DEEPWATER PORT LICENSE APPLICATION FOR THE BLUEWATER SPM PROJECT

VOLUME II – ENVIRONMENTAL EVALUATION

Section 9 – Cultural Resources

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ACRONYMS AND ABBREVIATIONS

AIRFA	American Indian Religious Freedom Act
APE	Area of Potential Effects
Applicant	Bluewater Texas Terminal, LLC
AWOIS	Automated Wreck and Obstruction Information System
BOEM	Bureau of Ocean Energy Management
B.P.	[years] before present
CFR	Code of Federal Regulations
DWP	deepwater port
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ft.	Feet
FS	fill and spoil
GOM	Gulf of Mexico
HDD	Horizontal Directional Drilling
km	Kilometer
MHT	mean high tide
mi	Miles
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
nT	nanoTesla
OCS	Outer Continental Shelf
Project	Bluewater SPM Project
SAL	State Antiquities Landmark
SMCA	Sunken Military Craft Act
SPM	single point mooring
TAC	Texas Administrative Code
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
USGS	United States Geological Society

9 Cultural Resources

This section discusses the existing cultural resources within the vicinity of the Proposed Bluewater SPM Project (Project) and the Alternative Project, and the anticipated environmental impacts associated with the construction, operation, and decommissioning of the Proposed Project and the Alternative Project. The detailed description of the Proposed and Alternative Project and the framework for the evaluation of environmental impacts is provided in Section 3: Project Description and Framework for Environmental Evaluation.

9.1 Applicable Laws and Regulations

The National Environmental Policy Act (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 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, the Advisory Council on Historic Preservation, and other interested parties an opportunity to comment with regard to the undertaking. The NEPA Environmental Assessment (EA) / Environmental Impact Statement 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 Advisory Council on Historic Preservation (36 CFR 800, Protection of Historic Properties).

In addition to NEPA and NHPA, other laws and guidelines are applicable to the 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 (16 U.S.C. 470 aa–mm);
- Archaeological and Historic Preservation Act of 1974 (16 U.S.C. 469);
- Outer Continental Shelf (OCS) Lands Act 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 U.S.C. 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 U.S.C. 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 Outer Continental Shelf (OCS). The BOEM's primary responsibility is to manage oil, gas, and mineral resources on the OCS and assess the impacts of all 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, and the Marine Mammal Protection Act. 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 archeological resources, prehistoric archaeological resources, or both. 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 Gulf of Mexico (GOM) and Atlantic OCS are contained in Minerals Management Service Notices to Lessees 2005-G07 and 2005-G10 in compliance with 30 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 deepwater port (DWP) will lie on the OCS outside of the jurisdiction of the State of Texas and will be subject to these regulations.

9.2 Proposed Project

9.2.1 Proposed Project Area

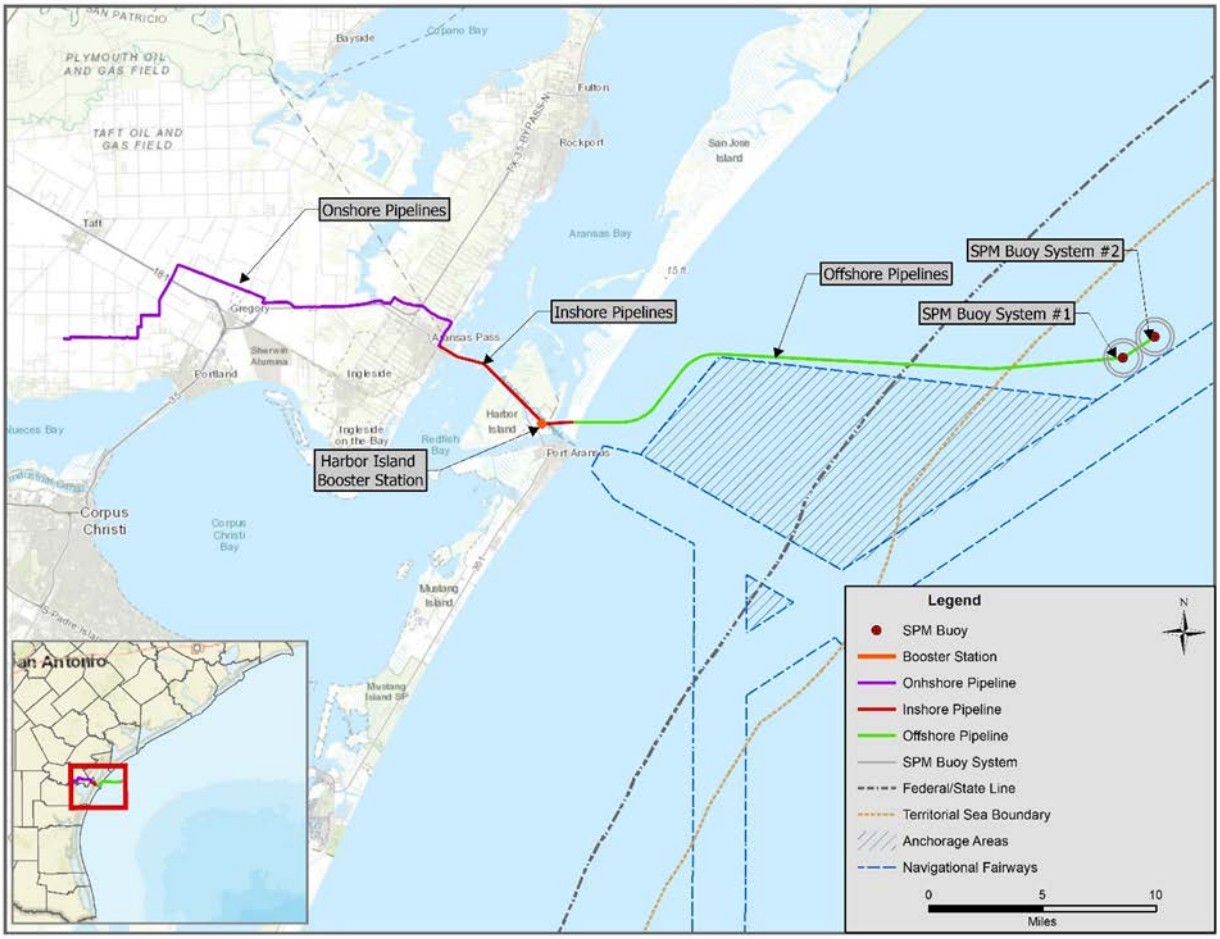
The Proposed Project area considered for cultural resources includes Onshore Pipelines, Inshore Pipelines, Offshore Pipelines, and two single point mooring (SPM) buoy systems (which make up the DWP). Onshore components associated with the Proposed Project are defined as those components landward of the western Redfish Bay mean high tide (MHT) line, located in San Patricio and Aransas Counties, Texas. Onshore Project components include approximately 22.20 miles of two (2) new 30-inch-diameter crude oil pipelines extending from the landward side of the MHT line of Redfish Bay to the existing Midway Terminal located south of the City of Taft in San Patricio County, Texas. The onshore study area evaluated for cultural resources investigations consisted of a 300-foot wide corridor along the length of the proposed onshore pipeline, encompassing 812.74 acres.

Inshore components associated with the Proposed Project are defined as those components located between the western Redfish Bay MHT line and the MHT line located at the interface of San Jose Island and the GOM. Inshore Project components includes approximately 7.15 miles of two (2) new 30-inch-diameter crude oil pipelines, and an approximate 19-acre booster station located on Harbor Island. The inshore portion of the Proposed Project area includes the terrestrial portion of the pipeline corridor area including Lydia Ann Island, Harbor Island, Stedman Island, and a small segment leading into Aransas Pass. The inshore study area evaluated for natural resources investigations consisted of a 100-foot wide corridor along the pipeline centerline within Aransas, Nueces, and San Patricio Counties, Texas.

Offshore components associated with the Proposed Project are defined as those components located seaward of the MHT line located at the interface of San Jose Island and the GOM. The Offshore Project components include approximately 27.13 miles of two (2) new 30-inch-diameter crude oil pipelines extending to two (2) SPM buoy systems. The proposed offshore pipelines would extend from the MHT line located at the interface of San Jose Island

and the GOM to the proposed SPM buoy systems. The offshore project area considered for cultural resources is a 2000-foot wide corridor along the proposed offshore pipelines.

Figure 9-1: Proposed Project Area Map



9.2.2 Proposed Project Area Existing Conditions

Existing conditions are described with regard to geological setting and cultural setting of the Proposed Project. Both the geologic setting and cultural setting of the Project area encompasses the general southeast Texas coast and the vast underlying geologic formations as well as historical periods of cultural significance in the general area.

