Deepwater Port License Application for the

Texas Gulf Terminals Project

Volume II – Environmental Evaluation (Public)

Section 8:

Cultural Resources

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ACRONYMS AND ABBREVIATIONS

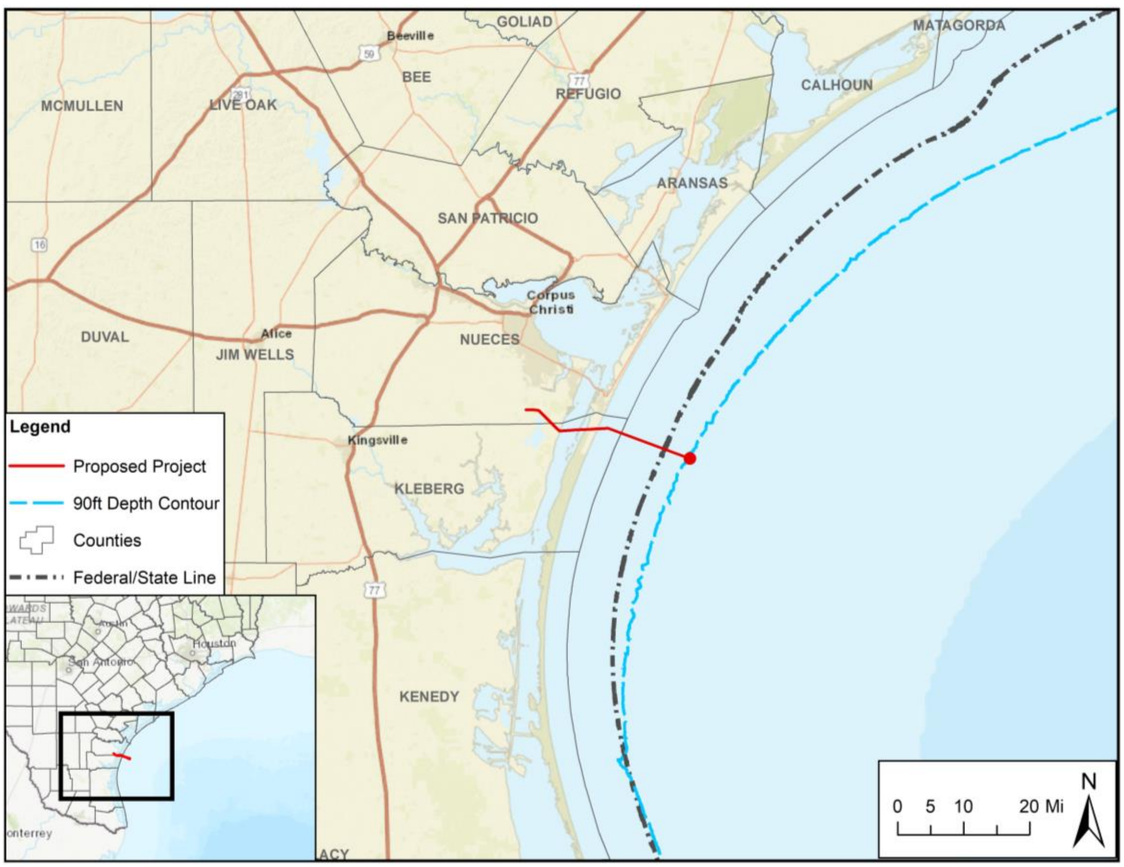
°	Degrees
>	greater than
<	less than
Ac	Acre
ACHP	Advisory Council on Historic Preservation
AHPA	Archaeological and Historic Preservation Act
AIRFA	American Indian Religious Freedom Act
APE	Area of Potential Effects
Applicant	Texas Gulf Terminals Inc.
ARPA	Archaeological Resources Protection Act
AWOIS	Automated Wreck and Obstruction Information System
BMP	Best Management Practice
BOEM	Bureau of Ocean Energy Management
B.P.	[years] before present
Bph	barrels per hour
CALM	Catenary Anchor Leg Mooring
CFR	Code of Federal Regulations
Cm	Centimeters
DWP	deepwater port
DWPA	Deepwater Port Act of 1974, as amended
DWPL	Deepwater Port License
EA	Environmental Assessment
e.g.	exempli gratia [Latin for '*for example*']
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
et al.	et alia [Latin for *'and others'*]
et seq.	et sequentes [Latin for *'and the following'*]
ft.	Feet
GOM	Gulf of Mexico
GPS	Global Positioning System
Ha	Hectare
HDD	Horizontal Directional Drilling
HUD	Department of Housing and Urban Development
kHz	Kilohertz
km	Kilometer
m	Meter
MARAD	Maritime Administration
MHT	mean high tide
mi	Miles
MMPA	Marine Mammal Protection Act
MMS	Mineral Management Service
mph	miles per hour

NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
nm	nautical miles
NRHP	National Register of Historic Places
NTL	Notices to Lessees
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Land Act
OSTF	onshore storage terminal facility
PELM	pipeline end manifold
PINS	Padre Island National Seashore
POCC	Port of Corpus Christi
Project	Texas Gulf Terminals Project
SAL	State Antiquities Landmark
SMCA	Sunken Military Craft Act
SPM	single point mooring
TAC	Texas Administrative Code
TASA	Texas Archeological Sites Atlas
TDAT	Tribal Directory Assessment Tool
THC	Texas Historical Commission
U.S.	United States [of America]
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USCG	United States Coast Guard
VLCC	very large crude carrier

PROJECT OVERVIEW

Texas Gulf Terminals Inc. (TGTI; also referred to as Applicant) is proposing to construct and operate a deepwater port (DWP), associated pipeline infrastructure, booster station, and an onshore storage terminal facility (OSTF), collectively known as the Texas Gulf Terminals Project (Project), for the safe, efficient and cost-effective export of crude oil to support economic growth in the United States of America (U.S.). The Applicant is filing this Deepwater Port License (DWPL) application to obtain a license to construct, own, and operate the Project pursuant to the Deepwater Port Act of 1974, as amended (DWPA), and in accordance with the U.S. Coast Guard (USCG) and the Maritime Administration's (MARAD) implementing regulations.

The Applicant is proposing to construct and operate the Project to allow direct and full loading of very large crude carriers (VLCC) at the DWP, via a single point mooring (SPM) buoy system. The proposed Project consists of the construction of a DWP, onshore and inshore pipeline infrastructure, offshore pipelines, and an OSTF. The proposed DWP would be positioned outside territorial seas of the Outer Continental Shelf (OCS) Mustang Island Area TX3 (Gulf of Mexico [GOM]), within the Bureau of Ocean Energy Management (BOEM) block number 823. The proposed DWP is positioned at Latitude N27° 28' 42.60" and Longitude W97° 00' 48.43", approximately 12.7 nautical miles (nm) (14.62 statute miles [mi]) off the coast of North Padre Island in Kleberg County, Texas. Refer to the Vicinity Map depicting the location of the proposed Project.



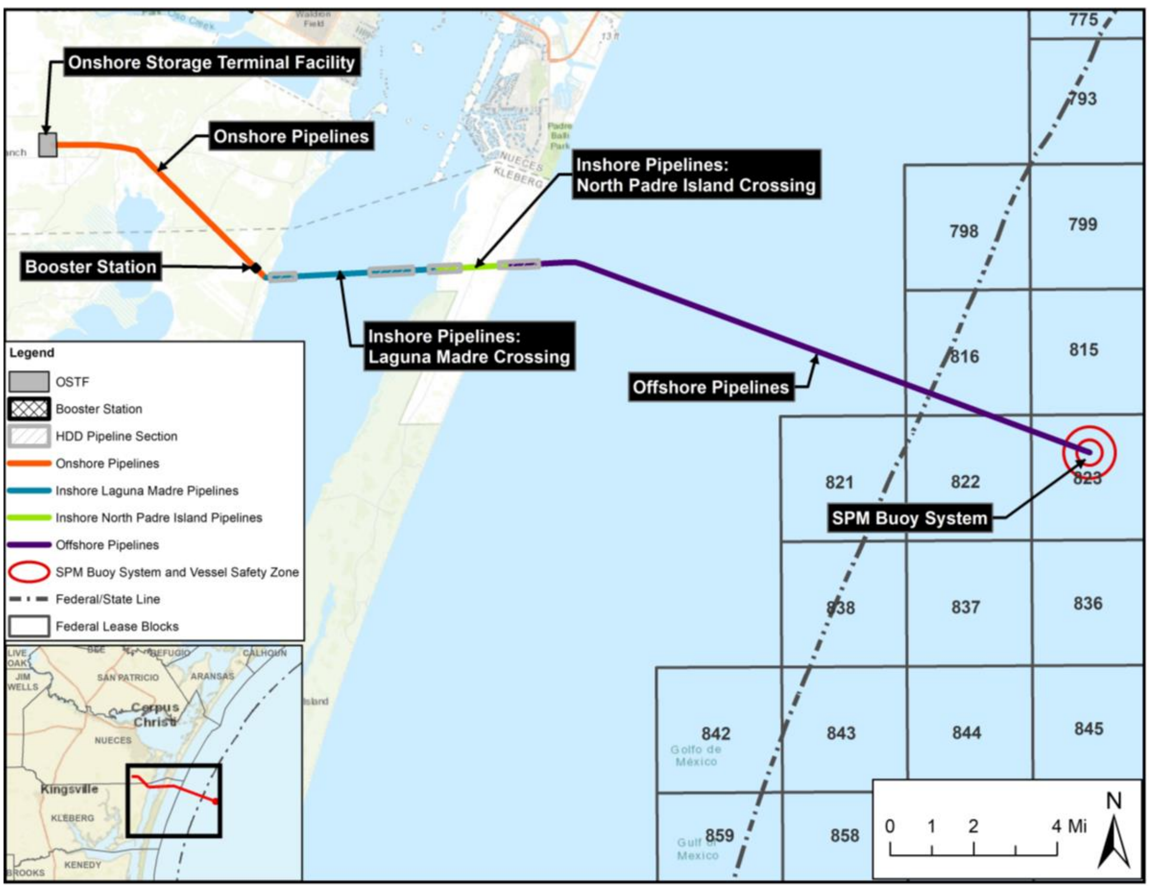
Vicinity Map

The proposed Project involves the design, engineering, and construction of a DWP, 26.81 miles of pipeline infrastructure, booster station, and an OSTF. For the purposes of this DWPL application, the proposed Project is described in three distinguishable segments by locality including "offshore", "inshore", and "onshore".

Onshore Project components includes an approximate 150-acre (ac) (60.7 hectares [ha]) OSTF, an 8.25 ac (3.3 ha) booster station, and approximately 6.36 mi of two (2) new 30-inch-diameter crude oil pipelines extending from the OSTF located in Nueces County, to the booster station located in Kleberg County, and continue to the landward side of the mean high tide (MHT) line of the Laguna Madre. The proposed OSTF will serve as the primary collection and storage terminal of crude oil to be directly pumped through the proposed pipeline infrastructure to the DWP. Outbound flow rates from the OSTF to the DWP are anticipated to be approximately 60,000 barrels per hour (bph).

Inshore components associated with the proposed Project are defined as those components located between the western Laguna Madre MHT line and the MHT line located at the interface of North Padre Island and the GOM; this includes approximately 5.74 mi of two (2) new 30-inch-diameter crude oil pipelines and an onshore block valve station located on North Padre Island. The onshore valve station will serve as the primary conjunction between the proposed onshore and offshore pipeline infrastructure.

Offshore components associated with the proposed Project include the DWP and offshore pipelines. Principle structures associated with the proposed DWP includes one SPM buoy system consisting of the SPM buoy, pipeline end manifold (PLEM), sub-marine hoses, mooring hawsers, and floating hoses to allow for the loading of crude oil to vessels moored at the proposed DWP. The proposed SPM buoy system will be of the Catenary Anchor Leg Mooring (CALM) type permanently moored with a symmetrically arranged six-leg anchor chain system extending to pile anchors fixed on the seafloor. Offshore pipeline infrastructure associated with the proposed Project consist of approximately 14.71 mi of two (2) new 30-inch-diameter pipelines extending from MHT line on North Padre Island to the SPM buoy system located at the proposed DWP. Refer to the Project Components Map below for a depiction of the location of the Project components discussed above.



Project Component Map

8.0 CULTURAL RESOURCES

Section 8.0 describes the Cultural Resources that occur within and adjacent to the proposed Project. Due to the location of the various Project components, Cultural Resources are discussed in terms of inshore, onshore, and offshore habitats. Onshore habitats refer to water bodies located landward from the western shore of the Laguna Madre. Inshore habitat refers to water bodies located landward from the mean high tide (MHT) line of North Padre Island. Offshore habitat refers to the aquatic environment located seaward into the Gulf of Mexico (GOM) from the MHT line of North Padre Island. The framework for the evaluation of environmental consequences and cumulative impacts in the Introduction of Volume II of the Deepwater Port License (DWPL) application.

Section 8.0 is structured as follows:

- Section 8.1 Applicable Laws and Regulations: Background on relevant regulatory laws for consideration;
- Section 8.2 Existing Conditions: Information on the existing onshore and inshore environment;
- Section 8.3 Environmental Consequences: An analysis of environmental consequences;
- Section 8.4 Cumulative Impacts: An analysis of cumulative impacts;
- Section 8.5 Mitigation Measures: Proposed mitigation measures;
- Section 8.6 Summary of Potential Impacts: A summary of potential impacts; and
- Section 8.7 References.

8.1 Applicable Laws and Regulations

NEPA recognizes that a unique characteristic of an environment is its relation to ‘historic or cultural resources’ and requires agency officials to consider the degree that an action might “adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places (NRHP)” (40 CFR 1508.27 [b][3] and 40 CFR 1508.27 [b][8]). However, under the National Environmental Policy Act (NEPA), no definition is provided for “cultural resources.”

The National Historic Preservation Act of 1966, as amended (NHPA) (54 U.S. Code [U.S.C.] 300101 et seq.) established the NRHP and identifies historic properties based on their relationship to significant historic events or individuals, important stylistic or engineering trends, or in their potential to provide information about the local, regional, or national past (36 CFR 60[a-d]). Historic properties may include archaeological sites, historic structures, historic districts, landscapes, battlefields, or shipwrecks. Also included are Traditional Cultural Properties, which may be defined as locations which are eligible for inclusion in the NRHP due to their association with a practices or beliefs of a modern community that are tied to a community’s sense of history, place, or identity (Parker and King 1998).

