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AN INTENSIVE ARCHAEOLOGICAL SURVEY OF THE PROPOSED LA BAHIA PIPELINE PROJECT BRAZOS AND GRIMES COUNTIES, TEXAS

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Abstract

Atkins conducted an intensive cultural resources investigation on behalf of Navitas Midstream Partners LLC for the proposed La Bahia Pipeline in Brazos and Grimes Counties, Texas, during September and October 2014. The investigations consisted of an intensive terrestrial cultural resources survey for a proposed 13.13-mile, 20-inch-diameter natural gas pipeline, which originates near the Gibbons Creek Reservoir and terminates at a new gas-processing facility west of the Navasota River. The overall Area of Potential Effect (APE) is about 200 feet (ft) (61 meters [m]) wide with a depth of impacts averaging between 6 to 8 ft (1.8 to 2.4 m), with deeper impacts where horizontal directional drilling will be used to bore under existing roads and utilities. Thus, the overall APE is about 315.15 acres (127.5 hectares). The cultural resources survey was limited to portions of APE that coincide with the estimated U.S. Army Corps of Engineers (USACE), Fort Worth District jurisdictional areas, corresponding to 100-year floodplains plus an additional 300 ft (91.4 m) onto the first terrace, if present.

Portions of the proposed project traverse the Texas Municipal Power Agency (TMPA) properties, which are owned by the cities of Bryan, Denton, Garland, and Greenville, Texas. Because the TMPA is owned by cities that are political subdivisions of the state of Texas, compliance with the Antiquities Code of Texas is required. However, the TMPA declined to sign an Antiquities Permit application; thus, the results of survey efforts associated with the proposed pipeline construction activities located on the TMPA property are included in this report.

During the survey, two sites were recorded (41GM469 and 41BZ174), and revisits were attempted at four prehistoric sites, of which three (41GM322, 41GM329, and 41GM330) were not relocated within the pipeline right-of-way (ROW). Despite investigations to identify these four sites' recorded locations within the APE, no cultural materials associated with them were encountered during the present survey.

Newly recorded site 41GM469 is situated within the APE and between existing sites 41GM322 and 41GM323. The site location is presently being used as a plowed and cleared pasture, with Gibbons Creek forming the site's northern perimeter. The site 41GM469 assemblage includes burned clay pebbles, charcoal flecks and nodules, an ash lens, and FCR. These elements are indicative of a small clay oven or hearth; however, severe disturbances similar to those affecting nearby site 41GM323 have likely destroyed the context and integrity of site 41GM469. Thus, Atkins recommends that site 41GM469 is not eligible for inclusion to the National Register of Historic Places (NRHP).

Site 41BZ174 is a prehistoric site occupying a low toeslope between an ephemeral drainage and the Wickson Creek floodplain. Initially, the site was identified by the presence of a chert tertiary flake within a disturbed mound, which led to the excavation of five shovel tests in order to determine the sites boundary. Site 41BZ174 likely represents a short-term occupation as indicated by the presence of probable Caddo ceramics. Atkins recommends avoidance of site 41BZ174. If that is not

a viable option, additional work for the purpose of assessing whether site 41BZ174 is eligible for listing in the NRHP would be necessary prior to ground-disturbing construction activities. Based on these reasons, Atkins recommends that site 41BZ174's eligibility for inclusion to the NRHP remains undetermined.

Revisited site 41GM323 consisted of a light subsurface scatter of lithic debitage, fire-cracked rock (FCR), and one sand-tempered, ceramic rim sherd located on a knoll along the south side of Gibbons Creek. Site 41GM323 possesses buried intact deposits with research potential; therefore, Atkins recommends avoidance of the portions of this site extending within the survey corridor during the construction and maintenance of proposed oil and gas facilities. Atkins concurs with the findings of two previous investigations that recommended the site for additional testing to determine its eligibility for inclusion to the NRHP.

Based on the results of the background literature reviews and field surveys, it is Atkins' professional opinion that it is very unlikely that significant cultural resources will be encountered during construction of the pipeline. However, if previously unknown cultural resources are encountered during construction of the proposed project, construction should cease at that location until a qualified professional archaeologist can assess the significance of the findings.