9.2.2.1 Geological Setting

9.2.2.1.1 ONSHORE AND INSHORE

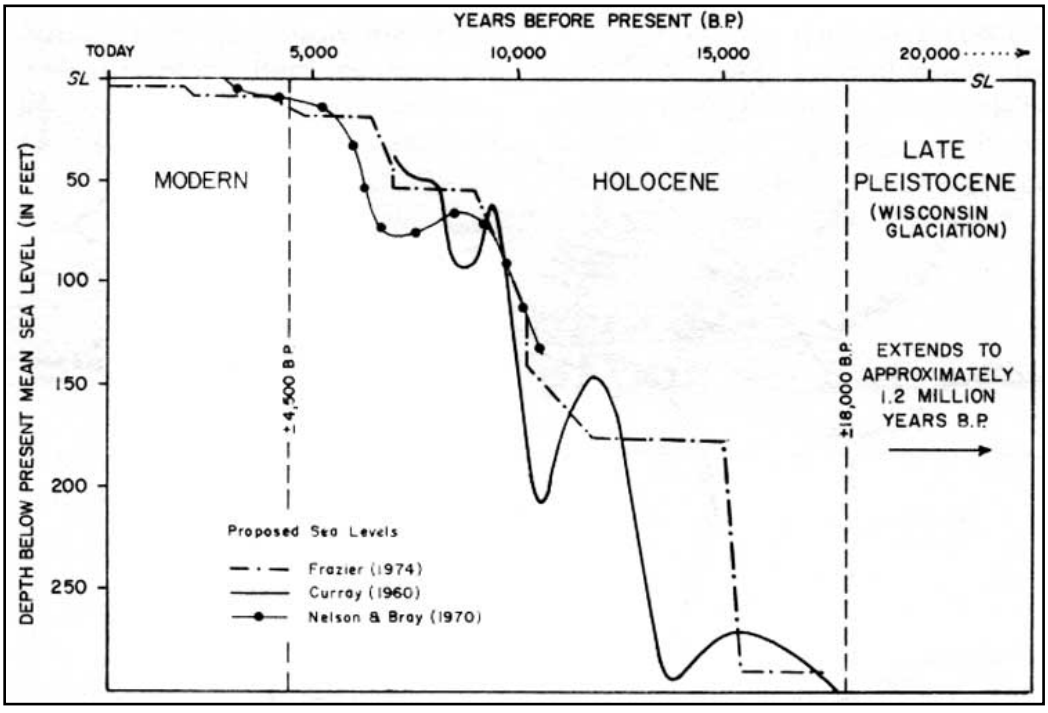
The underlying geology of the inshore and offshore portions of the Proposed Project area consists of Beaumont Formation deposits (Qbc), Barrier Island deposits (Qbb), alluvium (Qba), fill and spoil (FS), and barrier ridge and barrier flat deposits (Qbi) (Barnes 1974). Beaumont Formation deposits consist of predominantly clay and mud of low permeability along with intermixed and interbedded clay and silt and contains lenses of fine sand, decayed organic matter, and many buried organic-rich, oxidized soil zones. This formation includes plastic and compressible clay and mud deposited in flood basins, coastal lakes, and former stream channels on a deltaic plain. These deposits typically date to the Late Pleistocene.

Barrier island deposits are formed from deposits of fine-grained sand and shells; they formed during the Holocene-age approx. 4,000–6,000 years ago. Holocene-age alluvium deposits are composed of various percentages of clay, silt, and sand. They form on the lagoon side of barrier island and are of variable thickness. Fill and spoil deposits are the result of modern dredging activity and consist of mixed deposits of mud, silt, sand, and shell. They are highly disturbed and are unlikely to contain *in situ* buried cultural deposits. Barrier ridge and barrier flat deposits are formed from deposits of sand, silt, and clay along beach ridges, tidal channels, tidal flats, and sand dunes; they formed during the Holocene.

9.2.2.1.2 OFFSHORE

The formation of the offshore portion of the Proposed Project area geomorphology was influenced by sea level changes during and after the Late Pleistocene Glaciation (Figure 9-1). 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; Weise, et al. 1980). Sea level has risen more than 300 ft since the last glacial low stand, about 20,000 to 22,000 years ago.

Archaeologists are interested in geologic unconformities marking recent inundation of dry lands by rising seas. The timing of the most recent low-stand sea level overlaps the period of earliest known human habitation in North America. Fresh surface water and ecological diversity of coastal streams, marshes and estuaries during this period likely would have attracted human populations. One geologic unconformity is of significance to archaeologists along the Texas Coast and the adjoining continental shelf. It marks the divide between the top of the Late Pleistocene-aged, Beaumont Formation and the base of Holocene-aged sediments.



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

Figure 9-2: Holocene Sea Level Curves by Various Authors

The Beaumont Formation consists of hard and soft clay layers, intermixed with sandy strata, deposited in a delta plain environment along the Texas Coast during the previous interglacial high-stand sea level, between 120,000 and 80,000 before present (B.P.). Beaumont Formation exposures along Powderhorn Lake and Matagorda Bay have been dated between 72,000 and 83,000 B.P. by optical luminescence (Paine et al. 2018). Clays in the Beaumont Formation

that were exposed to subaerial conditions became desiccated and hardened, increasing their resistance to erosion. Intervening layers are more easily eroded. The desiccated hard clay layers may be as thin as a few inches; however, they are highly reflective to seismic energy, making this unconformity a prominent horizon in acoustic sub-bottom profiles. The Beaumont Formation is older than any known human evidence in the Western Hemisphere, thus its upper surface forms the hypothetical lower limit of strata likely to contain archaeological materials, except where the formation has been dissected by streams post-dating the entry of humans into the region. Distributary channels dissecting the Beaumont surface, on the other hand, are presumed to be about the same age as the surrounding materials; therefore, they would predate human habitation of the region.

The entire offshore portion of the Proposed Project area remained available to human use throughout the late-Wisconsin period until rising sea level gradually flooded the offshore portion of the area of potential effect (APE) between about 10,000 and 3,500 years ago. As sea level rose during the Holocene, a layer of sediment known as the Texas Mud Blanket covered large portions of the central and southern Texas continental shelf seaward of the mid-Wisconsin shoreline referenced above. Much of the Texas Mud Blanket material originated in the Colorado and Brazos river basins, although sediment from as far as the Mississippi River has been documented (Weight et al. 2011). Geo-Marine Technology, Inc. (2019) state that the survey corridor crosses an inter-deltaic section of the Texas Mud Blanket, dominated by shoreface processes (Rodriguez et al. 2001).

9.2.2.2 Cultural Setting

9.2.2.2.1 ONSHORE AND INSHORE

The Texas archeological record spans the breadth of documented human occupation in North America from approximately 13,500 B.P. to the present. Over the course of thousands of years, people within the modern state of Texas experienced immense cultural development and diversification of subsistence strategies. The following overview draws heavily from Perttula (2013) and Ricklis (2004) and attempts to chronicle the wide breadth of cultural experience across southeastern Texas. Discussion of the prehistoric and historic occupational periods is included below in order to provide a cultural context relevant to the findings of the Phase I survey efforts.

THE PALEOINDIAN PERIOD (CIRCA [CA]. 13,500–8,000 B.P.)

The Paleoindian Period encompasses the earliest signs of human presence in North America and includes massive ecological changes from the close of the Pleistocene to the Early Holocene transition (Aten 1983; Hester 1980; Patterson 1980; Ricklis 2004). Generally, Paleoindians are characterized as a migratory hunting and gathering people that traveled across the Americas in small bands following mega-fauna, such as mammoths, mastodons, giant bison, and giant sloths. The long-held belief that the Clovis Complex was associated with the earliest people in the Americas was redefined by the discovery of the Debra L. Friedkin site. This site, located in Salado, Texas, includes a stone tool assemblage that dates between approximately 13.2 and 15.5 thousand years old, and was identified as the Buttermilk Creek Complex (Waters et al. 2014).

Several Paleoindian projectile points and other artifacts have been encountered in the coastal plain region of Texas; however, none of these were identified within discrete Paleoindian contexts. Evidence is sparse due to the fluctuating nature of the sea level during the terminal Pleistocene to Early Holocene transition caused by glacial advancement and subsequent retreat (Ricklis 2004). Providing a detailed assessment of Texas coast Paleoindian lifeways is difficult because of a lack of contextualized cultural material, which can be attributed to a combination of various site formation processes such as sea level fluctuation, Holocene erosion, and alluvium deposition (Aten 1983; Hester 1980; Patterson 1980; Ricklis 2004). Understanding the cultural patterns of people from elsewhere in Texas and beyond provides a fair indication that the coastal inhabitants were also hunters-gatherers. Moreover, the material used to make projectile points found along the Texas coast was procured from elsewhere based on the high-quality of stone (Bousman et al. 2004; Ricklis 2004). This indicates that the Paleoindian people of the Texas coast engaged in long-distance trade networks, large-scale migratory rounds, or both (Ricklis 2004).

THE ARCHAIC PERIOD (CA. 8,000 TO 2,000 B.P.)