Section 106 of the NHPA (54 U.S.C. 306108) requires that federal agencies with jurisdiction over a proposed federal project take into account the effect of the undertaking on cultural resources listed or eligible for listing on the NRHP and afford the State Historic Preservation Offices (SHPOs), the Advisory Council on Historic Preservation (ACHP), and other interested parties an opportunity to comment with regard to the undertaking. The NEPA Environmental Assessment (EA) / Environmental Impact Statement (EIS) process may take the place of a Section 106 review, as long as the processes are substantially similar and involve the same parties (36 CFR 800.8). The process of agency reviews and assessment of the effect of an undertaking on cultural resources is set forth in the implementing regulations formulated by the ACHP (36 CFR 800, Protection of Historic Properties).

In addition to NEPA and NHPA, other laws and guidelines are applicable to the proposed Project, including:

- Antiquities Code of Texas (9 Texas Natural Resource Code 191);
- Implementing Regulations of the Antiquities Code of Texas (13 Texas Administrative Code (TAC) Part 2)

- Texas Cemetery Protections (8 Texas Health and Safety Code 711)
- Executive Order (EO) 11593: Protection and Enhancement of Cultural Environment;
- EO 13007: Indian Sacred Sites
- Antiquities Act of 1906 (16 U.S.C. 431 et. seq.);
- Historic Sites Act of 1935 (16 U.S.C. 461 et. seq.);
- Archaeological Resources Protection Act (ARPA) (16 USC 470aa-mm);
- Archaeological and Historic Preservation Act of 1974 (AHPA) (16 USC 469);
- OCS Lands Act (OCSLA) of 1953, as amended (43 U.S.C. 1331);
- NEPA of 1969 (42 U.S.C. 4321 et. seq.);
- Abandoned Shipwreck Act of 1987 (Public Law 100-298, 43 U.S.C. 2101-2106);
- Sunken Military Craft Act (SMCA) (10 USC 113 note);
- Native American Graves Protection and Repatriation Act of 1990 (Public Law 101-601; U.S.C. 3001-3013);
- American Indian Religious Freedom Act (AIRFA) (42 USC 1996)
- Determination of Eligibility for Inclusion in the NRHP (36 CFR 63);
- Recovery of Scientific, Prehistoric, and Archaeological Data (36 CFR 66);
- Curation of Federally Owned and Federally Administered Archaeological Collections (36 CFR 79), and
- Consultation and Coordination with Indian Tribal Governments.

The Bureau of Ocean Energy Management (BOEM) has federal authority for protection of cultural resource on the OCS. The BOEM's primary responsibility is to manage oil, gas, and mineral resources on the OCS and assess the impacts of all Outer Continental Shelf (OCS) activities on marine, coastal, cultural, and human environments. BOEM leasing and permitting activities comply with all federal environmental laws that provide resource-specific protections, such as the NHPA, the Endangered Species Act (ESA), and the Marine Mammal Protection Act (MMPA). The focus of the BOEM's archaeological resource protection program is to ensure that permitted activities do not adversely affect significant cultural resources on the federal OCS, in compliance with the requirements of Section 106 of the NHPA. The BOEM has completed a series of archaeological baseline studies to define those areas of the OCS that have potential for historic and/or prehistoric archaeological resources. The BOEM considers the entire Gulf Coast to be a high-probability area. Marine archaeological surveys and reports are required for those areas defined as having archaeological potential prior to approval of any BOEM-permitted activities. BOEM archaeological survey and report requirements for the GOM and Atlantic OCS are contained in Minerals Management Service (MMS) Notices to Lessees (NTL) 2005-G07 and 2005-G10 in compliance with 30 Code of Federal Regulations [CFR] 250.194; 30 CFR 250.203[b][15]; 30 CFR 250.203[o]; 30 CFR 250.204[b][8][v][a]; 30 CFR 205.204[s]; and 30 CFR 250.1007[a][5]). Portions of the underwater pipeline and the location of the DWP will lie on the OCS outside of the jurisdiction of the State of Texas and will be subject to these regulations.

8.2 Existing Conditions

8.2.1 Geologic Setting

Geomorphology of the Area of Potential Effects (APE) was influenced by sea level changes during and after the Late Pleistocene Glaciation (Figure 8-1). Continental glaciers held back significant amounts of water from the sea during the Pleistocene, resulting in a much lower sea level than exists today. Geologists have charted the timing and magnitude of sea level rise (e.g. Fisher, et al. 1973, cited in Weise, et al. 1980: Figure 16). Sea level has risen more than 300 feet (ft.) (91.4 meters [m]) since the last glacial low stand, about 20,000 to 22,000 years ago.

Archaeologists are interested in the geologic unconformity between the most recent exposure of dry land and its inundation by rising seas. The age of this unconformity can be estimated based upon its elevation below sea level. The timing of the most recent low-stand sea level overlaps the period of human habitation in North America. Fresh surface water and ecological diversity of coastal river valleys and estuaries during this period likely would have attracted human populations. For example, Berryhill (1981) charted a seaward extension of the Nueces River Valley crossing the continental shelf 4-6 mi (7.4 kilometers [km]) north of the offshore APE.

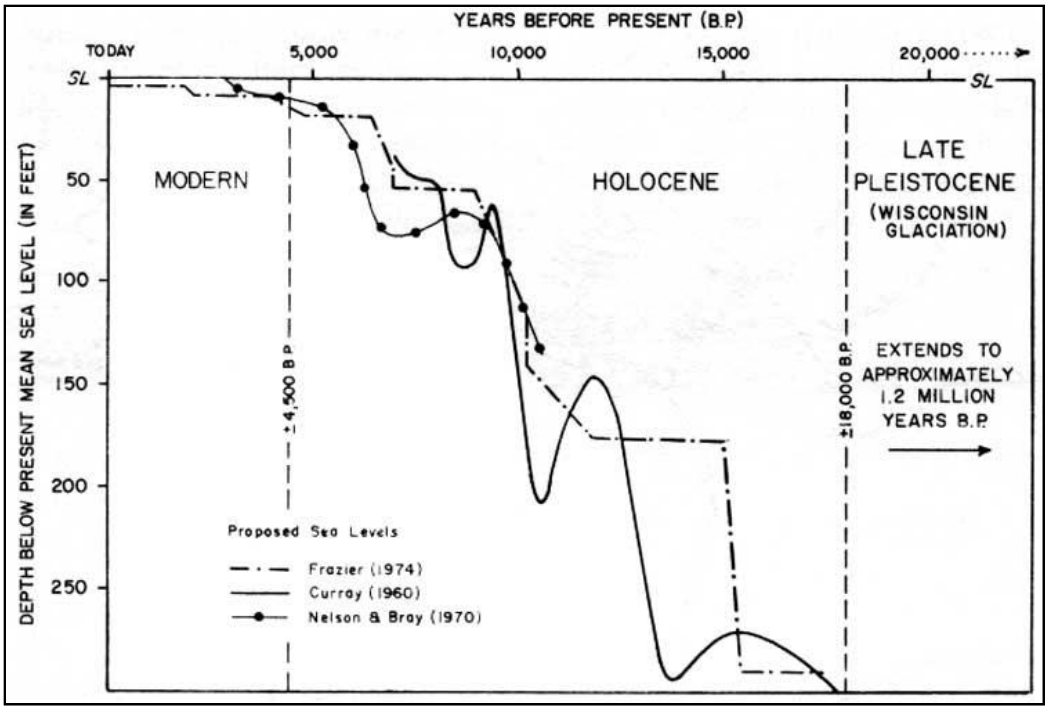
Rising sea level began flooding the former Pleistocene land surface beneath the APE by about 10,000 years ago. Weise, et al. (1980) place the low-stand Pleistocene-Holocene unconformity, beneath Padre Island, at 35–40 ft. (10.6–12.2 m) below sea level. The area now occupied by Padre Island was probably inundated around 6,000 years ago, before the formation of the barrier island complex. Accumulation of Holocene sediments began soon after inundation and has continued to present times. Much of the offshore Holocene material originated in the Colorado and Brazos river basins, although sediment from as far as the Mississippi River has been documented here (Weight, Anderson and Fernandez 2011). Nearer the island, evidence from this project suggests that seafloor sediments, below and seaward of the Padre Island sandbars, were deposited as part of an earlier Nueces River Delta.

Sub-bottom profiles acquired in the offshore APE are interpreted in the Offshore Geophysical Survey Report (Volume III, Confidential). The following information is adapted from their report. A buried Pleistocene land surface has been interpreted from sub-bottom profiles beneath most of the offshore APE. While it could not be seen in profiles beneath nearshore sand deposits, its presence there can be surmised at a depth of 35–40 ft. (10.6–12.2 m) below sea level from Weise, et al. (1980). The Pleistocene unconformity was observed in sub-bottom data beginning about 2.5 mi (4.0 km) from the beach at an elevation of -55 ft. (-16.7 m), 10 ft. (3.0 m)below the seafloor. This surface is presumed to slope gradually upward, toward the island, to the depth reported by Weise, et al. The Pleistocene surface is incised by paleo-channels crossing an area from 2.8–5.3 mi (4.5–8.5 km) offshore. Channel margins range from 10-15 ft. (3.0–4.5 m) below the seafloor. Thalwegs range in depth, below the channel margins, from 4–17 ft. (1.2–4.2 m).

The Pleistocene unconformity gradually slopes downward to an elevation of -160 ft. at the seaward end of the alignment, where it is buried by 65 ft. (19.8 m) of Holocene sediment. No paleo-channels are visible seaward of 5.3 mi (8.5 km) offshore. There is no evidence anywhere in the offshore APE for less than (<) 10 ft. (3.0 m) of Holocene cover above the Pleistocene unconformity. This surface would have been inundated by rising sea level between 10,000 and 6,000 years ago, well within the timeframe of Paleoindian habitation in North America.

A more recent, Holocene, unconformity was interpreted shoreward of 5.3 mi (8.5 km) offshore to a point where it disappears beneath the Padre Island sandbars at about 0.7 mi (1.1 km) offshore. This former land surface is heavily dissected by paleo-channels, which Geo-Marine (2018) interprets as remnant distributary channels of the Nueces River Delta, before it retreated westward under rising seas. These channels likely are 3,500-6,000 years old and predate the formation of Padre Island.

A few individual Holocene channels could be charted just seaward of the Padre Island sandbars, from 0.9-1.7 mi (2.7 km) offshore, where their margins are exposed on the seafloor at an elevation of -20 ft. (-6.1 m). Their thalwegs range from 12–19 ft. (3.7–5.8 m) deep and appear to incise through the Pleistocene unconformity in this area, such that any remnant Pleistocene channels would be indistinguishable. Holocene paleo-channels seaward of 1.7 mi (2.7 km) gradually become buried up to 10 ft. (3.0) but are too conflated to map individually. This area of conflated channels grades into one of chaotic acoustic reflections seaward of about 3.8 mi (6.1 km) offshore. Geo-Marine interprets these chaotic reflectors as "bioturbated and/or reworked sediment discharged near the mouth of the distributaries." Seaward of 5.3 mi (8.5 km) offshore, Holocene sediments become horizontally bedded, indicating that the material was deposited in a marine environment.



Reproduced from Weise, et al. (1980, Figure 16)

Figure 8-1: Holocene Sea Level Curves by Various Authors

8.2.2 Prehistoric Resources

Occupation of the North American continent has been documented for at least 11,500 years. Although there is some scant evidence that human occupation of the western hemisphere may date even earlier, clear evidence indicates that Native Americans were well established in Texas by around 11500 years before present (B.P.) (Adovasio et al. 1990; Bousman et al. 2004). Human responses to the varying challenges of life have varied across both space and time, resulting in distinct patterns of occupation, subsistence, and technology. These differences have necessitated that archaeologists divide the archaeological record geographically into similarly-related cultural areas. The current Project lies within the South Texas and Coastal Texas archaeological zones described by Pertulla (2004). Similarly, changes in past behavior have been used to further delineate archaeologically observed periods. In South Texas, the most common temporal divisions are the Paleoindian, the Archaic, and the Late Prehistoric/Ceramic periods (Perttula 2004). Archaeology in coastal Texas is complicated by a complex geological environment. Rising sea levels following the end of the last ice age flooded up to 50 mi (80.5 km) of land, which now lies under the waters of the GOM (Aten 1983). This process ended approximately 3,000 years ago, at which point the system of barrier islands and bays began to be established (Aten 1983:157).

Paleoindian Period (11,000–8000 B.P.)

The earliest documented occupation in South Texas occurred during the Paleoindian period, between 11,000 and 8,000 years ago. Paleoindian sites are rare in the region, and artifacts occur almost exclusively in isolated contexts. Few sites in South Texas have large Paleoindian components, and in general, South Texas appears to be relatively less populated compared to other parts of Texas (Meltzer and Bever 1995). A Clovis point base was found by A.E. Anderson at Laguna Atascosa National Wildlife Refuge during the early 20th century (Anderson 1932). W.A. Price later reported mammoth bones eroding in the same vicinity (Suhm, et al. 1954: 118, 121). Lithic artifacts have been reported at Falcon Reservoir in association with extinct megafauna (Cason 1952: 243; Kreiger n.d.: 18). Clovis points were recovered at the upper part of Corpus Christi Bay near the mouth of the Nueces River and at Buckner Ranch (Hester 1976; Bousmann et al. 2004). Many Paleoindian points also are known from San Miguel Creek in Atascosa and McMullen counties (Hester 1968: 147-162). Although Clovis sites have most often been associated with big-game hunting, no mammoth kill sites have been identified in South Texas; however, remains of mammoths have been documented in relation to Clovis and Folsom Points at the Buckner Ranch Site in Bee County (Hester 1995; Sellards 1940: 1627-1657). At the same time, broadening research has suggested that Paleoindians did not solely rely on big-game hunting, and a number of Paleoindian sites contain species such as turtle and deer (Bousmann et al. 2004).