In accordance with 33 CFR Part 325, Appendix C (Processing Department of Army Permits: Procedures for the Protection of Historic Properties; Final Rule 1990; with current Interim Guidance Document dated April 25, 2005), Atkins has made a reasonable and good faith effort to identify archaeological historic properties within the APE. As no properties besides sites 41BZ174 and 41GM323 were identified that meet the criteria for listing in the NRHP according to 36 CFR 60.4, Atkins recommends that sites 41BZ174 and 41GM323 be avoided, that no further cultural resource investigations are necessary, and that construction of the proposed project should be allowed to proceed.

Contents

Figures

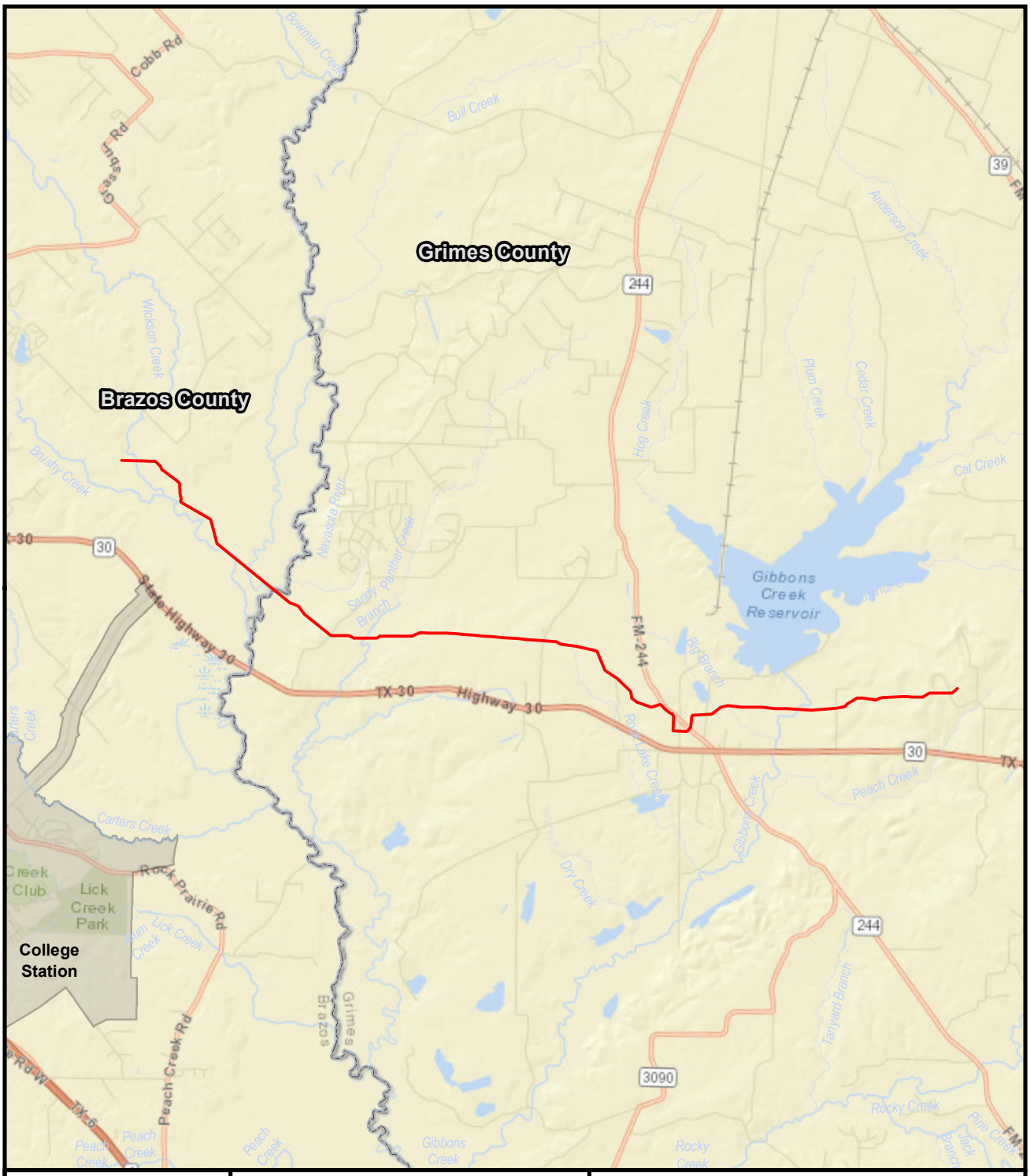
Page

I. INTRODUCTION

Atkins conducted an intensive cultural resources investigation for the proposed La Bahia Pipeline in Brazos and Grimes Counties, Texas, during months of September, October, and November 2014. The investigations consisted of an intensive terrestrial cultural resources survey for a proposed 13-mile (20.9 kilometer [km]), 20-inch-diameter ethane gas pipeline, which originates near the Gibbons Creek Reservoir and terminates at a new gas-processing facility west of the Navasota River (Figure 1). The overall Area of Potential Effect (APE) is about 200 feet (ft) (61 meters [m]) wide with a depth of impacts averaging between 6 to 8 ft (1.8 to 2.4 m), with deeper impacts where horizontal directional drilling will be used to bore under existing roads and utilities. Thus, the overall APE is about 315.15 acres (127.5 hectares [ha]). The cultural resources survey was limited to portions of the APE that coincide with the estimated U.S. Army Corps of Engineers (USACE) Fort Worth District jurisdictional areas, or 100-year floodplains, plus an additional 300 ft (91.4 m) onto the first terrace, if present. If the surveyed areas were also within 1,000 ft (304.8 m) of any previously recorded cultural resources site, a background review was conducted to identify local cultural resources and assess each site's eligibility recommendation. The survey involved approximately 662 shovel tests generally placed at 30 m intervals and excavated in transects spaced 30 meters apart along 13.13 miles (21.13 km) of the surveyed project corridor. A total of 133.93 acres were surveyed within the survey corridor with 32.16 acres falling outside of the floodplain buffer.

