline and Water Reuse Pipeline for its broader economic development purposes. These BPUB regional projects are intended to serve multiple customers, not merely the Generating Station. Tenaska and BPUB believe these regional projects are independent, and not interrelated, actions and not properly considered part of the Project for purposes of this assessment, as set forth in letters from BPUB to EPA dated April 18 and 26, 2013.

Accordingly, the August 6, 2013 cultural resources assessment report did not address the Natural Gas Transmission Pipeline and Water Reuse Pipeline to be developed by BPUB. Notwithstanding the independent utility of these BPUB regional projects, Attachments 3 & 4 provide a supplemental assessment of the Natural Gas Transmission Pipeline and Water Reuse Pipeline for the purpose of advancing EPA's consideration of Tenaska's GHG PSD permit pending receipt of a formal determination that the scope of the Project does not include these independent regional projects. Tenaska and BPUB maintain that these regional projects are beyond the scope of the Generating Station Project.

The Project is to be located on a 275-acre greenfield parcel located approximately 8.6 miles north of downtown Brownsville on the north side of Highway 511 in Cameron County, Texas. ERM defined the area within which direct effects may occur to be a 236-acre area, consisting of the Project site less a 14.51-acre potential wetland area and a 24.4-acre transitional area at the east end of the site.

One historic property was known to be present within the APE prior to conducting the cultural resources surveys: the Palo Alto Battlefield National Historic Site, an NHL historically significant as the site of the first battle of the U.S.-Mexican War on May 8, 1846.

No extant buildings were observed within the Project site. An intensive archeological survey was conducted within the Project site, including shovel

testing throughout the site and metal detection of 27.56 acres, resulting in the discovery of eight (8) isolated artifacts related to late 19th- to early 20th-century agricultural activities. No cultural resources with the potential to be eligible for listing in the NRHP were observed within the Project site.

ERM delineated an APE through windshield survey and consideration of the expected visual impacts, noise, and particulate matter deposition from the Project, as well as the topography and existing obstructions in the area, resulting in an approximately 14-square mile APE.

ERM's cultural resources investigations resulted in identification of two other historic properties in the APE: CCID6, determined eligible for listing in the NRHP through Section 106 consultation between TxDOT and THC in 2009; and CCDD1. These systems were among the earliest to be established in south Texas (1902 and 1905, respectively), and are historically significant on a local level under NRHP Criterion A for their roles in the agricultural and residential development of the area. A thorough evaluation of the eligibility and integrity of the full CCID6 and CCDD1 systems was beyond the scope of this study. However, given their historical significance ERM recommends as a conservative measure that they be treated as eligible for the purposes of Section 106 for the Project. No other aboveground historic properties were identified within the APE.

Tenaska coordinated with THC, NPS, and the CCHC. Face-to-face meetings were conducted with these three parties and solicited their input on the proposed Project, the approach to cultural resources investigations, and the effects of the project on these resources.

Recommendations

It is ERM's opinion that the efforts made by Tenaska are sufficient to identify historic properties that may be affected by the proposed Project as defined in Section 1.1, and that no further cultural resources investigations to identify historic properties are necessary.

Given the proximity of the Project site to the Battlefield, it is recommended that Tenaska consider implementing a chance finds protocol during construction. This protocol would indicate what to do in the event that previously unidentified cultural resources with the potential to be listed in the NRHP are encountered during the course of ground disturbing activities (e.g., excavation). A chance finds protocol would aid in the avoidance of adverse effects to historic properties.

In consideration of the presence of historic properties in the APE, including an NHL, and the concerns raised by potential stakeholders, ERM recommends that the Section 106 process be formally initiated and consulting parties engaged. In addition to the THC and the NPS, ERM recommends the consideration of the following organizations as potential consulting parties:

- U.S. Secretary of the Interior (required);
- Advisory Council on Historic Preservation (optional but may become required);
- Cameron County Historical Commission (optional);
- Cameron County Drainage District No. 1 (optional);
- Cameron County Irrigation District No. 6 (optional);
- Brownsville Historical Association (optional); and
- American Battlefield Preservation Program (optional).