Later Paleoindian sites near the Project area include Buckner Ranch and Baker Cave in Bee County and Berger Bluff in Goliad County (Hester 1983; Bousmann et al. 2004). The relative scarcity of Paleoindian sites near the coast is likely due to the change in sea levels at the end of the Pleistocene. Sea levels are thought to have been as much as 330 ft. (100 m) lower than current average, and may have inundated a number of Paleoindian sites along the coast (Ricklis 2004; Bousmann et al. 2004). One such site is the McFaddin Beach site, located northeast of the Project area in Jefferson County, Texas, where one of the largest local collections of Paleoindian artifacts appears. The collection includes 14 Clovis Points. Faunal material recovered includes a wide variety of Pleistocene species, such as mammoth, mastodon, saber-toothed cat, bear, giant armadillo, bison, tapir and horse. An elephant tusk from the site yielded a radiocarbon date of 11,100 +/- 750 BP. The former Pleistocene land surface at McFaddin Beach, known regionally as the Beaumont Clay Formation, is about 5 ft. (1.5 m) below sea level at that site (Stright et al. 1999).

Many inundated sites have been discovered as a result of dredging. For example, human remains and artifacts were recovered from the Texas City Channel in Galveston Bay (Aten and Good 1985). This site, situated near the ancestral Trinity River Valley, contained 4,000 bone specimens from Pleistocene species, such as horse and tapir, including 42 bones that appeared to have been modified, and a variety of lithics interpreted as stone tools. Evidence of Pleistocene megafauna has also been discovered by dredging at Padre Island, although a cultural connection has not been demonstrated. The molar of an extinct elephant (species unknown) was recovered on Padre Island near Port Mansfield by a local resident in the late 1980s. The tooth was dredged from the Mansfield Cut (R. Gearhart, personal communication).

Few attempts have been made to actively seek intact buried site deposits on the continental shelf. Nevertheless, one such effort by Coastal Environments, Inc. (1986) located two possible prehistoric shell midden sites in vibracore samples collected near Sabine Pass at depths of 54 and 59 ft. (16.5 and 17.9 m) below Mean Sea Level. Pollen analyses demonstrated that both deposits had formed sub-aerially; however, the core sample sizes were too small to allow a definitive determination of cultural origin for the shell deposits.

Archaic Period (8000–1000 B.P.)

The Archaic Period is generally characterized by hunting and gathering subsistence strategies (Story 1985; Pertulla 2004). The Archaic period in South Texas is divided into three periods which coincide with three broadly defined geo-climatic episodes (Johnson and Goode 1994). The Early Archaic, which dates to between 8000 and 4500 B.P. coincides with a general warming trend continuing from the end of the Wisconsin Glaciation. The Middle Archaic, between 4500 and 2200 B.P. is a period of peak warming and drying during the Holocene. The Late Archaic, from 2200 to 1000 B.P., represents a return to cooler and wetter conditions.

On the South Texas coast, the Early Archaic Period is not well represented, likely due to continued sea level rise throughout this period. Even so, it appears from settlement patterns that population densities remained relatively low during the Early Archaic (Story 1985:34). Inland, the Early Archaic is represented by complexes of projectile points, such as the Martindale, Uvalde, Baker, and Bandy group, which Hester calls the “Early Corner Notched Horizon” and the types such as the Bell-Andice group, labeled the “Early Basal Notched Horizon” (Hester 1995). Sites have been documented around the mouth of Lavaca Bay and Corpus Christi Bay that may represent early adaptations to estuarine environments during the Early Archaic (Weinstein 2003; Ricklis 1988, 2004, 2010). These sites have yielded little information about the past except that marine resources such as oyster were already being exploited; although different types of shellfish appear to have been harvested in the Early Archaic compared with later periods (Ricklis 1988:43). Little other cultural material has been identified and generally consists of Uvalde and Gower projectile points (Ricklis 2004).

Apart from general subsistence and occupation patterns, another important manifestation of Early Archaic culture has been documented at the Buckeye Knoll site. Excavations at this site uncovered a formal Early Archaic cemetery that suggests that status differentiation was already occurring up to 7500 years ago (Ricklis 2011). In addition, formal burials may have begun at the Morhiss site during this time; although these are poorly documented (Campbell 1976).

In the Middle Archaic period, the sea levels appear to have stabilized, establishing a system of barrier islands surrounding a number of shallow estuaries and bays (Ricklis 2004). Early chronologies of the South Texas coast identified two distinct periods of occupation. Based on work at the Kent-Crane and Johnson sites on Matagorda Bay, Thomas Campbell divided the prehistoric period into the Archaic Aransas Focus and a Late Prehistoric Rockport Focus (Campbell 1960). The Rockport focus, which has been relatively well accepted within recent scholarship, will be discussed in detail below. The Aransas Focus was characterized by the presence of shell, bone, and stone tools but truly defined by the lack of pottery (Shafer and Bond 1983). However, further research has made it clear that sites identified within the Aransas Focus should really be divided into Middle and Late Archaic periods, as the Aransas Focus was simply too broad (Corbin 1974; Ricklis 2004). Based on this re-evaluation, the Middle Archaic should be characterized by a collection of Ensor, Matamoros, Palmillas, Refugio, Morhiss, and Bulverde style points (Hester 1995). Coastal sites commonly feature dense shell middens, suggesting extensive use of shellfish resources. These sites generally present distinctive shell tools, such as whelk whorl scrapers and shell columella gouges (Corbin 1963).

Inland manifestations of the Middle Archaic are usually found in close proximity to stream courses and may be less dense (Hester 1995; Steele and Mokry 1983). Sites in Choke Canyon exhibit concentrations of burned rocks and hearths, suggesting the use of plant resources (Hall et al. 1986). A shell midden site in Calhoun County also contained significant quantities of non-marine faunal remains, evidencing the important role that hunting continued to play in subsistence strategies of coastal dwellers (Gadus et al. 1999).

Middle Archaic cemeteries have been identified most notably at Loma Sandia, Ernest Witte, and Morhiss (Campbell 1976; Story 1985; Taylor and Highley 1995; Hester 2004). While some status differentiation is present among some male individuals in the cemetery, in general, few burial patterns were consistent throughout the cemetery. However, the presence of the centralized cemetery, as well as generalized votive offerings, suggest an important connection to the place was harbored by prehistoric groups over a long span of time (Taylor and Highley 1995).

The Late Archaic Period continues the trends from the Middle Archaic with slight changes in technology and an expansion of population (Story 1985). Many of the sites are much larger than the Middle Archaic period sites, suggesting more stable, larger populations (Ricklis 2004). The Ingleside Cove (41SP43) site is one of the best studied Late Archaic sites and is located on the north side of Corpus Christi Bay, approximately 19 mi (30.6 km) north of the current Project area. At this site a dense shell midden containing oyster, scallop, lightning whelk (*Busycon perversum)*, quahog *(Merceneria merceneria)*, and sunray venus (*Macrocallista nimbosa)* shells were interspersed with abundant evidence of fish exploitation (Story 1968; Ricklis 2004). Coastal populations appear to have relied much more heavily on fishing for subsistence during this period (Ricklis 2004). This is likely indicative of an increasing divergence of ecological adaptation during this period as different populations became more settled in specific areas (Story 1985:54).

Inland, Late Archaic populations also continued and intensified patterns seen earlier in the Early Archaic. Sites in Choke Canyon exhibit large burnt rock hearths and earth ovens, along with *manos* and *metates*, implying reliance on seed or nut crops like mesquite and acacia (Hester 2004). Inland sites also feature the exploitation of shellfish and possibly snails. Projectile points associated with inland Late Archaic sites include Ensor, Frio, Ellis, Fairland, Marcos, Desmuke, Matamoros, and Catan points (Hester 1995).

Late Prehistoric Period (1000–500 B.P.)

The Late Prehistoric Period in coastal South Texas dates from approximately 1000 to 500 B.P. This period corresponds with the introduction of ceramics and the bow and arrow. The bow and arrow is represented archaeologically by small projectile points more suitable for arrows than spears or darts. Scallorn projectile points are an early indicator of the Late Prehistoric Period, dating from 1300 B.P. (Turner and Hester 1999). Other Late Prehistoric arrow point forms include Perdiz and Edwards (Hester 1995; Turner and Hester 1999). Inland Late Archaic sites include Perdiz points associated with bone-tempered pottery, referred to as the Toyah Phase, which dates from 700 to 350 B.P. (Black 1986; Hester 2004).

On the coast, Late Prehistoric development appears different from inland sites. During the first part of the Late Prehistoric Period, sites are characterized by the presence of Scallorn projectile points along with rare, plain, sandy-paste pottery similar to Goose Creek wares from the southeastern Texas coast (Shafer and Bond 1983; Story 1968; Aten 1983; Ricklis 2004). In later periods, Late Prehistoric sites belong more correctly to the Rockport Phase, as defined by Campbell (Campbell 1960; Corbin 1974). These sites more often contain Perdiz point types, along with Rockport ceramics, a sandy paste ceramic with asphaltum decoration on the pottery surfaces in varying patterns (Ricklis 2004, 2013). Although Toyah and Rockport phase sites share arrow point technology in the Perdiz point, the ranges of pottery styles do not appear to overlap, with bone-tempered Toyah phase completely replacing Rockport phase pottery approximately 40 km from the coast (Ricklis 2004). However, the distinction between the two types may result from technological pressures, rather than any cultural distinctions (Black 1986).

Cemeteries continue to appear in the Late Prehistoric Period, both inland and along the coast. At Blue Bayou on Matagorda Bay, a study of at least 40 individuals found that overall population health appeared good during the Early Late Historic period (Comuzzie 1987). At the Mitchell Ridge site on Galveston Island, excavations encountered burials dating from the Late Archaic until the Historic Period, suggesting long-term reoccupation of the site, as well as possible indications of group continuity through time (Ricklis 1994).

Late Prehistoric subsistence patterns were likely affected by the introduction of new bow and arrow and ceramic technology. Fishing continued to be extremely important at Rockport sites, as excavations along Corpus Christi Bay have shown (Story 1968; Ricklis 2010). Perdiz points have also been identified at buffalo kill sites inland from the coast (Ricklis 2004). Evidence also suggests that there was seasonal movement of Rockport phase peoples (Ricklis 2004). This would appear to correspond well with later records of the Karankawa, which suggested they seasonally aggregated at coastal sites but separated and camped in smaller groups in the spring and summer (Aten 1983; Ricklis 2004).

Protohistoric Period (500-200 B.P.)

At the time of Spanish exploration of the new world, the South Texas coast was inhabited by a group of Native American tribes collectively called the Karankawa. The Karankawa was composed of five smaller groups related by a common language that lived in a relatively narrow strip of land along the Texas Gulf Coast from around Matagorda Bay to just south of Corpus Christi Bay (Aten 1983; Ricklis 2010). Although Spanish contact began with the visitations to the area by Alvar Nuñez Cabeza de Vaca in around 1528, European culture barely influenced Karankawa lifeways prior to the establishment of the Spanish Mission system in the 1700s (Campbell and Campbell 1981; Hester 1995). Based on Contact Period accounts as well as the presence of Rockport ceramics at a number of Spanish Mission sites into the early 1700s, it appears Rockport phase groups were the ancestors of the historic Karankawa (Newcomb 1961; Ricklis 2013). As such, the Protohistoric Period, which runs from Spanish contact through the establishment of the Spanish Mission system, is a period of little interaction and only gradual change in the archaeological record as Native American groups slowly became enveloped in increasing European and Anglo-American colonization. Trade goods and European artifacts sometimes appear but are often encountered within Native American systems of production, as is the case with Contact Period artifacts at the McGloin's Bluff site 19 mi (30.6 km) north of the current Project area (Ricklis 2010). Unfortunately, over time, disease and encroachment by Europeans took its toll on the Native American way of life in Texas. By 1831, only a few dozen Karankawa could still be identified on the Texas coast (Aten 1983: 49).

Offshore Prehistoric Resources

There is no doubt that humans lived along GOM coastlines that have long-since been submerged by rising seas. Many such sites are presumed destroyed by wave energy during the process of inundation. The most likely locations for such sites to remain preserved are along streams that were above sea level during the period of human habitation in North America. Sources of fresh water may have attracted humans, and burial of cultural sites in alluvial deposits might have afforded protection from wave energy as rising seas inundated the land. As river valleys flooded to become estuaries, deltaic sediments may have accumulated on top of already sealed deposits, providing further protection by the time those sites were exposed to the open GOM. The search for intact sites on the submerged continental shelf focuses on remnants of flooded and buried stream channels, which often are recognizable on acoustic sub-bottom profiles.

Weise, et al. (1980) place the low-stand Pleistocene-Holocene unconformity, beneath Padre Island, at 35-40 ft. (12.2 m) below sea level. Consistent with Weise, et al, a Pleistocene/Holocene unconformity was interpreted from acoustic sub-bottom profiles (Geo-Marine 2018) beneath the entire offshore APE, ranging in elevation from -55 to -160 ft. (-16.8 to -48.8 m) below sea level (10–65 ft.). This former Pleistocene land surface is incised by paleo-channels crossing an area from 2.8–5.3 mi (4.5–8.5 km) offshore. Stream channels of this age have potential for preservation of Paleoindian sites along their margins. The timing of the Late Pleistocene-Holocene sea level transgression includes the entire Paleoindian Period and any pre-Clovis human habitation postulated in North America. While submerged Paleoindian sites might exist in the offshore APE, they would be buried from 10–65 ft. (3.0–19.8 m) below the mudline and would not be affected by proposed construction activities.

A more recent, Holocene, unconformity was interpreted just beyond the Padre Island outer bar, from about 0.7–5.3 mi (1.1–8.5 km) offshore. This former land surface is dissected by paleo-channels, which Geo-Marine (2018) interprets as remnant distributary channels of an earlier Nueces River Delta. The delta would predate the formation of Padre Island, but probably not before 6,000 years ago, about the time when seas inundated the underlying Pleistocene surface. These channels are located within the upper 10 ft. (3.0 m) of seafloor sediment; thus, they will be affected by trenching for the offshore pipelines. Stream channels of this age may preserve prehistoric archaeological sites, dating from the Archaic Period, along their margins.

8.2.3 Historic Resources

Earliest Contact/Colonial Era (1500–1836)

Native groups in this region, due to their proximity to the GOM, made some of the earliest contact with European explorers and colonists. The Historic period began with several sixteenth century expeditions to the area, most notably Alvar Nuñez Cabeza de Vaca's travels stemming from the failed 1527 Panfilo de Narvaez expedition. Cabeza de Vaca was shipwrecked near Galveston Bay in 1528 and began a years-long odyssey living among and documenting the Native American groups of Texas (Hester 1999). For 150 years, contact was sporadic, until the French began to make incursions into the western GOM. French explorer, Robert Sieur de La Salle, wrecked in Matagorda Bay in 1685 in an attempt to colonize the area (Weddle 1991). The French presence in Texas proved short-lived, as La Salle's settlement in Matagorda Bay was attacked and destroyed in 1688. Yet the French incursion into the region provoked Spanish retaliation, resulting in the spread of the Spanish Mission system into South Texas (Weddle 1991).