This investigation was initiated in anticipation of the project requiring a Nationwide Permit 12 under Section 404 of the Clean Water Act, in accordance with 33 Code of Federal Regulations (CFR) Part 325, Appendix C (Processing Department of Army Permits: Procedures for the Protection of Historic Properties; final Rule 1990; with current Interim Guidance Document dated April 25, 2005). The survey was performed in compliance with the National Historic Preservation Act of 1966 (Public Law [PL] 89-665), as amended; the National Environmental Policy Act of 1969 (PL 91-190. 83 Stat. 915, 42 USC 4321, 1970); and in accordance with the Procedures of the Advisory Council on Historic Preservation (36 CFR 800), as well as the guidelines set forth by the Register of Professional Archaeologists and the Council of Texas Archeologists.

Portions of the proposed project traverse the Texas Municipal Power Agency (TMPA) properties, which are owned by the cities of Bryan, Denton, Garland, and Greenville, Texas. Because the TMPA is owned by cities that are political subdivisions of the state of Texas, compliance with the Antiquities Code of Texas is required. However, the TMPA declined to sign an Antiquities Permit application; thus, the results of survey efforts associated with the proposed pipeline construction activities located on TMPA property are included in this report.



Proposed Pipeline Route
Populated Areas
County Boundary

Datum: NAD 1983
Projection: UTM
Zone: 15
Units: Meter

0 1 2 Miles

ATKINS

Figure 1
Vicinity Map
Navitas Midstream Partners, LLC
Proposed 20-Inch La Bahia Pipeline Project

Brazos and Grimes Counties, Texas

Prepared By: Atkins/WADD6088	Scale: 1 " = 2 miles
Job No.: 100041559	Date: Nov 21, 2014

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The field investigation was conducted by Atkins archaeologists Dana Brown, Krista Flores, and Ruben Castillo under the direction of Principal Investigators Dale Norton and Mary Jo Galindo. The survey recorded sites 41GM469 and 41BZ174 and attempted to revisit four prehistoric sites, of which three (41GM322, 41GM329, and 41GM330) were not relocated within the pipeline right of way (ROW). Revisited site 41GM323 consisted of a light subsurface scatter of lithic debitage, fire-cracked rock (FCR) and one sand-tempered ceramic rim sherd located on a knoll along the south side of Gibbons Creek. Site 41GM323 possesses buried intact deposits with research potential; therefore, Atkins recommends that portions of this site extending within the survey corridor should be avoided during the construction and maintenance of proposed oil and gas facilities. Two previous investigations also recommended the site for additional testing to determine its eligibility for inclusion to the National Register of Historic Places (NRHP) (McWilliams and Fields 2001; Rogers and Foster 1992). The remaining portions of the site within the survey corridor have been severely disturbed by seasonal flooding and associated erosion, farming activities such as vegetation removal and cattle grazing, modifications to the landscape by heavy machinery, and by the construction of an overhead transmission line.