Generally, the Archaic period in Texas is characterized by hunting and gathering lifeways, stylistic changes to projectile points and tools, distinctive distribution of site types, and the introduction of groundstone technology (Turner et al. 2011). Details of the Archaic period vary regionally but it is chronologically divided into Early Archaic (8,000–6,000 B.P.), Middle Archaic (6,000–3,000 B.P.), and Late Archaic (3,000–2,000 B.P.) (Aten 1983; Turner et al. 2011). The Archaic period on the upper Texas coast is marked by sea-level rise and climatic fluctuation during the middle to late Holocene (9,000 to 2,000 B.P.) (Aten 1983). Occupation and site patterning change during this time. Sites are more frequent and are found along stream courses and shorelines indicating a rise in population. The Archaic period is further characterized by reduced group mobility and well-defined social territories, as exemplified by a significant increase in the representation of local chert in tool manufacture (Ricklis 2004; Story et al. 1990). Specialized hunting and gathering represented the main subsistence strategy for inhabitants of the central Texas coast during the Archaic period. For example, Archaic sites near the coastline demonstrate a dietary focus on marine resources, while the remains of terrestrial mammals are better represented at sites further inland.

Early Archaic (CA. 8,000–6,000 B.P.)

The Early Archaic is poorly understood, but in general, settlement patterning is scattered and broader relationships between groups are recognized by the widespread occurrence of points such as Martindale, Uvalde, early Triangular, and Bell (Turner et al. 2011). Many of the mega-fauna species in the Americas became extinct during this time period, highlighting more reliance on smaller game, such as bison (Foster 2006). Technologically, new biface styles appeared to be shifting away from lanceolate forms to stemmed, notched, and barbed broad blade bifaces. In Texas this period is reflected by early side-notched and corner-notched projectile point types that include Keithville, Neches River, and Trinity types (Ricklis 2004). Subsistence activities during the Early Archaic remained dominated by hunting large game, but there was a greater focus on foraging and small game hunting, relative to the Paleoindian period.

Middle Archaic (CA. 6,000–3,500 B.P.)

Tool types continue to diversify during the Middle Archaic subperiod. In Texas, the new tool types include new projectile point styles, such as the Carrollton, Morhiss, Palmillas, and Travis points (Ensor and Ricklis 1998; Turner et al. 2011). The Middle Archaic subperiod is also noteworthy for the introduction of groundstone artifacts, such as adzes, axes, manos, and metates.

Generally, cemeteries begin to appear, and specific types of sites are observed during this time period, including burned rock middens in central Texas and shell middens near the coast (Turner et al. 2011). However, the period between 4,000 and 3,000 B.P. is marked by a distinguishable break in the deposition of shell middens in certain portions of the Texas coastal region. While inland sites, such as Eagle's Ridge (site 41CH252), are continuously occupied or utilized through the Middle Archaic subperiod and beyond, sites close to the shoreline, such as the portion of the coast between Galveston Bay and Baffin Bay in particular, may have experienced fluctuating sea levels (Perttula 2013). These sea level variations likely disrupted the coastal biome and caused the depletion of food resources commonly exploited by Middle Archaic peoples. Sea levels ultimately stabilized in 3,000 B.P. (Perttula 2013).

Late Archaic (CA. 3,000–2,000 B.P.)

The Late Archaic continues to be characterized by hunting and gathering lifeways and the beginning of settlements in east Texas (Foster 2009; Turner et al. 2011). Central and coastal Texas areas see a significant increase in the population as demonstrated by the proliferation of shell midden sites along the shores of bays and in estuarine zones (Ricklis 2004). This population increase was likely facilitated by the stabilization of the sea level around 3,000 B.P. and the subsequent strengthening of the regional biome, which provided a plentiful and reliable source of food for the inhabitants of the area (Perttula 2013). In addition to estuarine and marine resources, reptiles and mammals were an additional a source of subsistence, further diversifying the Archaic diet (Ricklis 2004).

Sites in this period show variability among each other in terms of occupational intensity and size in addition to evidence of people having distinct affiliation with social groups in discrete territories (Dillehay 1975; Ricklis 2004). The territorialization of the landscape is further supported by the establishment and continued use of earlier cemeteries, such as the Ernest Witte site, which has been interpreted to indicate the expression of distinct social identities and territorial ties between discrete social units along the Texas coast (Perttula 2013; Ricklis 2004; Story 1985).

Technologically, the Late Archaic is characterized by the adoption of dart points, such as Yarbrough, Kent, and Gary types, which are found in both shoreline and inland sites (Perttula 2013; Turner 2011). It has been suggested that the development and application of technologies such as fisheries may have also allowed for higher levels of efficiency in the exploitation of coastal and riverine food resources, although empirical evidence for such devices is lacking in the region (Aten 1983; Ricklis 2004; Perttula 2013). Significant Late Archaic sites in the vicinity of the Project Study Area include sites 41HR80 and 41HR85, known collectively as Harris County Boys' School, which are located approximately 4.2 miles southeast of the Proposed Project in Harris County. This site is defined by an extensive midden and a cemetery, established and occupied from approximately 3,500 to 1,500 B.P. The midden is comprised mainly of Rangia shell, with a significant quantity of lithic debitage and broken or reworked bifacial stone tools, bone tools, and beads (Aten 1983). Other significant Late Archaic sites include the Ernest Witte site and the Eagle's Ridge site, which, although established in earlier periods, grew in the Late Archaic (Ricklis 2004).

THE CERAMIC PERIOD (CA. 2,000–300 B.P.)

The Ceramic period of Southeastern Texas is differentiated form earlier periods by the emergence and wide-spread use of two new technologies, pottery and the bow and arrow. Ceramics first appear in the archaeological record in the upper and central Texas coastal regions in 2,000 B.P., potentially through cultural diffusion from the east, most likely the Lower Mississippi Valley region (Ricklis 2004). The adoption of ceramic technology is largely interpreted to have represented a development in cooking and storage efficiency in comparison to earlier periods. However, the extent to which ceramics influenced other aspects of life and community in the Ceramic Period is still contested, as most of the material culture found in Ceramic period sites does not seem to differ greatly from that of the Archaic period (Ricklis 2004). The bow and arrow are first identified in the archaeological record in the second half of the Ceramic period around 1,200 B.P., replacing the atlatl and spear as the dominant projectile technology and thus, mirroring technological developments elsewhere in inland Texas and beyond (Ricklis 2004). The Ceramic Period is generally divided into Early Ceramic and Late Prehistoric periods, after Ensor et al. (1990) and Story et al. (1990).

Although the Ceramic period differs from earlier periods in technological terms, the high degree of occupational permanence observed in many sites established in the Archaic period has led to the suggestion that Ceramic period communities largely followed subsistence and settlement practices established in previous periods (Ricklis 2004). Two perspectives have been proposed. The first perspective, advocated by Aten (1984), proposes that coastal Texas communities in the Ceramic period were largely affiliated with the pre-Mississippian Woodland cultures of eastern United States, an association that is supported by perceived ceramic stylistic and technological similarities between the two groups (Ricklis 2004). The second perspective positions upper and central Texas groups in the Ceramic period as part of the more circumscribed, archaeologically distinct Mossy Grove cultural tradition (Story 1990), with closer ties to coastal Louisiana groups than to eastern Woodland cultural traditions.

Early Ceramic Period (CA. 2000 - 1200 B. P.)

As there is a high degree of occupation continuity between the Late Archaic and Early Ceramic period, Early Ceramic period sites in the central and upper Texas coast are generally characterized by rangia shell middens along coastal bays or river margins, with noticeable regional population increase (Ricklis 204, 192). Early Ceramic sites are identified in the archaeological record by the recovery of sandy or clay paste Tchefuncte and Mandeville ceramics and dart points, such as, Gary and Kent types (Aten 1983; Ricklis 2004). As sandy-paste ceramics are associated with cultural traditions prior to the development and adoption of horticultural practices at the larger regional scale in

places such as East Texas, it is thought that the subsistence strategies of the Early Ceramic period in the Texas coast was largely dependent on hunting and gathering, similar to earlier periods (Ricklis 2004).

LATE PREHISTORIC PERIOD (CA. 1200 B.P. - 300 B.P.)

The Last Prehistoric period is marked by the appearance of small and expanded-stem arrow points such as the Alba, Cathoula, Perdiz, and Scallorn types (Ensor et al. 1990; Ricklis 2004). The development and adoption of arrow technology also coincides with the appearance of bison faunal remains in the archaeological record of the Texas coast, which indicates the exploitation of bison as a subsistence strategy, a cultural practice also observed elsewhere in Texas (Ricklis 2004). Similarly, ceramic technology underwent changes in this period with the introduction of grog-tempered and bone-tempered ceramics in addition to sandy-paste ceramics. While ceramic forms remain largely the same (bowls, jars, and constricted-neck ollas), surface treatments of these vessels become more elaborate: decorative bands on rim exteriors become wider, with a greater variety of incision patterns (Aten 1983; Ricklis 2004). Ethnohistoric documents and archaeological research in the central and upper Texas coast have suggested that occupation of the coastal areas was seasonal in nature, with island settlements inhabited during the fall and winter periods, while inland locations were favored during the spring and summer (Ricklis 2004).

There is evidence of population growth during the Late Prehistoric period, as many of the barrier island sites are either established or grow significantly during this period. This has led to suggestions that as higher population numbers in the mainland coastal areas grew and exploitable resources were strained, people began to move towards the extreme coastal areas for the purpose of utilizing the resources present there.