Spanish attempts to establish missions and forts to convert and pacify the native populations along the coastal plain continued through the 1700s. These included Mission Espíritu Santo de Zuniga, established in 1722 near Matagorda Bay and then moved to Victoria County in 1726 (Walter 1999), Presidio La Bahia and Mission Rosario established in 1749 and 1754 in Goliad County (Ricklis 1999), and Mission Nuestra Señora de Refugio, built on the mouth of the Mission River lasted until 1828, nearly until the Texas Revolution (Newcomb 1961). Though the missions continued operating throughout the Spanish Colonial

Period, their constant movements were caused by consistent antagonism between the missions and local populations (Ricklis 1999). However, the area south of Corpus Christi Bay was relatively empty of European influence throughout the period. The first settlement in the area was formed in 1766, when Spanish rancher Blas Maria de la Garza Falcon, founded a ranch on Petronila Creek, north of Baffin Bay (Long 2016). By the end of the eighteenth century, most of the land south of the Nueces River and Corpus Christi Bay had been deeded to Spanish citizens and was sparsely occupied by cattle ranches (Long 2016). Although the Spanish claimed the area, the Texas coastal plain would remain mostly empty until the Mexican Revolution and the enticement of *empresarios* and colonists to the area.

Mexican Interest and Colonization (1810–1836)

After the Mexican War for Independence (1810–1821), Mexico continued to govern the states of Texas and Coahuila. In an effort to protect against encroachments by the nascent U.S., Mexico attempted to create a more populated buffer state in Texas. To this end, Mexican officials invited colonization of Texas, doling out land to farmers and ranchers and deferring payment for several years (Henderson 1928). These laws also continued the Spanish system of *empresarios*, by which land agents could obtain large grants of lands that could then be separately divided, instead of individual families petitioning the Mexican authorities. A majority of the *empresarios* and colonists were Anglo-American settlers (Henderson 1928). Slavery was allowed within Mexico, until banned by President Guerrero in 1829; however, Texas was specifically exempted from the law (de León 2017). In 1828, James McGloin and John McMullen signed a contract to bring 200 families to the area along the north side of Corpus Christi Bay (Henderson 1928: 299). During this period, a small fort, Fort Lipantitlan, was founded on the south side of the Nueces River near the Matamoros Road, and the settlement of Corpus Christi began to develop around a small trading post around 1831 (Long 2016). Padre Island appears to be settled by Europeans for the first time during this period, as Padre Nicholas Balli, a Catholic priest from Matamoros, acquired a grant to 11.5 square leagues of the island with the intention of raising cattle (Jones 1999). However, suspicions of the increasingly Anglo-American character of Texas, as well as the increasing power and autonomy of Anglo-Americans in Texas, led to pushes by the Mexican central authorities under General Santa Ana to revoke the colonization laws along with a general trend towards de-federalizing political control (de León 2017). Viewing these capricious changes to law as tyranny, a number of Texans, including a number of former *empresario*s, convened and declared independence for the Republic of Texas on March 2, 1836 (de León 2017).

Republic of Texas/ Antebellum Texas (1836–1861)

Upon their defeat at the Battle of San Jacinto, April 21, 1836, General Santa Anna was returned to Velasco, where he signed the Treaty of Velasco, freeing Texas from Mexican authority. The Constitution of the Republic of Texas set up a government similar in character to that of the U.S., with Sam Houston elected as the first president of the Texas Republic in September of 1836 (Kreneck 2018). The new constitution explicitly protected slavery within the new nation, allowing the slave trade to continue with the U.S. (Campbell 2017). During the first years of the Texas Republic, the general focus was on paying the debts incurred during the revolution, along with defining and protecting the new boundaries of the country, especially through continued settlement of the interior (Nance 2017). Even up to 1842, Mexican incursions into southern Texas threatened the sovereignty of the new nation (Long 2016).

For a new, small, and relatively poor nation, protection and recognition by foreign nations was vitally important. Annexation by the U.S. had always been one distinct possibility for Texas, and one that was promoted by Sam Houston during his first term as president (Nance 2017). By the 1844 U.S. presidential election, the question of Texas annexation was also on the front of the U.S. national mind. The election of expansionist James K. Polk was taken as a good sign of the desire of the U.S. to include another slave state in the nation and Texas President Anson Jones pushed for Texans to vote on the issue (Nance 2017). On October 13th, 1845, annexation and the new Texas State Constitution were accepted by overwhelming popular vote, and Texas became a part of the U.S. on December 29, 1845 (Nance 2017). The portions of Texas south of the Nueces River, however, remained in contention; the American occupation of Mexico City and the Treaty of Guadalupe Hidalgo would eventually fix the southern boundary of Texas at the Rio Grande in 1848 (Bauer 2016).

The subsequent years leading up to the Civil War were generally a time of expansion and consolidation of the primarily plantation based farming economy, especially within the coastal plain region. Cotton production increased over 600 percent between 1849 and 1859 (Britton et al. 2010). Slavery also expanded at an astounding rate. Between 1850 and 1860, the overall total number of slaves increased by 130,000, expanding from 27 percent to 30 percent of the population in the years just before the Civil War (Campbell 2017). At the same time, other industries grew slowly, possibly due to the overwhelming reliance on “King Cotton.” Only 5 percent of Texans were involved in commercial activity and only 1 percent involved in manufacturing (Campbell 2017). The only area of concerted industrial development in Texas during the Antebellum Period appeared in transportation. Beginning in the Texas Republic Period, a number of charters were established and legal wrangling began over the construction of railroads in Texas. By the outbreak of the Civil War, the Texas and New Orleans Railroad Company, the Eastern Texas Railroad Company, and the Washington County Rail Road Company all operated lines radiating out from Houston (Werner 2017). On the South Texas coast however, most of the economy was still dependent on cattle ranching and corn was a more important crop than cotton; ranches boomed after the Mexican-American War, with the number of cattle on tax rolls between 1848 and 1860 increasing over 8000 percent (Long 2016).

Civil War and Reconstruction (1861–1900)

Although Governor Sam Houston opposed any step that might lead Texas to break from the Union that he had fought so hard to join, Texans voted to secede from the U.S. in February of 1861 (Wooster 2017). Up to 90,000 Texans served in the Confederate forces, mostly fighting outside the state boundaries. Only the seacoast saw significant fighting during the war and most action focused on Galveston (Wooster 2017). Still, ordinary civilians felt the sting of war as the U.S. Navy successfully blockaded much of the Texan coast, preventing the importation of medicine, coffee, and other manufactured goods (Wooster 2017).

Little military action occurred in South Texas. Union troops bombarded Corpus Christi on two occasions, and occupied Mustang Island to prevent shipping to Mexico (Long 2010). In late 1863, Union troops took Brownsville and sent troops north to Matagorda Bay and Aransas Pass; however, Union troop levels were soon drawn down allowing Confederates to recapture the area (Wooster 2017). The most important change to result from the Civil War was the eventual end to slavery and the occupation of the area by Federal troops.

Reconstruction brought massive changes to the economic and cultural systems of Texas. Many of the former agricultural elites lost much of their wealth as a result of abolition (Moneyhon 2017). In South Texas, the growth of the cattle industry managed to outweigh the detrimental effects of the war. By 1870, the number of cattle in Nueces County had increased almost eightfold (Long 2016). During the period, outsized ranches grew to prominence (Cheesman, 2017). Corpus Christi grew in response as a meat packing and shipping center, with railroads reaching the city in the mid 1870’s and the sea channel was dredged in 1874 to allow ocean-going steamship traffic (Long 2010). The later part of this period also saw ranching supplanted by crop farming, with the introduction of cotton farming in Nueces County in the late 1880s (Long 2016). Still, Texas never managed to attain the success of northern manufacturing centers during the Reconstruction Period (Moneyhon 2017).

Modern Period (1900–present)

At the start of the twentieth century cotton, sorghum, cattle, and vegetable production dominated the local economy (Long 2016). By 1930, Nueces County was one of the largest cotton exporters in Texas (Long 2016). Kingsville, Texas, and the surrounding area, grew rapidly, and by 1913, had sufficient population to divide Kleberg County from Nueces (Coalson 2016). Development intensified in the early twentieth century as significant areas were cleared for ranching and farming. The petroleum boom finally arrived in the area in the 1920s and 1930s. The Port of Corpus Christi (POCC) opened in 1926, partly to serve the industry. Another significant driver of the economy in the area was the presence of several military bases, including the Corpus Christi Naval Air Station, opened in 1941, and Kingsville Naval Air Station opened in 1942, along with Naval Outlying Landing Fields (Coalson 2016; Long 2016). Oil production peaked in the 1970s and chemical and aluminum manufacturing plants sprung up along the bay in the 1980s, contributing to the slow dissolution of the traditional farming economy and the general development of the land surrounding Nueces and Kleberg counties (Long 2010, 2016)

Maritime History

Exploration of the Texas Coast began in 1519, when a Spaniard named Alonso Alvarez de Pineda led an expedition, on behalf of the governor of Jamaica, to map lands bordering the GOM. Pineda's map of the GOM shows inlets along the Texas Coast; however, there is no evidence that he entered or explored their shores (Weddle 1985; Chipman and Joseph 2010: 25). Pineda demonstrated there is no shortcut to Asia through the GOM. His logs also helped to identify the fastest sailing route between Vera Cruz and Havana (Chipman 1992: 24–26).

The first Europeans known to explore the Texas Coast inland were survivors from the shipwrecked Pánfilo de Narváez expedition of 1527. Álvar Núñez Cabeza de Vaca and 80 other Spaniards sailed on makeshift rafts to what many believe was Galveston Island. Those who survived the first winter were enslaved by Native Americans. Only four men returned to tell their stories of wandering from tribe to tribe through what is now Texas and northern Mexico to the Pacific Coast, eventually reaching Mexico City after eight years. Cabeza de Vaca published his story in 1542 upon returning to Spain (e.g., Cabeza de Vaca 2013).

The Spanish silver fleet, sailing out of Vera Cruz, conducted steady trade with Havana for about 250 years, until 1790. Their ships typically followed either a northern route, paralleling the coast, or crossed the central GOM. Seasonal changes in wind and current patterns determined their choice of routes (Lugo-Fernandez et al. 2007). The northern route occasionally imperiled Spanish flotillas when storms pushed them toward the coast.

In 1554 a fleet of three Spanish ships wrecked on the Texas Coast near the Port Mansfield Channel, about 70 mi (112.7 km) south of Mustang Island. The loss of the ships, Santa María de Yciar, San Esteban, and Espíritu Santo, led in the short term to an intensive 2-month salvage effort by García de Escalante Alvarado to recover their valuable cargos (McDonald and Arnold 1979). The loss of nearly 300 crew and passengers (only 32 people returned to Vera Cruz), including women and children, prompted longer range plans for more detailed explorations of the Gulf Coast. Guido de Lavazares was chosen to lead an expedition of three ships with orders to explore the entire coast from Rio de las Palmas to the Florida Keys. Lavazares arrived on the Texas Coast in the fall of 1558 at the latitude of present-day Kingsville (Chipman and Joseph 2010: 48). From that point, he followed the coast, stopping in what is believed to be Matagorda Bay, where he formally claimed the region as a Spanish possession (Chipman 1992:48–49 and Weddle 1991:100–103). A second expedition by Gonzalo Gayon followed the Gulf Coast in the opposite direction, from Florida to Texas, within a year or two of Lavazares.

Spain understandably did little to explore or develop settlements along the Texas Coast until their claims were challenged by other nations. Their population and trade centers were located far to the south in Mexico. Instead, they focused on inland explorations and establishment of missions to Christianize the natives. But then, in 1685, René Robert Cavelier, Sieur de La Salle arrived in Matagorda Bay with 300 colonists. By the time Spain heard talk of a French colony in the heart of their territory, La Salle's Fort St. Louis was already doomed, through a series of unfortunate events, to failure. The expedition lost one of three ships upon their arrival. A second ship returned to France with a group of colonists. While La Salle was attempting to find the Mississippi River with an overland expedition, their last ship, La Belle, grounded during a storm and was lost in Matagorda Bay. La Salle was murdered by his own men, and, with no way to return to Europe, those remaining at Fort St. Louis eventually perished (Weddle 1991).

Despite La Salle's failure to establish a lasting French presence, rumors of the French incursion quickly reached Spain. Spain mounted an intensive exploration of the Texas Coast to find and rout out the unwelcome intruders while simultaneously charting their own, relatively unknown, possessions there. Weddle (1991:68) summarized the effect of La Salle's arrival on the Spanish royal court as inspiring "the most intense coastal reconnaissance ever made in the GOM. In five coastal voyages spanning three years, there were few rivers and bays that had not been examined." One such voyage explored the area of Aransas Pass. Martín de Rivas and Pedro de Iriarte sailed north from Veracruz in 1686, reaching Aransas Pass in March of 1687. They named the pass Rio de San Joseph, charted its depths, and spent several days exploring the surrounding area (Weddle 1991). The abandoned remains of Fort St. Louis eventually were discovered by Alonso de León in 1689, upstream from Lavaca Bay on Garcitas Creek.

In 1764, Jose de Escandon was ordered by the viceroy of New Spain, Joaquín de Montserrat, marqués de Cruillas, to investigate rumors of English settlement on islands of the Texas Coast, not far from the mouth of the Nueces River. Escandon reported about the shoreline from Tampico to the Trinity River, based largely on testimony of a seaman, Joseph Garabito, who had made many trips up and down the coast. He reported that no English were found and that there was no place along that stretch of coast suitable for the English to establish a settlement (Bolton 1915: 104).

Shortly thereafter, in 1766, Diego Ortiz Parrilla was commissioned to explore the islands of the lower Texas Coast, and in particular what is now known as Padre Island. Parrilla was unable to personally explore the coast above the Nueces River, due to flooding from a hurricane, so he diverted inland to La Bahía del Espíritu Santo (Goliad) where he recorded extensive testimony regarding that portion of the coast between Nueces and the Trinity River. The soldiers of La Bahía interviewed by Parrilla had extensive knowledge of the coast between Matagorda Bay and the Nueces River, having made frequent trips to investigate wrecked vessels and pursue mission Indians (Bolton 1915: 104–106).