Newly recorded site 41GM469 is situated between existing sites 41GM322 and 41GM323, and within the proposed project ROW. The site location is presently being used as a plowed and cleared pasture, with a Gibbons Creek and existing transmission line forming the site's northern perimeter. The site 41GM469 assemblage includes burned clay pebbles, charcoal flecks and nodules, an ash lens, and FCR. These elements are indicative of a small clay oven or hearth; however, severe disturbances similar to those affecting nearby site 41GM323 have likely destroyed the context and integrity of site 41GM469.

Site 41BZ174 is a prehistoric short-term occupation during the Late Prehistoric period, as indicated by the presence of probable Caddo ceramics, located on a toeslope between an ephemeral drainage and Wickson Creek floodplain. Four of the five shovel tests excavated tested positive for cultural materials, which extended into the entire 25-m (82-ft) permanent ROW. Avoiding the site during construction activities, if possible, is recommended. Otherwise, additional testing to assess the sites NRHP eligibility may be required prior to impacting ground surfaces.

This report is divided into seven sections. Section 1 is an introduction to the project and findings, while Sections 2 and 3 present background information on the environmental and cultural settings of the project area, respectively. Section 4 details the research strategy and methods for implementing the surveys, and Section 5 contains the results of the survey, including a description of a previously recorded site that was revisited in the field. Section 6 provides the conclusions and recommendations for the project, and Section 7 is the references cited in the report. An appendix is comprised of project overview maps that include the locations of documented archaeological sites. This appendix is not for public disclosure and has been provided only to the USACE and Texas Historical Commission (THC). No artifacts were collected during the survey; however, all project documents will be curated at the Texas Archeological Research Laboratory.

II. ENVIRONMENTAL BACKGROUND

PROJECT AREA DESCRIPTION

The project area can be found on portions of the Carlos (3096-411), Ferguson Crossing (3096-412), and Reliance (3096-413) U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle maps; the project area is situated north of Texas Highway 30 and east of College Station, Texas. The Navasota River and Gibbons Creek are the predominant drainages in the proposed project ROW.

Physiography

The Navasota River rises northeast of Mount Clam in southeastern Hill County and flows southeast through Limestone County(Figure2). It serves as a natural barrier between Leon and Robertson, Madison and Brazos, and Brazos and Grimes Counties before its confluence with the Brazos River, approximately 6 miles southwest of the city of Navasota in Grimes County. The river navigates across relatively flat to rolling terrain with local shallow depressions. The waterway is flanked by clay and sandy loams that support water-tolerant hardwoods, conifers, and grasses. A popular transportation route for indigenous people and early European settlers through the 1860s, the Navasota River is home to numerous archaeological sites (Sorrow and Cox 1973).

Figure 2: Overview of the Navasota River along the project corridor

Gibbons Creek, the second predominant drainage with the project corridor, traverses a nearly flat valley floor that is prone to seasonal flooding (Figure 3). Most of the creek's valleys are surrounded by a somewhat rounded, but very pronounced, escarpment approximately 6 to 9 m (19.69 to 29.53 ft) high. Occasionally, more precipitous header erosion may be found on smaller feeder gullies (Handbook of Texas Online 2010).

Figure 3: Overview of Gibbons Creeks along project corridor

Panther Creek, a rather small intermittent stream, flows northeast to southwest, into the Navasota River approximately 5.5 miles south of the proposed pipeline corridor (Figure 4). Big Bend Creek, a small drainage, flows northwest to southeast into Gibbons Creek 0.5 mile south of the project corridor. All drainages that flow through the La Bahia pipeline project corridor have left noticeable abandoned channels and relict terraces from past meandering. Previous surveys have identified prehistoric sites located on these landforms, which attests to the likelihood of additional sites being located in similar areas outside of the studied area (Kleiner 2010).