HISTORICAL PERIOD

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 Historical 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 1980. 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 (Newcombe 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. 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 empresarios, 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 8,000 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. During the period, outsized ranches grew to prominence (Cheesman, 2017). South Texas towns, like Corpus Christi, grew in response as a meat packing and shipping center, with railroads reaching the area in the mid-1870s. Additionally, 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). 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 opened in 1926, partly to serve the industry. 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 in the region (Long 2010, 2016)

9.2.2.2.2 OFFSHORE

PREHISTORY

There is no doubt that humans lived along Gulf of Mexico coastlines that have long-since been submerged by rising seas. The timing of the most recent sea level transgression (Late Pleistocene through most of the Holocene) includes the postulated pre-Clovis culture, the entire Paleo-Indian Period, and most of the Archaic Period. Many sites are presumed destroyed by wave energy during the process of inundation. The most likely locations for submerged 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.

The Beaumont Formation is exposed in the survey corridor from the 31-ft to 46-ft isobath (GMT 2019). A buried Pleistocene / Holocene unconformity (top of the Beaumont Formation) was interpreted from acoustic sub-bottom profiles seaward of the 46-ft isobath (GMT 2019) and ranging in depth from 46 to about 105 ft (0–35 ft below the seafloor). The Beaumont Formation is capped, seaward of the 46-ft isobar, by under-consolidated layers of Holocene sand and mud, deposited in a marine environment during the most recent transgression.

The Beaumont Formation is incised by numerous, relict, distributary channels out to the 65-ft isobath, where the former land surface is buried beneath 35 ft of Holocene sediments (GMT 2019). Seaward of the 70-ft isobath, sub-bottom penetration was limited to about 40 ft and could no longer image the top of the Beaumont Formation. Evidence for distributary channels continues across the area where the Beaumont Formation is exposed at the seafloor. Bathymetry over the Beaumont exposure has a hummocky relief, and the side-scan sonar shows irregular patches of variable reflectivity, consistent with laterally discontinuous sediments expected of the Beaumont Formation (GMT 2019). Low spots are believed to correlate with distributary channel fill, while localized high spots are believed to be remnants of desiccated clay. These channels were incised prior to the earliest known evidence for humans in the region; however, they were exposed above sea level during the Paleo-Indian Period and roughly the first half of the Archaic Period before being flooded by rising seas and filled in their upper levels with estuarine sediments during the Holocene. Any sites associated with this unconformity would have had little protection from wave energy during sea-level rise and are presumed to have been destroyed by waves and currents, in the same manner that such erosion continues where the Beaumont Formation is presently exposed.

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 Gulf of Mexico. Pineda's map of the Gulf of Mexico shows inlets along the Texas Coast; however, there is no evidence that he entered or explored their shores (Weddle 1985; Chipman and Joseph 2010). Pineda demonstrated there is no shortcut to Asia through the Gulf of Mexico. His logs also helped to identify the fastest sailing route between Vera Cruz and Havana (Chipman 1992).

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 Gulf of Mexico. 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 90 miles south of Port Aransas. 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). 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; Weddle 1991). A second expedition by Gonzalo Gayon followed the Gulf Coast in the opposite direction, from Florida to Texas, within 1–2 years of Lavazares.

Spain 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 to failure, through a series of unfortunate events. 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 having no way to return to Europe, those remaining at Fort St. Louis eventually perished (Weddle 1991).

Rumors of the French incursion quickly reached Madrid. 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) summarized the effect of La Salle's arrival on the Spanish royal court as inspiring "the most intense coastal reconnaissance ever made in the Gulf of Mexico. 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).

Shortly thereafter, in 1766, Diego Ortiz Parrilla was commissioned to explore the islands of the lower Texas Coast, and 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). 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). 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" (ibid.).

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). 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) 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. Aransas Pass and Corpus Christi were used extensively during the war to land troops and supplies bound overland for Mexico. Taylor's troops and supplies were lightered to shallow-draft steamers near Aransas Pass for transport across the bay to Corpus Christi. Lightering presumably took place at a "U.S. Depot," charted in 1846 on the bay side of St. Joseph (San Jose) Island, about 3 miles up the Lydia Ann Channel from Aransas Pass. The circuitous route between Aransas Pass and Corpus Christi Bay followed Lydia Ann Channel northward from Aransas Pass, then turned westward through Corpus Christi Bayou, then southwestward to McGloins Bluff (Ingleside). The portion of channel connecting Corpus Christi Bayou to Ransome Point was deepened by dredging in 1874 and became known as the Morris and Cummings Cut (Alperin 1977).

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) (Folsom 1842); Lamar, at the entrance to Copano Bay opposite Live Oak Point; and a later version of Aransas on St. Joseph's (San Jose) 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. 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 (United States Geodetic Survey 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).

C.W. Howell proposed closing Corpus Christi Pass in a U.S. Army Corps of Engineers (USACE) annual report (Howell 1879). 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 4-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 Matagorda and Aransas Bay would have passed through the Proposed Project. By 1875, Morgan Line steamships were running weekly, from June to October, and biweekly, 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 5 years, from 1871 through 1876 (Hoyt 1990).

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 to 5 days (Kuehne 1973). Hoyt (1990) itemized imports and exports through Aransas Pass for a short part of the 1880's. 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, 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 direct channel between Aransas Pass and Corpus Christi, the Turtle Cove Channel, was dredged to a depth of 8.5 ft by 1909. Completion of the Turtle Cove Channel bypassed the Morris and Cummings Cut, so commercial traffic through the Inshore survey area would have decreased significantly after this time. By 1919 the current stone jetties at Aransas Pass had been completed, which aided efforts to maintain the Aransas Pass Channel (Alperin 1977) and removed the safety concerns associated with shifting sand bars at the harbor entrance. In 1922 the Turtle Cove Channel was renamed the Corpus Christi Ship Channel. The channel has been deepened and widened multiple times since then to accommodate larger ships.

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. While 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).

Natural gas was discovered in Nueces County in 1922. Oil production began in Aransas County in 1936, and 13 wells were producing there by 1946. Production in the area increased dramatically in the 1950s when offshore drilling became routine (Pratt, et al. 1997). Offshore drilling was stimulated by settlement of the Tidelands controversy in 1953, solidifying Texas ownership of mineral resources within 9 nautical miles of its Gulf of Mexico shorelines (Long 2016, 2019).

9.2.2.3 Previously Conducted Studies

A background cultural resources review was conducted for the Proposed Project area to determine if all or portions of the project areas had been previously surveyed for cultural resources or if any archaeological sites have been recorded within or adjacent to the project areas. To conduct this review, relevant US Geological Society (USGS) 7.5-minute topographic quadrangle maps on the Texas Historical Commission (THC) Texas Archeological Sites Atlas (Atlas) were reviewed. This source provided information on the nature and location of previously conducted archaeological surveys, previously recorded cultural resource sites, locations of NRHP properties, sites designated as State Antiquities Landmark (SAL), Official Texas Historical Markers, Registered Texas Historic Landmarks, cemeteries, and local neighborhood surveys. The review also examined aerial photographs, Bureau of Economic

Geology Maps, and the Natural Resource Conservation Service Web Soil Survey. The following sections detail the results of the background review for all components of both the Proposed Project and alternative project areas.

9.2.2.3.1 ONSHORE

Based upon a background literature review on the THC's Atlas, 24 archaeological sites and two cemeteries are mapped within a 1.0-mi (1.6-kilometer [km]) radius of the onshore portion of the Proposed Project area. Table 9-1 presents data available for the 24 sites, including site type and time period for the site. Additionally, the NRHP eligibility of each site is also presented. Three of the 24 archaeological sites identified within 1.0-mi (1.6-km) radius are located within or immediately adjacent to the Proposed Project.

Table 9-1: Previously Recorded Cultural Resource Sites within 1 mi of the Onshore Proposed Project Area

Site Trinomial	Site Type	Time Period	NRHP Recommendation
41SP55	Artifact Scatter	Prehistoric/ Historical	Undetermined
41SP257	Artifact Scatter	Historical	Not Eligible
41SP258	Artifact Scatter	Historical	Not Eligible
41SP264	Artifact Scatter	Historical	Not Eligible
41SP270	Artifact Scatter	Historical	Not Eligible
41SP48	Unknown	Unknown	Undetermined
41SP278	Artifact Scatter	Historical	Not Eligible
41SP279	Artifact Scatter	Historical	Not Eligible
41SP55	Artifact Scatter	Historical	Undetermined
41SP57	Unknown	Unknown	Undetermined
41SP70	Shell midden	Prehistoric	Undetermined
41SP71	Archaic - open campsite	Prehistoric	Undetermined
41SP283	Artifact Scatter	Historical	Undetermined
41SP45	Unknown	Unknown	Undetermined
41SP47	Unknown	Unknown	Undetermined
41SP48	Unknown	Unknown	Undetermined
41SP49	Unknown	Unknown	Undetermined
41SP56	Unknown	Unknown	Undetermined
41NU234	Causeway	Historical	Eligible
41SP134	Unknown	Unknown	Undetermined
41SP179	Unknown	Unknown	Undetermined
41SP273	Artifact Scatter	Historical	Not Eligible
41SP271	Artifact Scatter	Historical	Not Eligible
41SP281	Artifact Scatter	Historical	Not Eligible
San Patricio Memorial Park Cemetery	Cemetery	Historical	Undetermined
Prairie View Cemetery	Cemetery	Historical	Undetermined

The background review also determined that a total of 12 previous archaeological projects have been conducted within 1-mi (1.6 km) of the onshore portion of the Proposed Project. The majority of these archaeological investigations consist of Phase I surveys for large-scale energy infrastructure projects. The lead agency on these

projects is typically either the USACE Galveston District or the Federal Energy Regulatory Commission. Many of the remaining surveys were conducted in support of municipal transportation projects. Four (4) of the 12 surveys overlap or intersect portions of the Proposed Project route; however, these previous survey investigations do not constitute a significant overlap with the Proposed Project route.