Copano Bay was one of the earliest maritime destinations inside of Aransas Pass. Its origin as a place of commerce may be linked to the relative ease of overland travel between Copano Bay and Spanish settlements at San Antonio (Presidio San Antonio de Béxar in 1716) and Goliad (Presidio La Bahía in 1749). Huson points out that Copano was the "nearest port and had no great river or stream between it and the settlements at San Antonio, or Rosario and La Bahía Mission, required to be crossed in carting between this port and either town. There is no question that this port was regularly used to supply Bexar and La Bahía" (Huson 1935: 6). The Port of Copano was officially opened for trade in 1785 with a collector of customs located at Goliad. Huson goes on to say that "the Mission of Nuestra Senora del Refugio was established [in 1793] to protect this port from pirates and smugglers".

Perhaps not surprisingly, when the Mexican army came ashore at the onset of the Texas Revolution, the chosen landing site was El Copano. General Cos landed on September 20, 1835 with 400 soldiers. From there he marched through Refugio to Goliad and then on to Béxar (Huson 1935: 24). Fortunately for the Texan colonists, Santa Anna had not acted on General Almonte's suggestion to fortify the entrance to Copano Bay. Seizing on this oversight, General Houston ordered that the port be protected as a point of entry for military supplies and provisions to support Burleson's army and the Texan garrison at Goliad. In 1835, Copano was designated as a port of entry for the Republic of Texas. A community of shellcrete houses developed around the landing beginning about 1840, and the town did a thriving export business in cotton, hides and tallow.

The first settlement at what is now Corpus Christi was founded as a trading post in 1839 by Henry Kinney and William Aubrey (Long 2010). The first town to be organized at the site was Grayson, shown on Hunt and Randel's (1839) chart and mentioned by Folsom (1842: 204) as "a town recently laid off on the south side of Corpus Christi Bay." By 1845, when General Zachary Taylor's army landed there during the Mexican American War, the town had become known as Corpus Christi.

Other early bay settlements dependent largely upon trade through Aransas Pass included the original town of Aransas, charted by Hunt and Randel (1839) on Live Oak Point (present site of Fulton and Rockport; see also Folsom 1842: 204); Lamar, at the entrance to Copano Bay opposite Live Oak Point; and a later version of Aransas on St. Joseph's Island (Marcy 1855). Marcy indicated channels and soundings leading from Aransas Pass to each town, as well as wagon roads leading to various points inland. All of the above bay shore communities were accessed by sea primarily through Aransas Pass and to a lesser extent through Corpus Christi Pass, and Cedar Bayou, also known as Espíritu Santo Inlet (Hunt and Randel 1839).

Marcy did not chart soundings for Cedar Bayou, as he did for the other two inlets, suggesting it was of less commercial importance.

Corpus Christi Pass, on the south end of Mustang Island, remained open from before 1839 (Hunt and Randel 1839) through at least 1934 (USCGS 1935). It was never a naturally deep pass; however, one branch of the pass, known as Packery Channel, became important to the local beef packing industry following the Civil War. A county map shows two structures on the south side of Corpus Christi Pass labeled “Factory” and “Kings” in 1869 (Blucher 1869). Attempts to dredge Packery Channel in 1890 and again in 1938 and 1940 were only briefly successful (Alexander et al. 1950; cited in in USACE 2003a: 3–77).

C.W. Howell proposed closing Corpus Christi Pass in a USACE annual report (Howell 1879: 930; cited in USACE 2003a: 3–77). Howell believed that cutting off tidal flow through Corpus Christi Pass might increase flows through both Aransas Pass and Laguna Madre, south of Corpus Christi Bay. Laguna Madre was an important route for the local beef packers to access salt production in Baffin Bay, referred to by Blucher (1869) as “Salt Lagoon.” Funding was never allocated for Howell’s planned closure of the inlet; however, it closed through natural processes by the mid-twentieth century.

Morgan Line steamboats began regular runs between New Orleans and the Texas Coast following the Civil War. This trade was subsidized by contracts with the federal government to deliver mail. Morgan negotiated four-year contracts in 1867 for service three times per week between New Orleans, Galveston and Indianola (in Matagorda Bay) and for a coastal route between Galveston, Matagorda, Aransas Bay, and Brazos Santiago. The route between Aransas Bay and Brazos Santiago would have passed through the offshore APE. By 1875, Morgan Line steamships were running weekly, from June to October, and twice-weekly, from October to June, between Brashear, Louisiana (Morgan City) and Rockport, by way of Aransas Pass. The Morgan Line offered the only regular steamship service along the Texas Coast. Morgan Line steamers averaged one trip through Aransas Pass every 10 days over a period of five years, from 1871 through 1876 (Hoyt 1990: 9–16). While important to the regional economy, the Morgan steamship visits represented less than half of offshore maritime trade (measured in vessel transits) through Aransas Pass. Over the period from 1866–1877, ships crossed the bar at Aransas Pass 1,880 times, averaging one arrival and one departure every 4–5 days (Kuehne 1973: cited in Hoyt 1990, Appendix A).

Hoyt (1990: Appendix B) itemized imports and exports through Aransas Pass for a short part of the 1880s. His research provides a snapshot of the quantity and variety of commerce through the pass at that time. Cattle products greatly dominated exports, including: tinned beef, hides (wet and dry), tallow, bones, blood, hair, shin bones, horns, knuckles, hoofs, neat’s-foot oil, and a small number of live cattle. Also exported was a large quantity of wool, and lesser quantities of ixtle fiber, fish and turtles, cotton, hemp, lead, merchandise, sheep, horses, hogs, and ore. Imports were dominated by general merchandise, lumber, and shingles. Other items imported included: steel rails, coal oil, coal, fire brick, cedar piles, salt, sheep, and a small number of calves, and hogs.

The bar at Aransas Pass became so shallow in 1878 that steamships could not enter the harbor. Federal involvement with navigation improvements in Corpus Christi Bay began with passage of the Rivers and Harbors Act of 1878. The following year, funds were authorized for deepening the outer bar channel at Aransas Pass, which was completed in 1885. The first channel between Aransas Pass and Corpus Christi was authorized in 1910 (USACE 2003b: 12). By 1919 the current stone jetties had been completed, which aided efforts to maintain the Aransas Pass Channel (Alperin 1977: 129–132) and removed the safety concerns associated with shifting sand bars at the harbor entrance.

Improvements to channels coincided with steady advancements in the safety of ships during the first half of the twentieth century. Sailing vessels were being replaced rapidly by safer, machine-powered vessels. By 1910, sailing ships comprised less than half of annual losses of U.S. merchant vessels for the first time, and by the end of World War II, only 2 percent of nationwide losses were sailing ships. This is significant, because sailing ships were at a higher risk of running aground than machine-powered vessels. At the same time that machinery was replacing wind power, more durable metal hulls gradually were replacing wooden hulls, a trend which had accelerated by the turn of the century. Nevertheless, at least 93 percent of all U.S. merchant vessels lost through the end of World War II were made of wood (Gearhart 2011a).

8.2.4 Previously Recorded Features

8.2.4.1 Terrestrial Sites

A background research and literature review was completed for the onshore portions of the Project and surrounding area. The background review consisted of a cultural resources and environmental literature review for the proposed Project, including a 1-mile (1.6-km) radius around the study area. An SWCA archaeologist reviewed the corresponding USGS 7.5-minute topographic quadrangle map on the Texas Archeological Sites Atlas (TASA), a restricted online database, for any previously recorded surveys and historic or prehistoric sites located in or near the Project. Site files, relevant maps, NRHP properties, State Antiquities Landmark (SAL) listings, Registered Texas Historic Landmarks, cemeteries, and local neighborhood surveys were also examined. Listings on TASA are limited to projects under purview of the Antiquities Code of Texas or the NHPA of 1966; therefore, all work conducted in the area may not be available. The Texas Historic Sites Overlay, historical topographic maps, aerial photographs, Bureau of Economic Geology Maps, and the NRCS Web Soil Survey were also examined for historical and environmental information related to the Project.

Previous Investigations

Only two previous cultural resources survey has been completed nearby (Figure 8-2). The first (Atlas No. 1001) intersects the southern corner of the onshore portion of the Project area. The survey was conducted for the USACE in 1984, however, no additional data associated with the Project is available on the TASA database. A second survey is located on Padre Island (Atlas No. 11644), and appears to be associated with Park Road 22. However, that survey terminates over 1 mile (1.6 km) north of the study area and also has no data associated with it in the TASA database (THC 2018). Finally, at least two general reconnaissance surveys of Padre Island have been conducted in association with the designation of the Padre Island National Seashore (PINS) (which does not intersect the Project area). These study relied on informants to identify cultural resources on Padre Island and did not involve intensive survey of the island (Campbell 1964; Scurlock 1974).

Previously Recorded Terrestrial Resources

No previously recorded archaeological sites are located within the study area (see Figure 8-2). One site (41KL60) is recorded within 1 mile (1.6 km) of the study area (THC 2018). This site is a prehistoric artifact scatter in a disturbed dune context and will not be impacted by the proposed Project as currently defined. In addition, one shipwreck that potentially dates to the nineteenth century has been recorded by the THC Maritime Archaeology Program approximately 900 ft. (274.3 m) south of the eastern end of the study area. The positional accuracy for the location of this shipwreck (Atlas No. 2459) is given as 1 mile (1.6 km); the location has not been verified. The shipwreck was identified in 1967 after it was exposed by Hurricane Beulah. Private excavations were conducted by individuals claiming mineral rights to materials extracted. Materials identified within the immediate vicinity by private excavations included human bone, a Roman head coin, oxidized silver, beeswax, and Spanish pitch. Ed Page, one of the mineral claimants/excavators, concluded that the ship was a Spanish “nao” at least 75 ft. (22.9 m) in length, however, no conclusions were drawn by any official archaeological entities (Phelps 1967).

In addition, the onshore portion of the Project area falls entirely within a NRHP District, which is also designated as a National Historic Landmark (NPS Designation 66000820), with national significance in agriculture, exploration, and settlement of the American West. The NRHP was listed in 1961; however, at the time, the contributing elements for listing were not published, and none have been identified within the THC database (THC 2018). The boundaries of the NRHP were based upon different landholdings of the area prior to 1940, but the location of contributing elements to the NRHP is not known.

No cemeteries or historical markers are recorded within 1 mile (1.6 km) of the study area (THC 2018).

Historical Documentary Evidence

Historical maps (USGS 1925, 1929, 1951a-b, 1956, 1968, 1969) and aerial photographs (National Environmental Title Research [NETR] 1995 Google Earth 1956, 1961, 1979), as well as historical maps on the Texas Historic Overlay (Foster et al. 2006) were reviewed for the study area. No evidence of any structures or other cultural features were identified within the Padre Island portion of the study area. The study area within each of the topographic maps is within areas labeled as "Shifting Sand Dunes" with various elevations from 5 to 25 ft. (1.5–7.6 m).

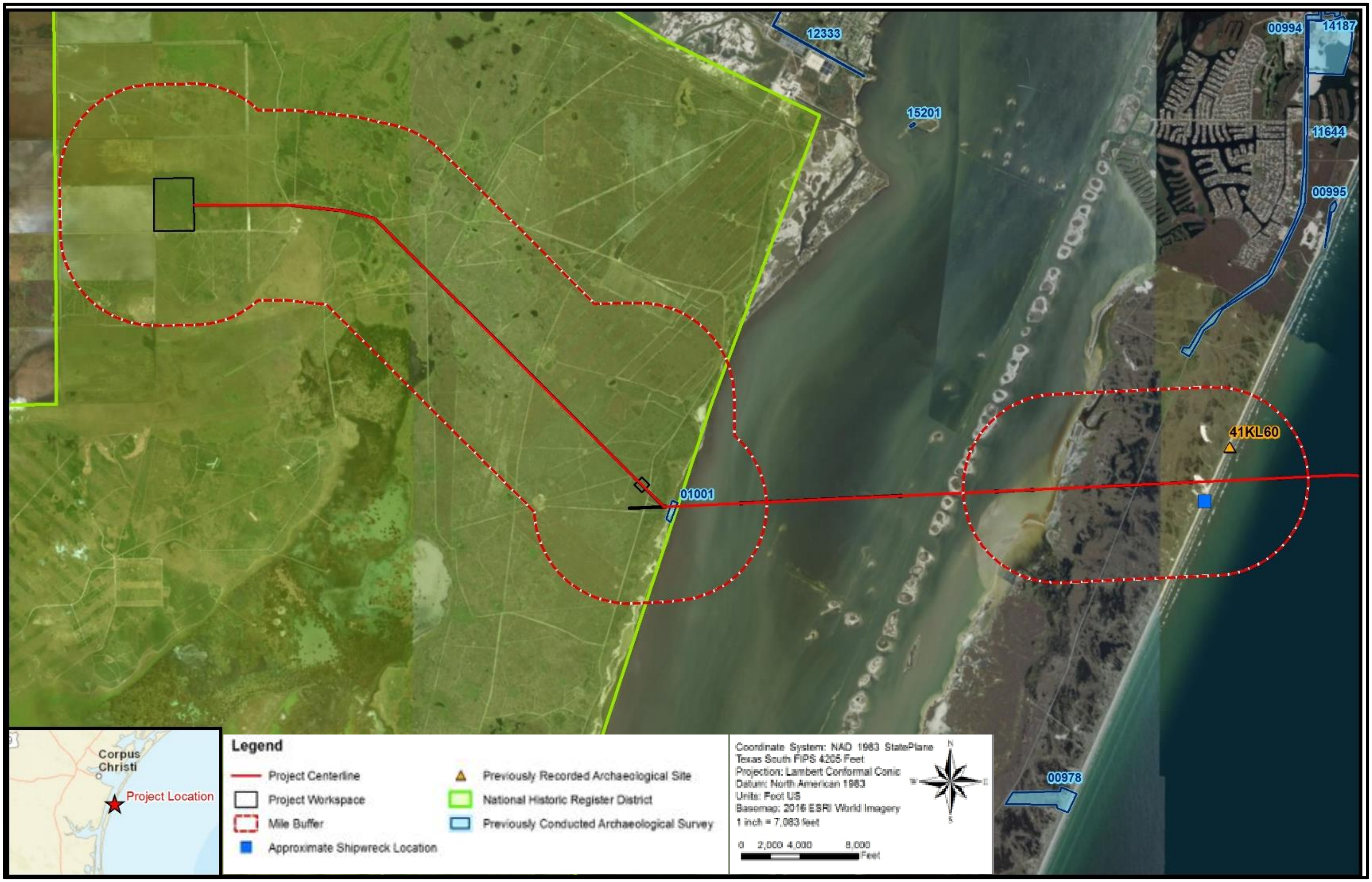


Figure 8-2: Previous surveys and cultural resources adjacent to the Project

Onshore, the 1925 topographic map of the Project area shows the "Los Sedros Windmill" located approximately 1900 feet (580 m) northeast of the proposed pipeline corridor at the edge of Laguna Madre (USGS 1925). A second windmill, the Dutches Windmill, is shown approximately 715 feet (218 m) south of the proposed pipeline corridor approximately 1.1 mile (1.7 km) east of the OSF. By 1951, an improved road had been constructed along the edge of Laguna Madre through the Project area, and an irregular shaped feature, labeled "Outlying Field No 41 (abandoned)" is present within the northern half of the Project area (USGS 1951a). This appears to be a Naval Outlying Air Field associated with training flights out of the Kingsville or Corpus Christi Naval Air Stations. Los Sedros (now labeled as 'Cedros') and Dutches Windmills are still present. A 1956 aerial photograph and the 1969 map of the area still shows the windmills in the same locations, with a set of structures or corrals surrounding the Dutches Windmill in the 1956 aerial photograph. These documents also show a set of structures located near the HDD entry location at the edge of Laguna Madre (Google Earth 1956; USGS 1969). These structures appear to persist through the 1960s and 70s, and a small dock extends into Laguna Madre (Google Earth 1979). The structures around the Dutches Windmill also persist, with several corrals still surrounding the location; the most substantial structure appears to have been demolished in 2014 (Google Earth 2014). The function of these structures is not known.