Figure 4: Overview of Panther Creek along project corridor

Geology

Grimes and Brazos Counties are situated in the subsided Western Gulf Coastal Plain (Fennenman 1938), which is characterized by hilly and rolling landforms interspersed with irregular plains. Elevations range from about 61 m (200 ft) above mean seas level (AMSL) in the flood plains to more than 91 m (299 ft) AMSL on side summits. This topographic variability is formed by differences in thickness and composition of a series of northeast- to southwest-oriented sand ridges and clay swales produced by ancient marine and shore-zone processes in which the eroded Cretaceous deposits were successively overlain by younger Mesozoic and Cenozoic marine and alluvial sediments. Soils are generally deep with a medium to fine texture.

The geologic units in the La Bahia pipeline corridor are Tertiary-age deposits of the Manning Formation of the Jackson Group. The Manning Formation is composed of dark brown clay, lignite, and fine- to medium-grained tuffaceous sands. The formation has an average thickness of 74 ft, and is interpreted as representing four different deltaic sedimentary sequences, including delta front sand, delta plain clay, a mudstone, and a lignite section. The four deltaic sequences have been further divided into eight members based on stratigraphic control using lignite seams and delta front sands.

Lithic raw material was available to the prehistoric occupants within the proposed project area. In general, four rock types were utilized by the prehistoric populations along the Navasota River and Gibbons Creek: sandstone, chert, quartzite, and petrified wood. All materials are present to some degree on the local landscape, although there is a greater abundance of sandstone than the other

types. Sandstone has been most frequently been associated with hearths and ground stone implements.

Chert and quartzite, while never abundant, are present on upland surfaces and stream beds as pebbles and cobbles. When found in an unmodified state these rock types are typically subround in shape, and were undoubtedly deposited by ancestral fluvial systems. They may be derived from lag deposits such as those found in the Ogallala Formation. Chert and quartzite are not common in within the project area, and the Ogallala Formation has not been geologically mapped in the area; however, outcrops of both have been documented along the Brazos River, south-southwest of the proposed La Bahia pipeline corridor. In general, quartzite was preferred by indigenous populations for hammerstones and manos. Chert was the predominant rock type for flake tool manufacture at each site investigated during this survey.

Petrified wood occurs with some frequency in the project ROW and varies in composition. While jasperized fragments have been documented occurring within the Navasota River, Gibbons Creek floodplains, and associated upland terraces, none were observed during the archaeological survey of the project areas. Unlike chert and quartzite, petrified wood is not rounded from fluvial transport but has been silicified in situ. Occurrences of the material were noted eroding from soils and encountered in excavated shovel tests.

SOILS

Brazos and Grimes Counties are within the Western Gulf Coastal Plain, which is a subset of the Atlantic-Gulf Coastal Plain (Thornbury 1965). The project area is located on the inner part of the coastal plain in an area of gently rolling hills, wide floodplains, and northwest-facing cuestas (sloping plains). The soils in the project area are mapped as Desan, Sandow, Singleton, Burlewash, Shiro, Axtell, Lufkin, Gredge, Gladewater, Nahatche, and Gowker series (Chervenka 1993; Greenwade 1995).

Desan Series

The Desan series consists of moderately deep, excessively drained, and loamy, fine sandy soils in stream terraces. Slopes range from 3 to 8 percent, and depth to restrictive feature is more than 80 inches. The parent material is a sandy alluvium of Pleistocene age derived from mixed sources.

Sandow Series

The Sandow series consists of moderately deep, moderately well-drained, and loamy soils in the flood plains. Slopes are recorded at 0 to 1 percent and the area is frequently flooded. The parent material consists of loamy alluvium of Holocene age derived from mixed sources.

Singleton Series

The Singleton series consists of moderately deep, moderately well-drained, and loamy soils on the uplands. These soils formed in loamy and sandy tuffaceous siltstone and sandstone bedrock. Slopes range from 0 to 5 percent. The typical solum ranges from 20 to 40 inches in thickness. The content of clay in the upper 20 inches of the Bt horizon is 35 to 45 percent; consequently, small cracks are visible at the surface during dry periods.

Burlewash Series

The Burlewash series consists of moderately deep, well-drained, and loamy soils on the uplands. These soils formed in tuffaceous shale and sandstone with a slope that ranges from 1 to 15 percent. Soil thickness ranges from 20 to 40 inches, while the content of siliceous pebbles ranges from 0 to 15 percent throughout.

Shiro Series

The Shiro series consists of moderately deep, moderately well-drained, and sandy soils on the uplands. These soils formed in tuffacesous sandstone bedrock with slopes that range from 1 to 8 percent. Shiros soils are made up of loamy fine sand, with thickness ranging from 20 to 40 inches.