9.2.2.3.2 INSHORE

Based upon a background literature review on the THC's Atlas, four cultural resources surveys have been completed within 0.5-mi (0.8 km) of the inshore Proposed Project area; one of which intersects with portions of the Proposed Project route (Atlas Number 8500011899) (Table 9-2). In addition, three previously recorded sites (i.e., 41NU289, 41NU286, 41AS91) and six previously recorded Historical Markers occur within a 0.5-mile (0.8-km) radius of the inshore Proposed Project area. Of the three previously recorded sites, two (41NU289 and 41AS91) are within the Proposed Project area. None of the six previously recorded Historical Markers are located within the Proposed Project area; however, one recorded Historical Marker (Terminal Railroad) is located immediately adjacent to the Proposed Project area.

The previously conducted survey that intersects with the project area (Atlas Number 8500011899) was completed in 2001 in compliance with requirements by the USACE. The survey resulted in the identification of one new historical site (41NU289), which is described as an abandoned railroad causeway from 1912 that was part of the railroad system that ran between Aransas Pass and the Harbor Island docking facilities. The old causeway is marked by a sandy roadbed that has parallel lines of wood piling still protruding from the sand in sections. No artifacts or other features were reported in association with the railbed component of the site. At the time of recording, the site was described as having "fair" integrity. The site is recorded as having limited research value and further work was not recommended. Its NRHP eligibility is undetermined.

The 2001 cultural resources survey also revisited previously recorded site 41AS91. This site was originally recorded in 1997 and was described as a potential Mexican Army supply depot dating to the early 19th century, and possibly continued to be used a supply depot during the Civil War (THC 2019). The original recorders recommended further testing due to the high potential for archaeological/historical significance; however, the 2001 revisit determined the site had been originally mis-plotted or mis-identified. Prewitt and Associates call attention to the fact that the southern portion of San Jose Island, where site 41AS91 is depicted, had completely eroded away in the late 19th century, and was subsequently rebuilt. Thus, a site formed prior to the late 19th century in this location could no longer exist. Prewitt and Associates did, however, find a concentration of 53 pilings and 20 bricks within the depicted site boundaries. This pilings and bricks are thought to be associated with a 1934 factory depicted on maps in this location. The recording archaeologist describe the site as lacking in artifacts or features and having been heavily impacted by both natural erosion and channel maintenance. Prewitt and Associates (2001) recommended additional testing to determine if additional features or artifacts could be located under the sand. The THC reviewed site 41AS91 in 2005 and found the site to be Not Eligible for NRHP listing.

Historical markers identified within the Project background review area include marker for Aransas Pass, Tarpon Inn, Terminal Railroad, the United States Coast Guard on Mustang Island, the World War II Coastal Defenses at the Aransas Pass, and the Aransas Pass First Baptist Church.

Table 9-2: Previously Recorded Cultural Resource Sites within 0.5 mi of the Onshore Proposed Project Area

Site Trinomial	Site Type	Time Period	Eligibility Determination by State Historic Preservation Offices
41NU289	Aransas Railroad Causeway	Historical-1912	Undetermined
41NU286	Open Campsite	Prehistoric	Undetermined
41AS91	Structural Remains	Historical-Unknown	Not Eligible

9.2.2.3.3 OFFSHORE

At least 95 shipwrecks have been reported within a 3-mile radius of the offshore Proposed Project area (Table 9-3). Positions reported in historical accounts are often imprecise; however, archaeologists have verified the locations of at least five of the wrecks listed in Table 9-3. Sources consulted for Table 9-3 include the 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).

Table 9-3: Previously Recorded Cultural Resource Sites within 3 mi of the Offshore Proposed Project Area

Name of Vessel	THC No.	PBS&J No.	AWOIS No.	Description	Date Lost
40 Fathom No. 12	256	574		Oil screw	1955
American Star	2209			-	1970
*Baddacock (*41NU282)	141	1092		Steel tug	1920
Baetty Sca	2215			-	1966
Bahia Honda	1232		4998	50-ft wooden shrimp boat	Pre-1968
Bertha	153	1100		Steam ship; wooden	1917
Bertram	-		13347	28-ft fishing vessel; USCG #4029	1992
Bill Hollis	2218			-	1970
Blue Bonnet	861		201	Fishing trawler	1967
Buckroy	2224			Unknown; BOEM #1038	1959
Cabezon	1942			-	1959
Captain Charles Griffin	-			Fishing vessel; BOEM #146; USCG #4098	1986
Cardena	115	562		Merchant sailing ship	1834
Chuck A. Dee II	175	564		-	1963
Colonel Yell	192	565		Side-wheel steamer	1847
Coral Chipper	2269			-	1961
Coral Sands	197	566		Oil steamer	1955
De Rail	1028	607	195	cabin cruiser; USCG #79	1972
				(possible duplicate of #1940)	
De Rail	1940		195	Yacht	1972
				(possible duplicate of #1028)	
Eagle's Cliff	1938		4183	259-ft freighter	1979
Electra	235			-	1955
Ellen	1420			Merchant sailing ship	1901
"Fire Brick Wreck"	2408			steam	Post-1915
Georgiana	2260			-	1951
Guyton No. 1	286			Barge	1916
Guyton No. 10	287			Barge	1911
Henrietta	5	1207		Merchant sailing ship	1888
Jane and Julie	2191			Unknown; BOEM #109; USCG 2803 (possible duplicate of #1939)	1981
Jane and Julie	1939			Trawler (possible duplicate of #2191)	1981
Jiffie	1944			-	1955
Jimbo	1031	576	4177	Passenger vessel; USCG #73	1965
John Worthington (41AS88)	1032	580	5020	Oil tanker; moved in 1945 from original location	1944
L'éclair	1272			Merchant sailing ship	1866

Name of Vessel	THC No.	PBS&J No.	AWOIS No.	Description	Date Lost
Lake Austin	992			scow schooner barge	1903
Libbie Shearn	343	1258		Merchant sailing ship	1911
Liberia C	1941			- (possible duplicate of #860)	1964
Liboria C.	860			Trawler; BOEM #1250; USCG #5796	1954
				(possible duplicate of #1941)	
Lionel Hodgson	2281		4191	Fishing vessel; BOEM 112; USCG #946	1977
Little Saran	2282			-	1959
Louisa	659	584		Merchant sailing ship	1865
Margie B	-		4186	Pleasure craft; BOEM #12243; USCG #4459	1984
Mary (41NU252)	51	1281	4175	Steam-sail	1876
Mary Agnes	2483			Schooner (possible duplicate of #655)	1865
Mary Agnes	655	586		Merchant sailing ship	1862
				(possible duplicate of #2483)	
Mary E. Lynch	609	1283		Merchant sailing ship	1902
Mary Hanson	1459			Merchant sailing ship	1870
Mary Lorena	1422	1288		Merchant sailing ship	1900
Mattie	653	589		Merchant sailing ship	1873
Mert	2287			-	1970
Miss Aransas	2292	-	-	-	1974
Moon Glow	-		5014	Fishing vessel	1967
Mox Nix	-			USCG #1697	-
Nieuwe Market	-			Fishing vessel; BOEM #133	1973
O'Jennings Gill	1386			Merchant sailing ship	1887
Philadelphia	423	593		Merchant steam-sail	1868

There are 11 marine archaeological surveys reported within 3 miles of the offshore Proposed Project area. Most of those investigations were sponsored by the USACE in connection with harbor improvement projects. The earliest project in the vicinity was an investigation of the steamship *Mary*, Site 41NU252, which sank in Aransas Pass in 1876. Espey, Huston & Associates, Inc. conducted a remote-sensing survey and archaeological dive investigations under Texas Antiquities Permit No. 858, on behalf of the USACE, to assess the site's condition and historic potential. Their field study and subsequent historical research concluded that the wreck is eligible for the NRHP (Hoyt 1990).