8.2.4.2 Submerged Sites

Potential for Historic Shipwrecks

Europeans have navigated the Texas Coast, including the offshore APE, for the past 500 years. Visits increased after 1685 as Spain and France competed for possession of the region. Europeans probably made regular trips through Aransas Pass by the mid-1700's to supply the mission and presidio at Goliad by way of Copano Bay. The Port of Copano was officially opened in 1785 along with a Customs House at Goliad. By 1839 traffic through Aransas Pass was visiting other coastal communities including Lamar, Aransas, and Kinney's Trading Post at Grayson (soon renamed Corpus Christi). The volume of trade through Aransas Pass would have steadily grown from then onward. The inshore APE may have been navigated sporadically by local ranchers and fishermen prior to the mid-nineteenth century. The beef packing industry on Padre Island also used this route, following the Civil War, to transport salt from Baffin Bay to Packery Channel. The offshore APE would have been intentionally crossed by ships transiting between Aransas Pass and more southerly ports, including Brazos Santiago Pass. Both areas have potential for wrecks driven ashore by storms.

Factors Affecting Vessel Loss

Factors contributing to the loss of watercraft vary depending on environmental conditions. Historic government statistics, summarized by Gearhart, et al. (1990: Volume IV, 59–61), categorized vessel casualties, including most accidents and incidents resulting in injury or loss of property, and reported the value of losses incurred. A total loss was reported if the hull could not be saved. These statistics do not reflect the degree to which cargo and vessels were salvaged. Types of casualties included foundering, stranding, collision and other (including fires, boiler explosions, injuries, and mechanical failures, etc.).

Foundering was the primary mechanism of vessel loss in navigable waters. The Annual List of Merchant Vessels of the U.S. (U.S. Department of the Treasury 1906–1946) defined foundering as leaking or capsizing of vessels. Foundering accounted for about 6 percent of historic vessel losses. Despite its low rate of occurrence, recovery from foundering was less likely than from any other type of casualty. Fifty-four percent of all foundered vessels were reported as totally lost.

Stranding was the primary mechanism of loss in shoal waters and was, by far, the most common type of shipwreck during the historic period. Stranding (or grounding) accounted for 64 percent of total losses reported by the U.S. Lifesaving Service for the period 1876 through 1914 (Gearhart, et al. 1990: Volume IV, 59–61). Stranding occurred where the water was too shallow for navigation, including shorelines, harbor bars and reefs. Forty-six percent of stranding events resulted in a total loss.

Severe weather accounted for 55 percent of total losses reported by the U.S. Lifesaving Service from 1876 through 1914. Almost half of all losses from foundering were caused by weather, compared with two thirds of losses from stranding. Mariners had short warning of approaching storms prior to modern weather forecasting. The Texas Coast can experience hazardous weather conditions throughout much of the year. Hurricane season lasts from late June through October. Hurricane-force winds can devastate ships caught unprepared. During the winter, severe cold fronts, or Northers, with winds exceeding 50 miles per hour (mph) and dangerous waves can affect the Texas Coast.

Factors Affecting Vessel Preservation

Preservation of sunken watercraft depends mainly upon their composition and the extent of their burial in the seafloor. Vessels may become partially buried soon after sinking due to the combined effects of storm-induced current scour, liquefaction of sediments, and their weight pressing down on a waterlogged substrate. Ships made of metal are equally susceptible to burial as wooden hulls, but metal hulls remain exposed much longer than wooden ones in saline waters along the Texas Coast. Exposed wooden components tend to disintegrate quickly where wood-boring organisms thrive. Biological organisms and water saturation weaken the wood, which is then more easily disarticulated and laid flat or removed by fishing trawlers and storm waves. Burial promotes long-term preservation of wood by creating an oxygen-deprived environment, which limits biological activity. Given a sufficient quantity of weakly-consolidated sediment, a significant portion of a hull might become preserved in this manner.

Iron corrodes five times faster in seawater than when buried on land. Iron artifacts tend to become concreted when calcium carbonate from the seawater cements adjacent materials, such as rock and sand, or even other artifacts, to the iron object. Prolonged oxidation can leach out most or all iron mineral, leaving only a carbonate mold of the original artifact (Hamilton 1998). Iron and steel hulls, nevertheless, can survive seawater exposure for well over a century.

Previous Investigations

There have been no marine archaeological surveys reported within 3 mi (4.8 km) of the APE; however, three maritime studies have been completed nearby at slightly greater distances (Table 8-1).

Table 8-1: Previous Marine Investigations near the APE

Antiquities Permit	Principal Investigator	Report Title	Sponsor	Reference
2734	Robert Gearhart	Archaeological Remote-Sensing and Terrestrial Survey of the Proposed North Padre Island Storm Damage Reduction and Environmental Restoration Project Packery Channel, Nueces County, Texas	PBS&J	Bond, et al. 2002
n/a	Gordon Watts	Historical and Literature Research and Remote Sensing Survey of Proposed Facility Development Areas Associated with the Mine Warfare Center at NAVSTA Ingleside	Tidewater Atlantic Research, Inc.	Watts 1995
n/a	Robert Gearhart	Terrestrial Magnetic Survey of Packery Channel, Padre Island, Corpus Christi, Texas	Espey, Huston & Associates, Inc.	Gearhart 1988

In 2002, archaeological investigations were conducted along Packery Channel, about 5 mi (8 km) north of the APE, on behalf of the U.S. Army Corps of Engineers (USACE), Galveston District (Bond et al. 2002). Their survey supported an Environmental Impact Statement prepared to study the effects of reopening Packery Channel (USACE 2003a). The survey included terrestrial shovel testing, a terrestrial magnetometer survey of the beach and dune area, and marine geophysical survey of navigable areas proposed for dredging both inshore and offshore of the island. No potentially significant targets were discovered by the survey, and the project was later constructed.

Tidewater Atlantic Research, Inc. conducted a marine remote-sensing survey, in 1995, of a small area near the mainland shore of Laguna Madre, slightly more than 3 mi (4.8 km) south of the APE (Watts 1995).

The survey was performed on behalf of the Ingleside Naval Station in support of proposed facility developments for their Mine Warfare Center. The study was not completed under a Texas Antiquities Permit, and no abstract or report is on file with the THC Atlas.

During the 1980's, a terrestrial reconnaissance survey was conducted over most of the historic Packery Channel route by James Warren (1987), working on behalf of the Reopen Packery Channel Association. Warren's survey did not discover any sites, since the channel was completely buried, so he subcontracted Espey, Huston & Associates, Inc. to perform a magnetometer survey of the area. A portable magnetometer was used to survey a grid over the channel to search for potential buried wrecks. The survey located 28 unidentified magnetic anomalies and 11 were recommended for further investigation (Gearhart 1988). No further investigations were conducted; however, the area was resurveyed by PBS&J in 2002 (Bond et al.

2002).

Shipwrecks reported within 3 mi (4.8 km) of the APE are included in Table 8-2. Sources consulted for Table 8-2 include the Texas Historical Commission's (THC) Texas Archaeological Sites Atlas (Atlas); the NOAA Automated Wreck and Obstruction Information System (AWOIS) database; a shipwreck database compiled by PBS&J; a BOEM GIS database; and historic maps from the Texas Historical Overlay (Foster, et al. 2006). The THC Atlas contains reports of shipwrecks from historic records.

Previously Recorded Submerged Resources

The AWOIS database is maintained by NOAA to support the charting of coastal areas. AWOIS tends to report recent shipwrecks; however, some historic wrecks are included. Positions for wrecks in AWOIS are usually more accurate than those from historic records, although positions pre-dating the era of satellite position systems can vary considerably from actual locations. A group of archaeologists, including this author, assembled the PBS&J database, in part, based on information gathered from charts, historical reports, THC files, and AWOIS. The PBS&J database focuses primarily on well-documented commercial wrecks postdating 1850. BOEM maintains a GIS database for offshore areas showing historic wrecks, USCG hazards to navigation, and net hangs reported by trawl fishermen.

At least 12 shipwrecks have been reported within a 3-mile (4.8 km) radius of the APE (Table 8-2) by one or more of the sources listed above. Positions reported in historical accounts are often imprecise, and archaeologists have yet to record any of the wrecks listed in Table 8-1.

Table 8-2: Wrecks and Obstruction Reported Within 3 Miles (4.8 km) of APE

Name of Vessel	THC No.	Coast Guard No.	AWOIS No.	Description	Date Lost
Leeway II	1690	File DMA063	4147	Fishing vessel	1975
Lucky Four	-	File 366-83 ; LNM 53-84	4146	Fishing vessel	1983
Mr. Murphy	2302	-	-	Unknown	1968
Orion	32	File DMA061	171	Freighter	1945
Unknown	2459	-	-	Unknown	1800's?
Unknown		File 001-54	-	Drilling Barge	1954
Unknown	1090	-	-	Unknown	1977
Unknown	-	File 103-77	-	16-foot Pleasure Craft	1977
Unknown	-	File 121-88 ; LNM 34-88	-	17-foot Glastron Pleasure Craft	1988

Name of Vessel	THC No.	Coast Guard No.	AWOIS No.	Description	Date Lost
Unknown	-	-	-	Submerged Wreck on NOAA Chart 11308	-
Unknown	-	-	-	Submerged Wreck on NOAA Chart 11308	-
Unknown	-	-	-	Wreck Awash on NOAA Chart 11308	-

8.2.5 Cultural Resource Assessments

8.2.5.1 Onshore and Inshore Terrestrial Cultural Resources Assessment

A Phase I cultural resources survey was performed by SWCA of the inshore, Padre Island portion of the Project area (Foreman and Mattox 2018; Volume III [Confidential]). No direct investigations of the onshore portion of the Project area have been conducted. Cultural resources investigations included pedestrian survey and backhoe trenching within the Project area to assess the potential for intact cultural resources.

The study area is located in a coastal floodplain setting with the potential for deeply buried archaeological sites. As such, the most expedient method of assessing this potential was through the excavation of backhoe trenches. Trench placement was based on the level of disturbance within the study area, the location of any buried utilities, and the preservation potential for archaeological sites.

Backhoe trenches were excavated to a depth sufficient to determine the presence/absence of buried cultural materials and allow the complete recording of all features and geomorphic information to depths of Project impacts. Generally, trenches were to be 6.6 ft. (2 m) deep, 26.3 ft. (8 m) long, and 4.9 ft. (1.5 m) wide. Excavations utilized the double-ditch method; top soil and vegetation from each trench was set aside, intact, during trenching, and was replaced after the rest of the subsoil in order to help preserve and restore vegetation at the affected locations.

An experienced archaeologist monitored all trenching while excavations were underway. Stratigraphic soils descriptions were recorded for each trench by an experienced archaeologist. SWCA mapped and photographed all features encountered during trenching. A column of soil was excavated and screened down one side of select trenches. The columns were roughly 30×30 centimeters (cm) in size, extending from the ground surface to the base of the trench. Soil from the column was removed in 20-cm levels and screened through ¼-inch hardware screen mesh.

An intensive archaeological survey of the study area was conducted on February 20–21, 2018. The investigation involved pedestrian survey of the entire corridor and the excavation of 17 backhoe trenches through the grasslands and dunes of Padre Island (Figure8-3). Ground surface visibility in the Project area was low to moderate (0 – 30 percent), due to dense grasses. The Project area is punctuated by a number of small wet areas that could not be directly accessed for pedestrian survey or trenching.

Trenching could not be conducted within the last 1,000 ft. (304.8 m) of either end of the alignment due to natural obstacles and environmental hazards. However, the areas were assessed by pedestrian survey, as much as possible. At the western end, the study area terminated in watery marshes along the Laguna Madre, where high water tables and lack of stable ground limited investigations. In the east, the study area terminated in large (20–30 foot) dunes that could not be crossed by the backhoe. These dunes have poor depositional integrity since they are constantly shifting under the influence of coastal winds, lowering the likelihood of intact cultural materials which might maintain some degree of context.

In order to account for the lack of direct excavation within the beach and surf zone of North Padre Island, Geo-Marine (2018) conducted a pedestrian magnetometer survey of the beach and results were interpreted by BOB Hydrographics, LLC (Gearhart 2018). No significant magnetic anomalies were identified on the beach within a 2000-foot (609.6-m)-wide survey corridor.