Axtell Series

The Axtell series consists of very deep, moderately well-drained, and fine, sandy loam soils on ancient stream terraces that are up to 60 inches thick. These soils formed in clayey alluvium with slopes ranging from 1 to 8 percent. During dry periods cracks that are 0.5 inch or more wide are within 20 inches of the surface. Soils in the series can contain fine siliceous pebbles.

Lufkin Series

The Lufkin series consists of very deep (~60 to 80 inches), somewhat poorly drained, and loamy soils on the uplands and stream terraces that sometimes contain siliceous pebbles. Slopes range from 0 to 3 percent. Soils typically were formed in clayey sediments. During dry periods, cracks are visible in the upper part of the subsoil.

Gredge Series

The Gredge series consists of very deep (~60 to 80 inches), moderately well-drained, and loamy soils on the uplands with slopes ranging from 1 to 12 percent. Gredge soils were formed in clayey and loamy sediments and consist of a fine sandy loam.

Gladewater Series

Gladewater series consists of very deep, somewhat poorly drained, and clayey soils on floodplains. Gladewater soils formed in clayey sediments and are frequently flooded. During drying periods cracks that are 0.5 to 2 inches wide are at a depth of 15 to 35 inches.

Nahatche Series

Nahatche series consists of very deep, somewhat poorly drained, and loamy soils on floodplains. These soils were formed in loamy alluvium and are found on relatively flat surfaces that are frequently flooded.

Gowker Series

Gowker Series soils consist of very deep, moderately well-drained, and loamy soils on flood plains of small streams. Gowker soils formed in loamy and clayey alluvial sediment with slopes between 0 and 1 percent (Greenwade 1995).

The present-day topography reflects the underlying deposits. The delta front sands form cuestas of moderate relief in the area. These sands are slightly more resistant to erosion processes and thus stand up in the landscape. The pro-delta muds underlie the rolling hills and are almost always capped by sands. The resistant delta plain sands have formed the isolate hills on the flats of the delta plain muds. The resulting landscape can be generalized as a series of strike-parallel sandy ridges bounding a rolling landscape of gentle hills.

The presence of a cap or mantle of Holocene-age sands has been noted during past investigations within the project area (Brown et al. 1987; Glander et al. 1986). These sands appear to be Aeolian and possibly colluvially transported. Their importance, archaeologically, is based on the presence of prehistoric sites within the matrices of these deposits. Thus, the sedimentary depositional history of these sands is believed to be contemporary with prehistoric occupations in the area. Research in the adjacent areas suggests that this mantle of sandy sediments is of Holocene age; it is termed the Big Brushy Formation, as identified by Servello and Bianchi (1983). According to Fields et al. (1990:5), of the total 44 radiometric assays taken from the Big Brushy Formation during the survey of the Jewett Mine, all but two are less than 4,000 years old.

The landforms evident in the survey area all appear to be of fluvial origin except for the Aeolian caps of Holocene age. The fluvial processes have been directed by the underlying stratigraphy and structure. The overall drainage pattern is dendritic, with minor modifications such as the north-facing cuestas and quasi-trellis pattern. The hills will generally be topped with sandy-textured material and the valleys dominated by the clays and shales, except where they have been buried under alluvium.

Climate

The modern climate of Brazos and Grimes counties is classified as Subtropical Humid (Larkin and Bomar 1983), and characterized by an annual precipitation averaging 40.5 inches annually. It is not uncommon for the project area to see seasonally dry periods and high evapotranspiration rates during the summer months and cooler temperatures during the winter.