Tenaska and ERM understand that the EPA is aware of the requirement to engage Indian Tribes in the Section 106 process, and that it is the agency's intent to do so upon initiation.

Consistent with 36 CFR §800.10(c) as presented in Section 6.2.4, ERM recommends that the SOI be notified of the undertaking and its potential to affect the NHL Palo Alto National Historic Site. Additionally, because the Federal agency may request the participation of the ACHP in any Section 106 consultation, and in consideration of the potential involvement of the SOI, it is recommended that the ACHP be notified of the undertaking and its potential to affect the NHL. The ACHP's role in such cases is to ensure that the regulatory process is being followed, which can prove to be a benefit to the Federal agency in cases of heightened review.

8.0 REFERENCES

8.1 PRINCIPAL INVESTIGATORS

Albee, Carrie. ERM: Architectural Historian; Senior Project Manager – Impact and Assessment Planning (IAP) Group: Northern Division, Washington, DC.

McClure-Cannon, Tara. ERM: Archeologist, RPA; Cultural Resources Consultant –Impact and Assessment Planning (IAP) Group: Southwest Division, Houston, TX.

Port, Dave. ERM: Archeologist, RPA; Cultural Resources Consultant – Impact and Assessment Planning (IAP) Group: Southwest Division, Houston, TX.

Nash, Sean. CEI: Archeologist, RPA: Corpus Christi, TX.

8.2 REFERENCE DOCUMENTS

Bauer, K. Jack
1992 *The Mexican War 1846-1848* (original publication 1974), University of Nebraska Press, Lincoln and London.

Black, Stephen L.
1989 Environmental Setting. In *From the Gulf to the Rio Grande: Human Adaptation in Central South, and Lower Pecos Texas*, by Thomas R. Hester, Stephen L. Black, D. Gentry Steele, Ben W. Olive, Anne A. Fox, Karl J. Reinhard, and Leland C. Bement. Research Series No. 3, Arkansas Archeological Survey, Fayetteville.

Blair, W. F.
1950 "The Biotic Provinces of Texas". *Texas Journal of Science* 2 (1): 93-116

Bonine, Mindy L., Laura A. Acuna and Ken Lawrence
2006 *Archeological and Historic Archival Background Research and Cultural Resource Survey for the Proposed Farm-To-Market 511 Road Expansion Project, Brownsville, Cameron County, Texas*. Archeological Studies Program, Report No. 78. SWCA Environmental Consultants, Austin, Texas.

Brewton, J.L., F. Owen, S. Aronow, and V.E. Barnes
1994 *Geologic Atlas of Texas: McAllen-Brownsville Sheet*. Reprinted. Arthur Carleton Trowbridge Memorial Edition. Originally published 1976. Bureau of Economic Geology, University of Texas, Austin.

Brown, L.F., Jr., J.H. McGowen, T.J. Evans, C.G. Groat and W. L. Fisher

1980 *Environmental Geologic Atlas of the Texas Coastal Zone: Brownsville-Harlingen Area.* Bureau of Economic Geology, The University of Texas at Austin.

Campbell, Thomas N.
2013 *Tejon Indians*, Handbook of Texas Online. Electronic document, (http://www.tshaonline.org/handbook/online/articles/bmt31), accessed April 28, 2013.

Caran, S. Christopher, Samuel D. McCulloch, Jan Jackson, B.M. Albert, Winsborough, and Isotope Geochemistry Laboratory of the Illinois State Geological Survey.

2005 *Report on a Geoarcheolocial Investigation at the Palo Alto Battlefield National Historic Site (41CF92) Cameron County, Texas.* McCulloch Archeological Services, LLC, San Marcos, Texas.