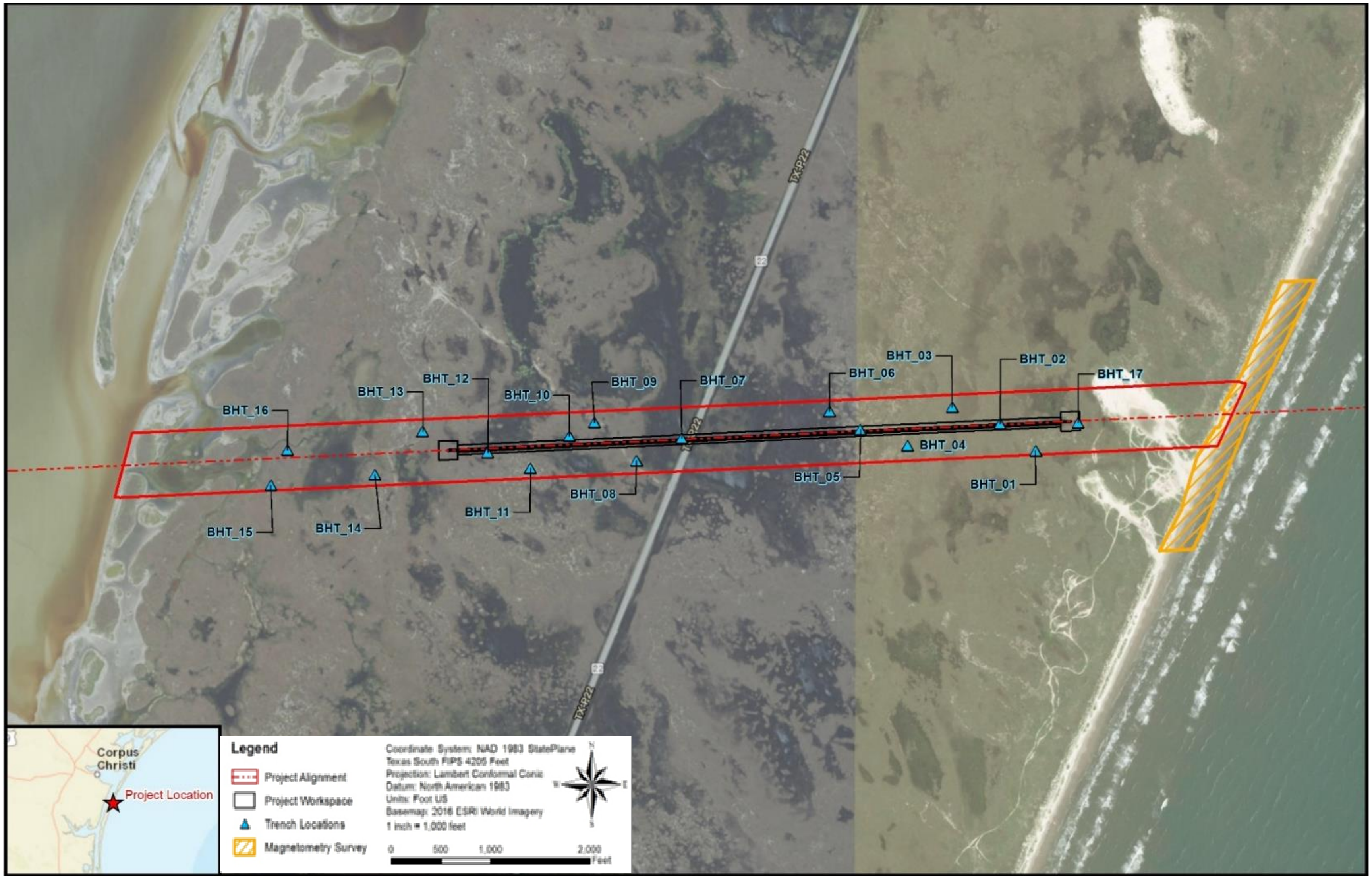


Figure 8-3: Inshore Archaeological Survey Results

As visual impacts to historic properties are potentially associated with any above-ground construction, a preliminary viewshed analysis was conducted of aboveground portions of the Project. A valve station will be installed approximately 0.33 mi (536 m) east of Park Road 22 within the inshore portion of the Project area. The exact height of this valve has not been established. In order to account for viewshed impacts to cultural resources within the vicinity, a desktop review was completed of the area within a 0.25-mile (402 m) radius of the valve station location. The background review revealed that no historic structures have been identified in available historic documentation within 0.25 mile (402 m) of the proposed valve station, and no structures are currently present within that radius. As such, the proposed valve station will have no visual impact on above-ground cultural resources. In addition, the SPM buoy system will sit on the surface of the waters of the Gulf of Mexico (GOM; the height of the SPM buoy system is not yet known and may vary over time. However, as the buoy will be located approximately 14.5 mi offshore, it will likely not be visible from the shore as it will be below the horizon. As such, it will not have the potential to affect the environment of any terrestrial cultural resources.

No cultural resources were identified as a result of cultural resource investigations of the inshore component of the proposed Project area. A cultural resources survey of the onshore component of the proposed Project area will be completed in consultation with the THC if required for NHPA Section 106 or NEPA compliance.

8.2.5.2 Offshore and Inshore Submerged Cultural Resources Assessment

The purpose of the survey was to map geophysical anomalies that might indicate the presence of historically-significant, submerged archaeological sites. Submerged archaeological sites, in this context, might be historic sites, such as sunken or abandoned watercraft or lighthouses; or drowned terrestrial prehistoric sites dating to the late Pleistocene or Early Holocene when the APE was last above sea level. The primary instrument for locating areas with potential for preservation of drowned prehistoric sites is the acoustic sub-bottom profiler. The search for submerged prehistoric sites focuses on the use of sub-bottom profiling to discover geomorphic features, such as buried stream channels, that tend to be associated with prehistoric sites on land. Stream dissections of ancient land surfaces, known as paleo-channels, are considered areas of heightened potential for preservation of submerged, prehistoric archaeological remains.

The primary instrument for locating submerged watercraft in buried contexts is the magnetometer. Exposed shipwrecks are most easily recognized in side-scan sonar imagery; however, historic wrecks in Texas bays and shallow areas in the GOM are more often buried. Vessels predating World War II tend to be constructed of wood, which quickly deteriorates when exposed to wood-loving organisms, common to warm saline environments. Nevertheless, buried wooden hulls can retain a high level of artifact preservation and historic integrity. Wrecks exposed above the mudline for more than a few years tend to be constructed of materials other than wood.

Geophysical survey was conducted of the offshore and inshore waters within the Project area (Figure 8-4, 8-5). Geophysical survey of the APE was designed to meet or exceed the following minimum standards of the THC for archaeological survey of state-owned submerged lands (TAC, Title 13, Part 2, Chapter 28, Rule 28.6) and meets or exceeds archaeological survey and reporting requirements published by BOEM in Notice to Lessees 2005-G07:

- The survey must be conducted under a Texas Antiquities Permit issued by the THC;
- The survey line interval cannot exceed 20 m (30 m when greater than (>) 3 nm offshore).
- Bottom-disturbing activities must be avoided within 50 m of potentially significant targets (150 m when more than 3 nm offshore).
- The survey area must extend beyond the limits of bottom-disturbing activities by the width of the avoidance margin.
- Survey instrumentation must include a marine magnetometer, a high-resolution side-scan sonar, and a recording fathometer all of which must record data digitally to electronic storage media.

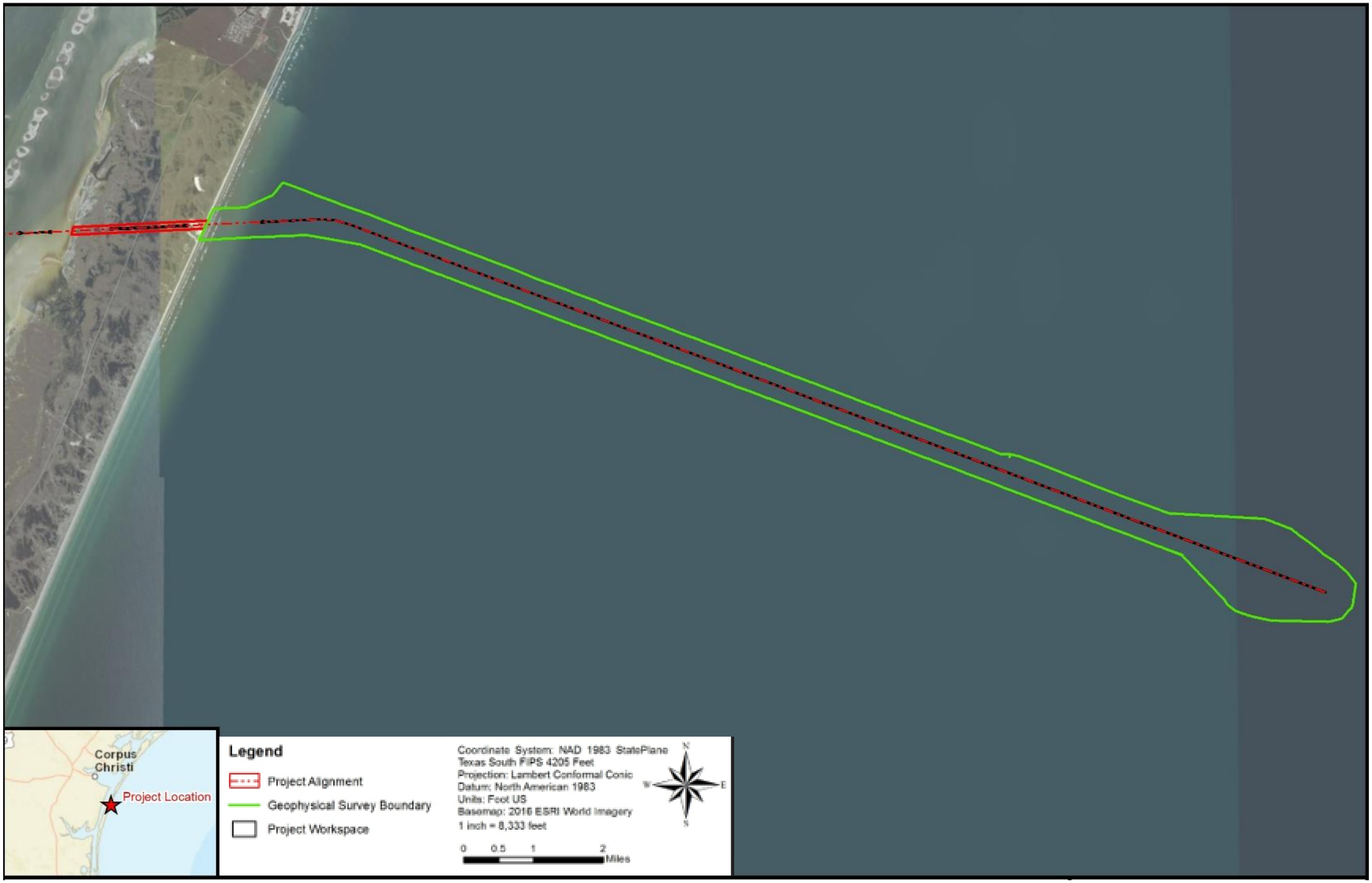


Figure 8-4: Offshore Cultural Resources Survey Results

- Survey instrumentation should be interfaced with a positioning system having accuracy comparable or better than a differential global positioning system (GPS) receiver.
- The magnetometer must be towed within 6 m of the marine bed and should sample at least once per second.
- The side-scan sonar should operate at a minimum frequency of 300 kilohertz (kHz).
- The positioning system should sample at least once per second; and
- No artifact collection is permitted.

Geophysical survey was completed by Naismith Marine, Inc. from January 26 through March 30, 2018. Archaeologists monitored the acquisition of all data in state waters. A 2,000-foot (609.6 m) -wide corridor, centered on the ROW and including the proposed lay barge anchorage, was surveyed both offshore and inshore. The survey encompassed 4,257 offshore ac, including the surf zone and the beach to the sand dunes, and 926 inshore ac. The offshore Survey spans portions of three Federal Lease Blocks (MU-816, MU-822, and MU-823) in the Mustang Island Area, and 7 State Mineral Lease Tracts (927, 928, 929, 933, 796, 817, and 818). The inshore Survey includes portions of eight State Mineral Lease Tracts (145A, 146A, 146, 147, 155, 170, 178, and 179) in the Laguna Madre. Water depth ranges from 0–16 ft. (0–4.9 m) inshore (in the Laguna Madre) and from 0–95 ft. (0–28.9 m) offshore.

BOB Hydrographics, LLC conducted an archaeological assessment of all geophysical data acquired by surveys of the offshore and inshore submerged areas. Submerged archaeological sites, in these context, might be historic sites, such as sunken or abandoned watercraft or lighthouses; or drowned terrestrial prehistoric sites dating to the late Pleistocene or Early Holocene when the APE was last above sea level. Submerged historic remains may be eligible for nomination to the NRHP or as State Antiquities Landmarks. A review of the cultural background determined that no prior marine archaeological investigations have been conducted within 3 mi (4.8 km) of this Project. At least, 12 wrecks have been reported within 3 mi (4.8 km) of the APE.

Analysis of geophysical survey results from this investigation discovered one target potentially eligible for the State Antiquities Landmark or for the NRHP. The inshore submerged cultural resources assessment located one unidentified magnetic anomaly, designated Anomaly 1, which is potentially associated with a buried, historic shipwreck. Anomaly 1 lies on the Project centerline approximately 0.61 mi (980 m) east of the western shore of Laguna Madre (Figure 8-5). No potential historic sites were discovered by the offshore submerged cultural resources assessment. No sub-bottom data was required in the bay, so areas of high potential for submerged prehistoric sites were not mapped there. Prehistoric site potential within the bay should be limited to the Archaic Period.

Filled remnants of distributary channels, associated with an earlier Nueces River Delta, are preserved within 10 ft. (3.0 m) of the seafloor along a portion of the offshore APE stretching from 0.7–3.8 mi (1.1–3.8 km) seaward of Padre Island. These channels pre-date the island and are believed to be from 3,500–6,000 years old. Channels of this age may preserve prehistoric archaeological sites, dating from the Archaic Period, along their margins.