The USACE sponsored a remote-sensing survey and diver assessment along three segments of the Corpus Christi Ship Channel in 1991. The work was performed by Coastal Environments, Inc. and Panamerican Consultants, Inc., under Texas Antiquities Permit No. 1008 (James and Pearson 1991). Their survey discovered 130 geophysical targets, 11 of which were recommended for diving. Five targets were investigated by divers and four targets proved to be modern debris. The fifth target, near the end of the south jetty remained unidentified, but was believed potentially significant. Further investigations were recommended for that target, as well as the six targets that were not visited by divers, if any of them would be affected by dredging.

Coastal Environments, Inc. conducted remote-sensing and diver investigations on seven geophysical targets recommended by James and Pearson (1991) for further study. With one exception, these were targets that had not been previously assessed. Their study also included data recovery on the steamship *Mary*, which had been recommended by Hoyt (1990) as eligible for the NRHP. This work was sponsored by the USACE and performed under Texas Antiquities Permit No. 1261 (Pearson, et al. 1995). Six of the targets were determined to lack historic significance. A seventh target, near the end of the south jetty, was revisited and was recorded as archaeological site 41NU264. The wreckage was suspected to be remains of a World War I-era steamer, named *Utina*, that wrecked on the end of the south jetty in 1920. *Utina* was built by the Emergency Fleet Corporation as a freighter but had been converted to a barge before it wrecked.

Coastal Environments, Inc. performed a marine remote-sensing survey in 1994 along a 45-mile segment of the Gulf Intracoastal Waterway between San Antonio Bay and Aransas Pass (Pearson and Simmons 1994). The study was conducted on behalf of the USACE, Galveston District in support of maintenance dredging operations. A total of 31 geophysical targets of interest were recorded by their survey, including the remains of two modern iron barges, associated with shell dredging activities. None of the targets in the corridor were recommended for avoidance. The remains of a World War II tanker, the *John Worthington*, were discovered just outside their project ROW but would not have been affected by maintenance dredging.

Four overlapping pipeline projects were surveyed for the offshore oil and gas industry by Eric G. Ryals, Inc. (Saltus and D'Arragi 2003a, 2003b, 2005a, 2005b). The surveys were not conducted under Texas Antiquities Permits; thus, no reports are available on the THC Atlas; however, the projects were reviewed by BOEM. PBS&J completed an extensive study of the Corpus Christi and La Quinta Ship Channels from 2000-2001 on behalf of the USACE (Enright, et al. 2003). Marine remote-sensing and archeological diving investigated areas potentially affected by expansion of both federal navigation channels. Geophysical survey of 5,610 acres discovered 13 potentially significant anomalies, which were further investigated by divers. One target was determined to be a historic shipwreck, believed to be the *Dayton* (designated 41NU291) a steamboat that sank as a result of a boiler explosion in 1845. A second intact shipwreck was discovered at the end of the south jetty, very near Site 41NU264, reported by Pearson, et al. (1995) as possibly associated with the *Utina*. The newly discovered site, designated 41NU292, has a largely intact hull. Its dimensions and position are consistent with those reported for *Utina*. The authors concluded that 41NU292 is, indeed, *Utina* and speculated that 41NU264 may be superstructure from *Utina* that was swept overboard by a storm.

In 2001, PBS&J completed a 294-acre geophysical investigation of a 3.5-mile corridor centered on Corpus Christi Bayou and the historic Morris and Cummings Cut in the northern half of Redfish Bay (Hedrick 2001). The study was conducted on behalf of Cabot Oil in connection with three USACE permit applications for proposed well pads and pipeline routes. Marine remote-sensing investigations included the collection and assessment of magnetic, side-scan sonar, and bathymetric data along 19 miles of survey transects. Naismith Marine Services conducted geophysical survey of 62 acres proposed as a mooring facility along the eastern side of Lydia Ann Channel. Coastal Environments, Inc. participated in the survey and assessed the data to determine whether any significant historic properties would be affected by the piling installation (Pearson 2015). The survey recorded only one side-scan sonar target of interest, bearing resemblance to a small boat. The target was examined by divers and by probing and determined to be a bottom feature produced by barges pushing into the channel bottom. No significant cultural resources were recommended for avoidance.

9.2.3 Proposed Project Construction Impacts

Cultural resources field surveys and nautical archaeology survey were conducted for the Proposed Project in order to determine impacts anticipated from Proposed Project construction activities. The reports of these field surveys are included in Volume III (Confidential Appendices) and include the Onshore Cultural Resources Report, Inshore Terrestrial Cultural Resources Report, and Offshore Nautical Archaeology.

Construction procedures and detailed maps of construction workspace extents for the Proposed Project are provided in Appendix A.

The results of the field surveys and a summary of the anticipated impacts to cultural resources from construction of the Proposed Project is included below.

9.2.3.1 Onshore and Inshore

Seven sites were newly identified or revisited within the onshore and inshore Project area as a result of survey efforts; none of these sites are eligible for listing on the NRHP or for designation as a SAL. No known historic properties or state landmarks, therefore, will be impacted by Proposed Project construction within the onshore and

inshore portion of the Proposed Project area. There is also low potential for unknown cultural resources to be impacted by project construction efforts in the inshore and onshore segments.

9.2.3.2 Offshore

Three potentially significant magnetic anomalies, possibly representing historic-era resources, have been identified within the submerged parts of the non-terrestrial inshore and offshore portion of the Proposed Project area. Anomaly 1 is in Federal waters, thus if historically significant might qualify for the NRHP. Anomalies 2 and 3 are both in Texas waters, thus they might meet criteria for State Antiquities Landmark, NRHP eligibility, or both. It is recommended that avoidance buffers be established around each of the anomalies. The avoidance buffers would extend outward 150 meters (492 ft) beyond the cluster of sonar contacts associated with Anomaly 1; 50 meters (164 ft) beyond the margins of Sonar Contact C-143, associated with Anomaly 2; and 50 meters (164 ft) beyond the -5-nT and +5-nT contours of Anomaly 3. Disturbance of the seafloor must be avoided within these avoidance buffers. Seafloor disturbances include, but are not limited to trenching, anchoring, dragging anchor chains, laying pipe on the seafloor, use of barge spuds, and pile driving. Anomaly 2 is located along a section of the Proposed Project offshore pipeline alignment will be installed via horizontally directionally drill (HDD) techniques. As such, so no negative effects are anticipated. For Anomalies 1 and 3, avoidance buffers have been established to minimize impacts to the maximum extent practicable. Apart from increased sedimentation in the vicinity of the anomalies, construction-induced effects, including direct ground disturbance, vibration, noise, or increased sedimentation in other portions of offshore waters have negligible potential to affect cultural resources. Impacts to the viewshed of potential historic resources are possible, but would be temporary and reversible.

There is low potential for the presence of intact prehistoric sites in the Offshore APE. Remnants of Pleistocene-aged distributary channels, associated with deltaic conditions that created the Beaumont Formation, were exposed above sea level throughout most, perhaps all, of the survey corridor during the Paleo-Indian Period and for roughly the first half of the Archaic Period. The area was available for extended human use; however, any archaeological sites once associated with the top of the Beaumont Formation would have had little protection from wave energy during sea-level rise. Such sites, if even present, are presumed to have been destroyed by waves and currents, in a similar manner as ongoing erosion effects the Beaumont exposure between the 31-ft and 46-ft isobaths. The energy of waves and wave-induced currents in this area is high during the winter season and is particularly severe during tropical storms. No archaeological investigation or avoidance of these deposits, for the purpose of protecting potential prehistoric sites, is recommended as part of construction efforts for the Proposed Project.

9.2.4 Proposed Project Operation Impacts

Maintenance and access to the pipeline corridor and the booster station during normal operation would be conducted within the pipeline corridor and the booster station site footprint. Maintenance and access, therefore, would 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.

9.2.5 Proposed Project Decommissioning Impacts

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 decommissioning, however, these affects will not be substantial enough to affect any significant attributes of any cultural resources. Visual impacts associated with decommissioning would be temporary and reversible.

9.2.6 Summary of Proposed Project Impacts

Seven archaeological sites were identified during archaeological survey to be within or directly adjacent to (within 1,000 ft. [304.8 m]) the terrestrial inshore or onshore portions of the Proposed Project area. None of the seven sites meets the eligibility criteria for listing on the NRHP or qualify for designation as a SAL. Therefore, no mitigation of cultural resources within the inshore or onshore portions of the project area are required. Three potentially significant magnetic anomalies, possibly representing historic-era resources, have been identified within the submerged parts of the non-terrestrial inshore and offshore portion of the Project area. Anomaly 1 is located in Federal waters, thus if historically significant might qualify for the NRHP. Anomalies 2 and 3 are both in Texas waters, thus might meet criteria for State Antiquities Landmark and/or NRHP eligibility. It is recommended that avoidance buffers be established around each of the anomalies. The avoidance buffers would extend outward 150 meters (492 ft) beyond the cluster of sonar contacts associated with Anomaly 1; 50 meters (164 ft) beyond the margins of Sonar Contact C-143, associated with Anomaly 2; and 50 meters (164 ft) beyond the -5-nT and +5-nT contours of Anomaly 3. Disturbance of the seafloor must be avoided within these avoidance buffers. Seafloor disturbances include, but are not limited to trenching, anchoring, dragging anchor chains, laying pipe on the seafloor, use of barge spuds, and pile driving. An Unanticipated Discoveries Plan has been prepared for the Proposed Project and can be referenced as Appendix Q. The Unanticipated Discoveries Plan provides a set of procedures to be used in the even that previously unreported and unanticipated cultural resources or unanticipated effects to cultural resources occur as a result of construction activities associated with the Proposed Project.