Collins, M. B.
1998 Early Paleoindian Complexes. In *Wilson Leonard, an 11,000-Year Record of Hunter-Gatherers in Central Texas*, assembled and edited by M.B. Collins. Studies in Archeology and Archeological Studies Program. Texas Archeological Research Laboratory, The University of Texas at Austin, and the Texas Department of Transportation, Austin.

Fenneman, N.M.
1938 *Physiography of the Eastern United States.* New York: McGraw-Hill.

Garza, Alicia A.
2013a *Los Fresnos, TX*, Handbook of Texas Online. Electronic document, http://www.tshaonline.org/handbook/online/articles/hjl15 , accessed April 30, 2013.

2013b *Olmito, TX*, Handbook of Texas Online. Electronic document, http://www.tshaonline.org/handbook/online/articles/hlo15 , accessed April 30, 2013.

2013c *Rancho Viejo, TX*, Handbook of Texas Online. Electronic document, http://www.tshaonline.org/handbook/online/articles/hrrru , accessed April 30, 2013.

Garza, Alicia A. and Christopher Long
2013 *Cameron County*, Handbook of Texas Online. Electronic document, http://www.tshaonline.org/handbook/online/articles/hcc04 , accessed April 28, 2013.

Gustavson, T.C., and M. B.Collins

1998 *Geoarcheological Investigation of Rio Grande Terrace and Flood Plain Alluvium from Amistad Dam to the Gulf of Mexico*. Technical Series 49. Texas Archeological Research Laboratory, Austin. Archeolocial Strudies Program, Report 12. Texas Department of Transportation, Austin.

Hall, Grant D., Thomas R. Hester, and Stephen L. Black
1986 *The Prehistoric Sites at Choke Canyon Reservoir Southern Texas: Results of Phase II Archeological Investigations*. Center for Archeological Research, The University of Texas at San Antonio, Choke Canyon Series: Volume 10

Hester, Thomas R.
1995 *The Prehistory of South Texas*: *The Bulletin of the Texas Archeological Society 66:427-459.* Volume 66/1995. The Society at Austin, Texas.

Kambham, Latha
2013a *Tenaska Brownsville Generating Station – Deposition Analysis for Cultural Report*. Memorandum from Trinity Consultants to Mr. Larry Carlson, Tenaska. July 19, 2013.

2013b *Tenaska Brownsville Generating Station – Visibility Analysis for Cultural Report*. Memorandum from Trinity Consultants to Mr. Larry Carlson, Tenaska, Inc. July 17, 2013.

Keillor, James A.
n.d. "A Brief History of Los Fresnos." Electronic document, http://www.losfresnoschamber.com/pdf/Keillor.pdf, accessed November 4, 2013.

Knight, Lila
2009 *A Field Guide to Irrigation in the Lower Rio Grande Valley*. Historical Studies Report No. 2009-01. Texas Department of Transportation, Environmental Affairs Division, Historical Studies Branch. Electronic document, http://ftp.dot.state.tx.us/pub/txdot-info/env/ifg_3.pdf, accessed July 26, 2013.

Mangum, A. W. and Ora Lee Jr.
1908 *Soil Survey of the Brownsville Area, Texas*. United States Department of Agriculture, Bureau of Soils. The Portal to Texas History. Electronic document, http://texashistory.unt.edu/ark:/67531/metapth19807/m1/1/?q=1907%20soil%20survey%20of%20the%20Brownsville%20Texas, accessed May2, 2013.

Moore, D.W. and E.G. Wermund, Jr.
1993 *Quaternary Geological Map of the Monterrey 4x6 Degree Quadrangle, United States: U.S. Geological Survey Miscellaneous Investigations Series Map I-1420 (NG-14)*,Electronic document,

http://pubs.er.usgs.gov/publication/i1420(NG14) , accessed May 2, 2013.

Nash, Sean R.
2001 *The Buckner Ranch Site (41BE2): a re-examination of the data from the 1938-1941 Texas Memorial Museum investigations,* University of Texas, unpublished Masters thesis.