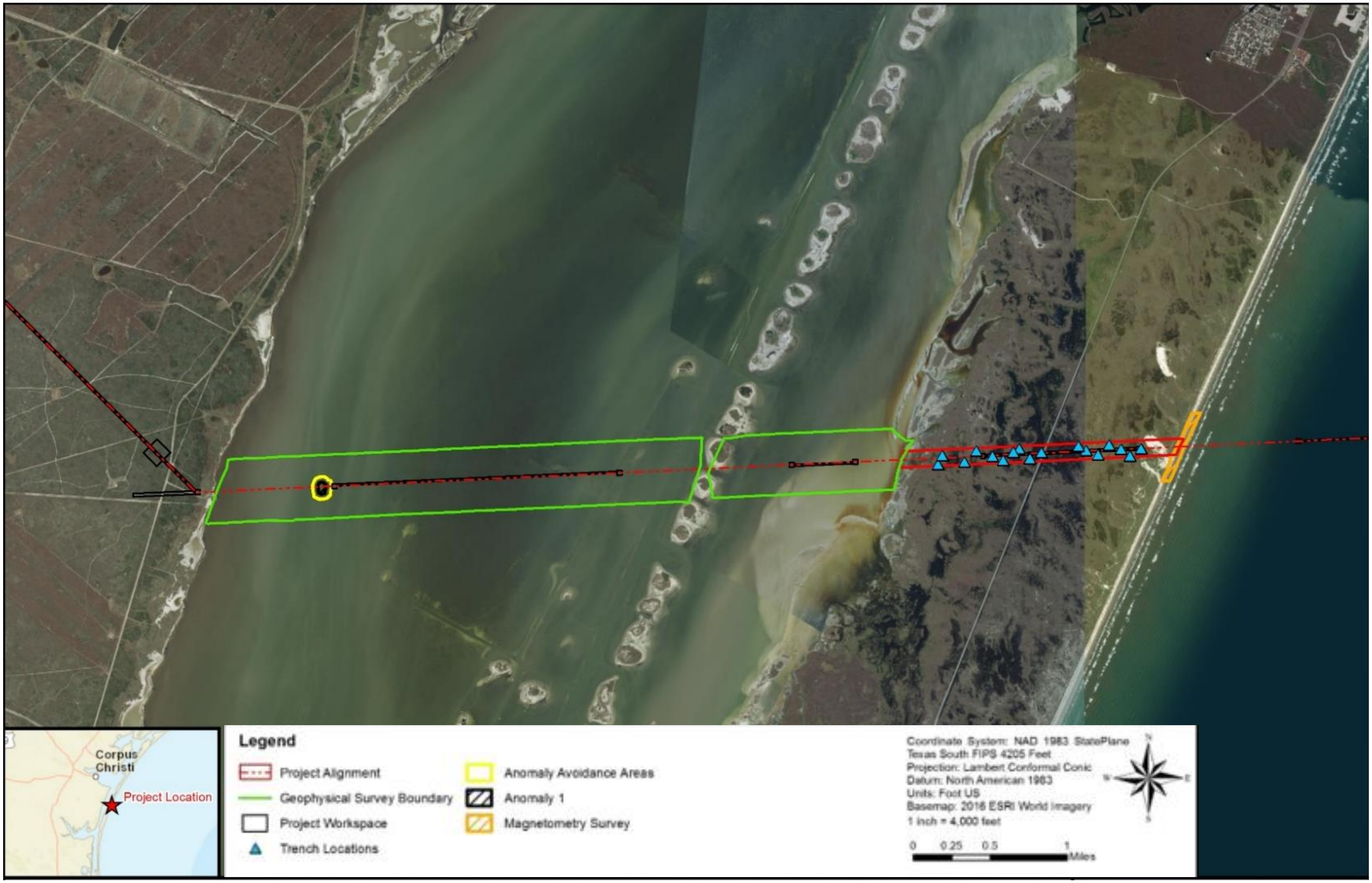


Figure 8-5: Inshore Submerged Cultural Resources Survey Results

8.2.6 Native American Concerns

Using the U.S. Department of Housing and Urban Development's (HUD's) Tribal Directory Assessment Tool (TDAT), four federally recognized tribes have been identified which expressed an interest in projects within Kleberg and Nueces counties, Texas. These include the Apache Tribe of Oklahoma, the Comanche Nation, The Tonkawa Tribe of Indians of Oklahoma, and the Wichita and Affiliated Tribes (Wichita, Keechi, Waco, and Tawakonie). Consulting federal agencies may recommend additional tribes. This section will detail the process of communication between federal agencies (possibly facilitated by the client) and the tribes, including dates of communication and responses. No consultation has yet occurred.

8.2.7 Summary of Findings

8.2.7.1 Onshore

Background review of the onshore portion of the Project area reveals that the area is wholly contained within a National Register Historic District, a National Historic Landmark. However, no previously recorded archaeological or otherwise historic sites have been recorded within the Project area. Potential historic features have been identified through documentary research, including potential historic sites in the southern portion of the Project area and a potentially historic windmill. A cultural resources survey of the onshore portion of the Project area was not conducted; as such, these sites have not been directly evaluated. Additional cultural resources surveys of the onshore portion of the Project area will be completed in consultation with the THC if required for NHPA Section 106 or NEPA compliance.

8.2.7.2 Inshore

A submerged cultural resources survey was conducted within Laguna Madre and a terrestrial cultural resources survey was conducted on Padre Island in order to identify potential cultural resources within the inshore portion of the Project area. The submerged cultural resources survey located one unidentified magnetic anomaly, designated Anomaly 1, which is potentially associated with a submerged historic site. Anomaly 1 lies on the Project centerline approximately 0.61 mi (980 m) east of the western shore of Laguna Madre. Submerged prehistoric site potential was not assessed for the inshore portion of the Project. The terrestrial cultural resources survey, including pedestrian survey, magnetometer survey, and backhoe trenching, did not identify any cultural resources within the terrestrial segment of the inshore portion of the Project area.

8.2.7.3 Offshore

A submerged cultural resources survey was conducted within the offshore portion of the Project, including the beach and surf zone, to identify any potential submerged cultural resources. No potential historic sites were discovered in the offshore Project area. Submerged prehistoric sites, dating from the Archaic Period, may be preserved within 10 ft. (3.0 m) of the seafloor along portions of the offshore Project area stretching from 0.7–3.8 mi (1.1–3.8 km) seaward of Padre Island. This area contains filled remnants of distributary channels, associated with an earlier Nueces River Delta, which may preserve sites along their margins.

8.3 Environmental Consequences

The methodology for evaluating impacts to cultural resources has identified consequence-producing factors within three distinct phases of the Project, including Construction, Operation, and Decommissioning. Consequences are assessed to determine the magnitude of impact. Refer to Appendix A: Construction, Operation and Decommissioning Procedures, for a detailed description of techniques, procedures, and phases of the Project that were used to evaluated environmental consequences in the following sections.

8.3.1 Construction

No known cultural resources are present in or within 1000 ft. (304.8 m) of the terrestrial inshore or offshore portions of the Project area. However, one potentially significant magnetic anomaly, possibly representing a historic resource, has been identified buried within the submerged parts of the inshore portion of the Project area. However, western horizontal directional drilling (HDD) location has been extended from the original location such that construction will bore beneath Anomaly 1. Construction equipment will not encroach within 164 ft. (50 m) of the potential historic site, and the pipeline will be installed at least 10 ft. (3.0 m) below the seafloor in the vicinity of the anomaly. Minor levels of increased sedimentation may affect the site during construction; however, these effects will not be substantial enough affect any significant attributes of site. Apart from increased sedimentation in the vicinity of Anomaly 1, construction-induced effects, including direct ground disturbance, vibration, noise, or increased sedimentation in other portions of the inshore and offshore waters have negligible potential to affect cultural resources. Effects to the viewshed of potential historic resources are possible, but would be temporary and reversible.

Although there is a low likelihood, cultural resources may be deeply buried within portions of the inshore and offshore Project area that are buried beneath deep Holocene sediments in Laguna Madre and the GOM. As there is no safe, effective way to survey for or assess these resources prior to construction, and these potential resources may be impacted by deep impacts associated with HDD pipeline installation.

Within the onshore portion of the Project area the proposed Project includes construction of a storage terminal facility and pipeline within portions of a National Register District. As contributing elements to the NRHP district are not definitively known, assessment of the impacts to the NRHP district cannot be estimated. If contributing elements are located within the direct construction area such that the contributing element would be damaged or destroyed, then impacts would be considered adverse, permanent, and significant. Similarly, if contributing elements are located outside, but within the viewshed of the proposed onshore facility, then the construction would serve to alter the environment, and thus the characteristics of the historic elements. These impacts, too, would be adverse, and significant, but would be reversible, as removal of the facility and returning the landscape to its former character would serve to restore the environment.

8.3.2 Operation

Maintenance and access to the pipeline corridor and valve site during normal operation would be conducted within the existing pipeline corridor, and would thus have no impact on cultural resources. Due to the lack of anchorage at the DWP, no ground or seafloor disturbing impacts would be expected. As no cultural resources are located within the viewshed of the Project, no impacts to the environment of cultural resources are to be expected from the operation of the Project.

8.3.3 Decommissioning

Impacts to the seafloor and ground surface during decommissioning would be similar to installation, as all materials will be removed. This would involve the re-excavation backfilled soils and sediments deposited in trenches, and disturbance of sediments around the SPM buoy system. As with the initial construction, all cultural resource areas would be avoided, thus avoiding impacts to cultural resources. An increase in sedimentation around the area may be expected during Project decommissioning, however, these affects will not be substantial enough affect any significant attributes of any cultural resources. Visual impacts associated with decommissioning would be temporary and reversible.

8.4 Cumulative Impacts

Cumulative effects generally refer to impacts that are additive or synergistic in nature and result from the construction of multiple actions in the same vicinity and time frame. Cumulative impacts can result from individually minor, but collectively significant actions, taking place over a period of time. In general, small-scale projects with minimal impacts of short duration do not significantly contribute to cumulative impacts (see Volume II Introduction, Evaluation Framework, and Summary of Impacts).

As the construction and operation of the DWP, along with the construction of any of the number of other industrial scale projects within the vicinity of the DWP have the potential to impact cultural resources through ground disturbance and impacts to the viewshed of cultural resources, the DWP has the potential to contribute to cumulative impacts to cultural resources in the vicinity of the Project. However, based on the relative location of the projects to the proposed Project, no common cultural resources will be impacted.

The proposed Project will not permanently impact historic properties listed on or considered eligible for listing on the NRHP. Therefore, any potential incremental increase in cumulative impacts on cultural resources from the other projects in consideration with the Project will be negligible.

8.5 Mitigation Measures

No known cultural resources are present in or within 1000 ft. (304.8 m) of the terrestrial inshore or offshore portions of the Project area. Therefore, no mitigation of cultural resources within the inshore or offshore portions of the Project area are required. One magnetic anomaly, Anomaly 1, was identified during geophysical survey of the inshore portion of the Project area within Laguna Madre. The Project will utilize an extended HDD to avoid impacts to this resource. Construction equipment will maintain a 164-foot (50-m) buffer around the resource, and the pipeline will be installed at least 10 ft. (3.0 m) below the anomaly. As such, apart from negligible increases to sedimentation, no adverse impacts to Anomaly 1 will occur as a result of the Project. Although, there is a low likelihood, cultural resources may be deeply buried within portions of the inshore and offshore Project area that are deeply buried beneath Holocene sediments in Laguna Madre and the GOM. As there is no safe, effective way to survey for or assess these resources prior to construction, and these potential resources may be impacted by deep impacts associated with HDD pipeline installation, monitoring of drill returns and implementation of the Unanticipated Discoveries Plan will be the only effective way of mitigating impacts to these potential resources.

The onshore portion of the Project area falls within the boundaries of a NRHP district and NHL. As contributing elements to the NRHP district are not definitively known, assessment of the impacts to the NRHP district cannot be estimated. If contributing elements are located within the direct construction area such that the contributing element would be damaged or destroyed, then impacts would be considered adverse, permanent, and significant. Similarly, if contributing elements are located outside, but within the viewshed of the proposed onshore storage terminal facility, then the construction would serve to alter the environment, and thus the characteristics of the historic element. These impacts, too, would be adverse, and significant, but would be reversible, as removal of the facility and returning the landscape to its former character would serve to restore the environment.

Any mitigation of impacts to contributing elements of the NRHP district would have to be developed in consultation with the property owners, THC, involved federal agencies, and the ACHP.

The following best management practices (BMPs) will be employed to further reduce the potential to impact cultural resources:

- Avoid all known cultural resources or potential resources, including potentially significant seafloor anomalies. If avoidance of known cultural resources or potential resources is not possible, additional investigations and a treatment plan will be developed in consultation with the THC and applicable federal agencies.
- Develop and implement an Unanticipated Discoveries Plan. This plan will be reviewed by the THC and applicable federal agencies. All proposed Project construction, operation, and decommissioning personnel shall be familiar with the plan and the steps that the Project has agreed to follow in the event of the discovery of significant cultural resources including human remains. The Unanticipated Discoveries Plan can be referenced in Volume III: Confidential Appendices.

8.6 Summary of Potential Impacts

Table 8-3: Summary of Potential Impacts to Cultural Resources

Project Phase	Impact	Duration	Significance	Mitigation
Construction	Onshore: ground disturbance to resources Visual impacts to NR District; Inshore: ground disturbance, seafloor disturbance; visual impacts of construction equipment Offshore: seafloor disturbance; increased sedimentation, visual impacts of construction vessels	Ground disturbance: permanent Visual impacts: Temporary Inshore	Ground/ seafloor disturbance: direct, adverse, negligible, long-term, irreversible; Visual impacts; indirect, adverse, minor, short-term, reversible; Increased sedimentation: direct, adverse, negligible, short-term, reversible	Known cultural resources will be avoided by construction impacts; Unanticipated Discoveries Plan will be in effect
Operation	Access and maintenance, visual impacts due to the presence of the onshore facility, valve station, and SPM buoy	Throughout life of Project	Access and maintenance: Negligible; Visual impacts: indirect, adverse, negligible, long term, reversible	Access and maintenance will be completed through corridors which avoid cultural resources
Decommissioning	Seafloor and ground disturbance, increased sedimentation, visual impacts of construction equipment/ vessels	During decommissioning	Ground disturbances: Negligible; Increased sedimentation: direct, adverse, negligible	Known cultural resources will be avoided by decommissioning impacts
Cumulative	None	Life of Project	Negligible	None

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