9.3 Alternative Project

9.3.1 Alternative Project Area

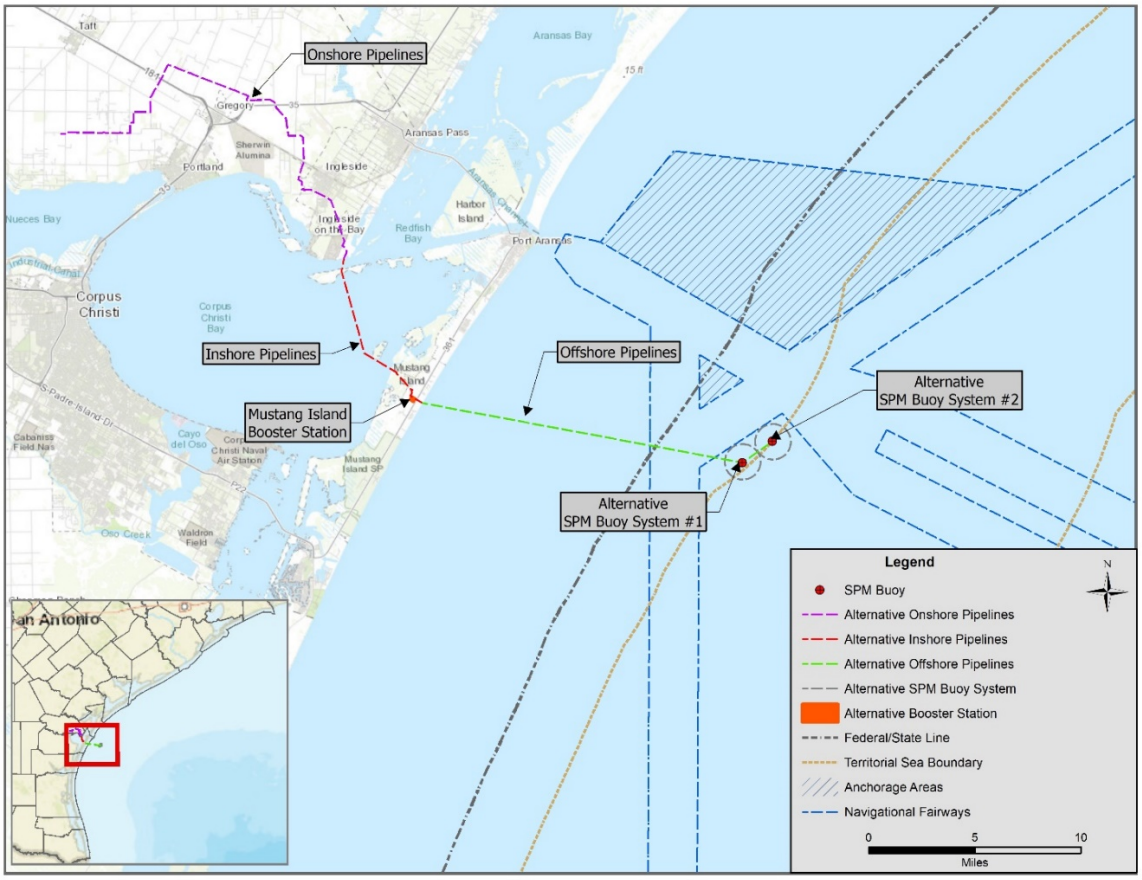
The Alternative Project consists of approximately 56.48 miles of pipeline infrastructure as well as a booster station (Alternative Project) within the State of Texas that continues into the Gulf of Mexico (Figure 9-3). The Alternative Project is comprised of three segments: onshore, inshore and offshore.

Onshore Project components include approximately 23.10 miles of two (2) new 30-inch-diameter crude oil pipelines extending from the landward side approximately 2.5 miles north of Nueces Bay to the MHT line of the Corpus Christi Bay located south of Ingleside in San Patricio County, Texas.

Inshore components associated with the Alternative Project are defined as those components located between the northern Corpus Christi Bay MHT line and the MHT line located at the interface of Mustang Island and the GOM. Inshore Project components includes approximately 8.45 miles of two (2) new 30-inch-diameter crude oil pipelines, and an approximate 19-acre booster station located on Mustang Island.

Offshore components associated with the Alternative Project are defined as those components located seaward of the MHT line located at the interface of Mustang Island and the GOM. The Offshore Project components include approximately 17.07 miles of two (2) new 30-inch-diameter crude oil pipelines extending to two (2) SPM buoy systems.

Figure 9-3: Bluewater SPM Alternative Project Vicinity Map



9.3.2 Alternative Project Existing Conditions

Due to the regional proximity of the Alternative Project to the Proposed Project, the general geologic setting and cultural setting of the Alternative Project is the same as the Proposed Project. Please refer to Section 9.2.2 above for descriptions of the geologic setting and the cultural setting of the Alternative Project area.

9.3.2.1 Previously Conducted Studies

A total of 25 previous archaeological surveys have been completed within 0.5-mile radius of the terrestrial inshore and onshore components of the Alternative Project route. These surveys consist of aerial and linear surveys conducted throughout the last 40 years for various sponsoring agencies; one survey parallels much of the alternative route. Additionally, a total of 10 marine surveys have been completed within a 0.5-mile radius of the non-terrestrial inshore and offshore components of the Alternative Project route. Of these 10 marine surveys, four intersect with the Alternative Project route.

A total of 20 cultural resources have been recorded within a 0.5-mile radius of the Alternative Project route (Table 9-4). Of these, three resources (i.e., 41SP257, 41SP270, and 41SP271) have been recorded within the Alternative Project route. Additionally, one previously identified shipwreck (1086) is recorded as being within the Alternative Project area.

Site 41SP257 was recorded in 2012 and consists of a surficial scatter of historical artifacts associated with a farmstead within an agricultural field. Materials observed include clear, amethyst, and blue bottle glass; porcelain and

whiteware fragments; cut bone; unidentified metal and metal tool fragments; and crushed shell fragments. The site was recommended as not eligible for the NRHP; the THC concurred with this finding in 2014.

Site 41SP270 was recorded in 2013 and consists of a surficial scatter of historical artifacts dating from 1900 to 1950 associated with a farmstead. No structures were identified in association with the site. Aerial photographs from 1950 and 1961, suggest that the structure may be associated with a non-extant structure that was located adjacent to the scatter. The structure was likely a tenant farmhouse based on the small size and deeds for the property show that for the majority of the time period of occupation, this was one of many large agricultural properties owned by the same family (usually the same person) in this part of the county. The deed research for the 663.192-acre property showed it was one of many tracts owned by the McKamey family starting in the 1930s, who obtained this parcel from the Hamilton family in 1935; R.H. Hamilton acquired the land in 1907 from J.C. Jenkins who had owned it for at least a year before that. The McKamey acquisitions were likely part of the small farm aggregation in the county during the 1930s and 1940s that continued into present day. The site was recommended as not eligible for listing on the NRHP; the THC concurred with this recommendation in 2013.

Site 41SP271 was recorded in 2013 and consists of a surficial scatter of historical artifacts dating from the 1930s to 1970s, with a likely main occupation date of 1930s to 1950s. There are four intact features associated with this site: a small shed still partly standing, a concrete pad, a post, and a culvert leading to the road. The structures are apparent on aerial photographs dating to 1950. There is a distinct lack of artifact associated with this site; based on the topography of the area, lack of artifacts, and pile of brick and wood, it appears almost the whole of the site was bulldozed or otherwise scraped into the observed pile. Artifacts observed include three pieces of glass bottle bottom fragments, in clear, cobalt, and milk, likely dating to between 1940 and 1950. The clear glass has a partial maker's mark that may be the Owens-Illinois Glass Co., dating from between 1929 and 1960. The only other observed artifacts were the building fragments, consisting of bricks, concrete chunks, weathered wood, and composite shingles. The site was recommended as not eligible for listing on the NRHP; the THC concurred with this recommendation in 2013.

No information could be found on the THC Atlas for Shipwreck 1086 other than it was identified in 1977.