National Park Service (NPS)
2013 *American Battlefield Protection Program.* Electronic document, http://www.nps.gov/hps/abpp/, accessed July 26, 2013.

2010 *National Park Service Cultural Landscape Inventory: Palo Alto Battlefield Landscape, Palo Alto Battlefield National Historical Park*. Draft Report on file at the Texas Historical Commission.

1990 *National Register Bulletin [#15]: How to Apply the National Register Criteria for Evaluation*. Revised 1991, 1995, 1997. Revised for Internet 1995.

Ramos, Raul A.
2013 *Tienda de Cuervo, Jose*, Handbook of Texas Online. Electronic document, http://www.tshaonline.org/handbook/online/articles/fti19 , accessed April 26, 2013.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture (SSS NRCS USDA)
2013a Web Soil Survey. Electronic document, http://websoilssurvey.nrcs.usda.gov/ , accessed May 9, 2013.

2013b Official Soil Series Descriptions. Electronic document, http://soils.usda.gov/technical/classification/osd/index.html, accessed May 9, 2013.

Terneny, Tiffany T.
2005 *A Re-Evaluation of Late Prehistoric and Archaic Chronology in the Rio Grande Delta of South Texas,* University of Texas Unpublished Dissertation. Electronic document, www.library.utexas.edu/etd/d/2005/**terneny**d72304/**terneny**d72304.pdf accessed May 2, 2013

Texas Beyond History
2013 *Native Peoples of the South Texas Plains During Early Historic Times,* University of Texas, Austin. Electronic document, http://www.texasbeyondhistory.net/st-plains/peoples/index.html accessed December 18, 2013.

Texas Historical Commission (THC)
2013 Texas Archeological Sites Atlas Electronic database: http://nueces.thc.state.tx.us/

nd *Texas Historical Commission Request for SHPO Consultation: Projects Subject to Section 106 of the National Historic Preservation Act and/or the Antiquities Code of Texas.* Electronic document, http://www.thc.state.tx.us/public/upload/forms/SHPO_Consultation_Form-Ver0811.pdf, accessed July 26, 2013.

Turner, Ellen S., Thomas R. Hester, and Richard L. McReynolds
2011 *Stone Artifacts of Texas Indians*, Taylor Trade Publishing, Boulder
United States Department of the Interior (USDI)

2013 U.S. *Geological Survey (USGS)*. Electronic document, http://mrdata.usgs.gov/geology/state/sgmc-unit.php?unit.php?unit=TXQac;0 , accessed May 2, 2013

United States Environmental Protection Agency (EPA)
1988 *Workbook for Plume Visual Impact Screening and Analysis,* EPA-450/4-88-015.

United States Department of Agriculture (USDA)
1907 *Soil Map, Texas, Brownsville Sheet*: The Portal to Texas History. Electronic document, http://texashistory.unt.edu/ark:/67531/metapth19741/ , accessed May2, 2013.

United States Secretary of the Interior (SOI)
1983 *Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines [As Amended and Annotated].* Electronic document, http://www.cr.nps.gov/local-law/arch_stnds_0.htm, accessed July 26, 2013.

WeatherSpark
2013 Electronic document, http://weatherspark.com/averages/29808/Brownsville-Texas-United-States, accessed July 22, 2013.

Weddle, Robert S.
2013 *Nuevo Santander*, Handbook of Texas Online. Electronic document, http://www.tshaonline.org/handbook/online/articles/usnue , accessed April 26, 2013.

Weinstein, Richard A., Pollyanna A. Held, Robert A. Ricklis, and William J. Wagner
2005 *Cultural Resources Survey and Preliminary Site Assessment within Six Right-of-Way Areas, State Highway (SH) 48, Port Isabel to Brownsville, Cameron County, Texas.* Coastal Environments, Inc.

Wermund, E.G.
1996 *Physiographic Map of Texas*. Bureau of Economic Geology. Electronic document, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf, accessed May 8, 2013.