Table 9-4: Previously Identified Cultural Resources within 0.5 mi of the Alternative Project Area

Site	Distance from Alternative Project Centerline (m)	Segment	Site Type	Temporal Period	Description	NRHP Eligibility
41SP119	135	Onshore	Hotel	Historical	Harbor Inn Site	Not Eligible
41SP122	399	Onshore	Cemetery	Historical	Cemetery on Hatch Preemption	Undetermined
41SP123	239	Onshore	Shell Midden	Prehistoric	Shell midden completely destroyed	Eligible
41SP127	491	Onshore	Shell Midden	Prehistoric	Shell midden with sparse, disbursed scatter of shell, lithic debitage, with an arrow point recovered	Not Eligible
41SP49	344	Onshore	Lithic Scatter	Prehistoric	None	Undetermined
41SP53	665	Onshore	Shell Midden	Prehistoric	Numerous flint flakes, fire hardened clay lumps, several dart points, several arrow points, potsherds, bone	Undetermined
41SP54	222	Onshore	Shell Midden	Prehistoric	Shell fragments, fire hardened clay lumps and a few small flint flakes	Undetermined

Site	Distance from Alternative Project Centerline (m)	Segment	Site Type	Temporal Period	Description	NRHP Eligibility
41SP55	144	Onshore	Unknown	Prehistoric	None	Undetermined
41SP56	670	Onshore	Unknown	Prehistoric	None	Undetermined
41SP226	606	Onshore	Shell Midden	Prehistoric	Shell midden, bone fragments, burned clay nodules, lithic debris and some diagnostic lithic artifacts, tools, fragments	Undetermined
41SP256	622	Onshore	Shell Midden	Prehistoric	Scatter of shell, faunal bone, and lithics	Not Eligible
41SP257	**4**	**Onshore**	**Farmstead**	**Historical**	**Scatter of bottle glass, ceramics, metal fragments**	**Not Eligible**
41SP258	177	Onshore	Farmstead	Historical	Scatter of glass, whiteware, and metal fragments	Not Eligible
41NU349	474	Inshore	Artifact Scatter	Multicomponent	Shell adze, sunray clam shell scraper and fragments of historic green/black wine bottle	Undetermined
41SP264	567	Onshore	Artifact Scatter	Historical	Rusted metal, chert, historic ceramics, nails, glass, shell	Undetermined
41SP270	**7**	**Onshore**	**Artifact Scatter**	**Historical**	**Sparse historical artifact surface scatter dating from 1900-1950**	**Not Eligible**
41SP271	**5**	**Onshore**	**Farmstead**	**Historical**	**Farm structures and associated artifact scatter**	**Not Eligible**
41SP273	615	Onshore	Borrow pit	Historical	Construction borrow pit and historical artifact scatter	Not Eligible
41SP278	742	Onshore	Artifact Scatter	Historical	Scatter of ceramic, glass, and bricks	Undetermined
41SP279	530	Onshore	Foundation	Historical	Gravel/Oyster shell foundation	Not Eligible
1086	**0**	**Offshore**	**Shipwreck**	**Historical**	**None**	**Undetermined**

9.3.3 Alterative Project Construction Impacts

A desktop review and constraints analysis was completed for the Alternative Project in order to determine impacts to cultural resources anticipated from Alternative Project construction activities. The constraints analysis can be referenced as Appendix R.

Construction procedures and detailed maps of construction workspace extents for the Proposed Project are provided in Appendix A.

9.3.3.1 Onshore and Inshore

Historical maps (U.S. Geological Survey 2019) and aerial photographs (Google Earth 2019) were reviewed for the Alternative Project area to determine the potential for historic standing structures. Five structures were identified in aerial photography dating from 1950 within the western half of the onshore Alternative Project area. These structures are all absent from the Alternative Project area by 1985. In the southeastern portion of the onshore Alternative Project area, historical imagery showed oil and gas facilities crisscrossing the Alternative Project area. No structures or features were identified in the inshore portion of the Alternative Project area. In general, aerial

photography for more recent decades indicate that the Alternative Project area passes through what has persisted as largely uninhabited rural lands primarily used for oil exploration, agriculture, and ranching.

Three sites were identified within the Alternative Project area during the desktop analysis; none of these sites are eligible for listing on the NRHP or for designation as a SAL. No known historic properties or state landmarks, therefore, will be impacted by Project construction within the onshore and inshore portion of the Alternative Project area. There is also low potential for unknown cultural resources to be impacted by project construction efforts in the inshore and onshore segments.

As a result of the desktop analysis, one previously documented shipwreck (1086) was identified as being within the Alternative Project area. Shipwreck 1086 has an undetermined eligibility for listing on the NRHP and SAL and is located along a section of the project alignment where pipes would be installed with horizontal directional drilling, so no negative effects are anticipated.

9.3.3.2 Offshore

There is low potential for the presence of intact prehistoric sites in the offshore area of the Alternative Project. Remnants of Pleistocene-aged distributary channels, associated with deltaic conditions that created the Beaumont Formation, were exposed above sea level throughout most, perhaps all, of the survey corridor during the Paleo-Indian Period and for roughly the first half of the Archaic Period. The area was available for extended human use; however, any archaeological sites once associated with the top of the Beaumont Formation would have had little protection from wave energy during sea-level rise. Such sites, if even present, are presumed to have been destroyed by waves and currents, in a similar manner as ongoing erosion effects the Beaumont exposure between the 31-ft and 46-ft isobaths. The energy of waves and wave-induced currents in this area is high during the winter season and is particularly severe during tropical storms. No archaeological investigation or avoidance of these deposits, for the purpose of protecting potential prehistoric sites, is recommended as part of construction efforts for the Alternative Project.

9.3.4 Alterative Project Operation Impacts

Maintenance and access to the pipeline corridor and the booster site during normal operation would be conducted within the pipeline corridor and the booster site footprint for the Alternative Project route. Maintenance and access, therefore, would 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.

9.3.5 Alterative Project Decommissioning Impacts

Alternative Project route 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.

9.3.6 Summary of Alternative Project Impacts

Three archaeological sites were identified during the desktop analysis to be within or directly adjacent to (within 1,000 ft. [304.8 m]) the terrestrial inshore and onshore portions of the Alternative Project area. All seven sites were previously determined to be not eligible for listing on the NRHP or SAL. One previously documented shipwreck was identified within the Alternative Project area. The shipwreck has an undetermined eligibility for listing on the NRHP

and an unknown determination for designation as a SAL. Shipwreck 1086 is located along a section of the project alignment where pipes will be installed through HDD, so no negative effects are anticipated. However, as there is no safe, effective way to survey for or assess this resource 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 if the Alternative Project route is selected.

9.4 Summary of Potential Impacts

A summary of impacts for the Proposed Project and Alterative Project is presented in Table 9-5 below. Neither the Proposed Project or the Alternative Project present any significant cultural resources impacts.

Table 9-5: Summary of Potential Impacts to Cultural Resources

		Construction	Operation	Decommissioning
Proposed Project	**Onshore**	ground disturbance to resources; temporary visual impacts of construction equipment	Access and maintenance, visual impacts due to the presence of the onshore facility, and SPM buoy	Seafloor and ground disturbance, increased sedimentation, visual impacts of construction equipment/ vessels
	Inshore	ground disturbance, seafloor disturbance; temporary visual impacts of construction equipment		
	Offshore	seafloor disturbance; increased sedimentation, temporary visual impacts of construction vessels		
Alternative Project	**Onshore**	ground disturbance to resources; temporary visual impacts of construction equipment	Access and maintenance, visual impacts due to the presence of the onshore facility, and SPM buoy	Seafloor and ground disturbance, increased sedimentation, visual impacts of construction equipment/ vessels
	Inshore	ground disturbance, seafloor disturbance; temporary visual impacts of construction equipment		
	Offshore	seafloor disturbance; increased sedimentation, temporary visual impacts of construction vessels		

*indicates an environmental consequence that is significantly more impactful as compared to the other Project alternative.

9.5 Mitigation of Proposed Project Impacts

Seven archaeological sites were identified during archaeological survey to be within or directly adjacent to (within 1,000 ft. [304.8 m]) the terrestrial inshore or onshore portions of the Proposed Project area. None of the seven sites meets the eligibility criteria for listing on the NRHP or qualify for designation as a SAL. Therefore, no mitigation of cultural resources within the inshore or onshore portions of the project area are required. Three potentially significant magnetic anomalies, possibly representing historic-era resources, have been identified within the submerged parts of the non-terrestrial inshore and offshore portion of the Project area. Anomaly 1 is located in Federal waters, thus if historically significant might qualify for the NRHP. Anomalies 2 and 3 are both in Texas waters, thus might meet criteria for State Antiquities Landmark and/or NRHP eligibility. It is recommended that avoidance buffers be established around each of the anomalies. The avoidance buffers would extend outward 150 meters (492 ft) beyond the cluster of sonar contacts associated with Anomaly 1; 50 meters (164 ft) beyond the margins of Sonar Contact C-143, associated with Anomaly 2; and 50 meters (164 ft) beyond the -5-nT and +5-nT contours of Anomaly 3. Disturbance of the seafloor must be avoided within these avoidance buffers. Seafloor disturbances include, but are not limited to, dredging, trenching, anchoring, dragging anchor chains, laying pipe on the seafloor, use of barge spuds, and pile driving. As there is not an 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 proposed way of mitigating impacts to these potential resources.

The following best management practices will be employed to further reduce the potential to impact cultural resources for both the Proposed Project route and the Alternative Project route:

- Avoid all cultural resources or potential resources, including seafloor anomalies, that have an undetermined eligibility for listing on the NRHP. If avoidance of cultural resources or potential resources with undetermined eligibility status 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 as Appendix Q.

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