Flora and Fauna

The proposed La Bahia Pipeline project corridor is located within three vegetation regions including Oak Woods and Prairies, Blackland Prairie, and Piney Woods. Grimes and Brazos Counties are dominated by Post Oak Savannah mixed with Blackland Prairies. These communities are a mixture of prairie climax grasses and scattered trees located in topography-restricting bottomlands in or near water resources. The soils associated with bottomlands (floodplains) range from a well-drained clayey loam to clay matrixes. Being located in a transitional area, the ecotone supports several varieties of grasses to include little bluestem (*Schizachyrium scoparium),* indiangrass (*Sorghastrum nutans)*, switchgrass (*panicum virgatum*), purpletop (*Tridens flavus)*, and inland sea oats (*Chasmanthium latifolim*) (Gould 1975). The most prevalent trees in project area are the post oak (*Quercus stellate)*, blackjack oak (*Quercus marilandica)*, and cedar elm (*Ulmus crassifolia).* The oaks maintain their present distribution due to the favorable moisture-retaining characteristics of the sandy soils. Allen's' (1974) work demonstrates that the forest of the Navasota River region ranges from 100 to 500 years old. Conversely, soils attributed to the Blackland Prairie region have been developed into agriculture production for cattle grazing and planted crops such as corn, cotton, and wheat. Native prairies of the region have been reduced for urban expansion, minimizing the space for wildlife-associated habitats.

The integration of forest and grasslands in the study area results in a mixture of vertebrate species typical of two general habitats. Home to an array of species typically found in either forested areas or open prairies, such as nutria (*Myocastor Coypu)*, swamp rabbit (*Sylvilagus aquaticus*), river otter (*Lutra Canadensis*), ocelot *(Leopardus pardalis albescens)*, white-tailed deer (*O. v. texanus*), and bison (*Bos bison*) (Blair 1950). During historic times, bison (*Bison bison*), black bear (*Ursus americanus*), and gray wolf (*Canis lupis*) were present on the coast, some of which are known ethnographically to have been hunted by indigenous people. Faunal remains recovered from archaeological sites in the region indicate that these species roamed inland prairies during prehistoric times (McReynolds et al. 1988; Moore 1995; Wheat 1953). In addition to a variety of snakes and turtles, alligators (*Alligator mississippiensis*) are common found in riverine and floodplain environments.

III. CULTURAL SETTING

ARCHAEOLOGICAL BACKGROUND

Prehistoric Setting in Southeast Texas

Paleoindian Period (ca. 11,500–7000 B.C.)

The Paleoindian period is the earliest generally accepted cultural period of the Americas and includes prehistoric populations who inhabited North America from the end of the Pleistocene epoch until the early Holocene epoch. The Paleoindian presence in southeast Texas is poorly defined. This is in large part because worldwide climatic changes began about 12,000 years ago and subsequently altered the coastline of the Gulf of Mexico. Geological research indicates that during the waning years of the Pleistocene, the coastline extended approximately 30 to 40 kilometers (km) (~18.6–24.8 miles) seaward of its present location and that the rivers in the region cut deep into sediments deposited during previous periods of glaciation. The coastline did not reach its present location until sometime between 4,500 and 3,500 years ago (Aten 1983a; Gagliano 1977; Paine and Morton 1986). Thus, the Paleoindian populations present in the region were affected by the gradual, but vast, worldwide climatic changes that significantly affected the Gulf Coast shoreline. Given the significant rise in sea level, most Paleoindian sites in the region are probably located offshore, are deeply buried in the terraces of major stream channels, or have been destroyed by Holocene erosion (Aten 1983a; Hester 1980; Howard et al. 1991; Weinstein et al 2013).

To date, only one site with a relatively discrete Paleoindian component has been excavated in southeast Texas (Weinstein et. al. 2013); however, the relatively large number of Paleoindian artifacts recovered from the region attest to the early presence of indigenous people in southeast Texas (Bever and Meltzer 2007). Unfortunately, the majority of these artifacts are found isolated on the surface. A 2007 study by Bever and Meltzer shows the highest density of Clovis points (n = 97) recovered on the Texas Gulf Coast come from a 35-km (22-mile) stretch along McFaddin Beach in Jefferson County. Apparently redeposited from now-submerged offshore sites, their negligible evidence of abrasion indicates minimal displacement from their original location and suggests the presence of a rich offshore record of Paleoindian settlements and the potential presence of deeply buried sites. Clovis points have also been recovered from other counties near the project area, including Brazoria (n = 1), Fort Bend (n = 2), Galveston (n = 1), Harris (n = 9), Montgomery (n = 8), Jasper (n = 3), and Tyler (n = 1) (Bever and Meltzer 2007; see also Patterson 1986, 1997). As Ricklis points out (2004:184), the fact that the recovered points were manufactured from relatively high-grade lithic materials that are scarce or absent in southeast Texas suggests the widespread movement of both people and materials.

The earliest dated evidence for human occupation in the north-northeastern portion of the region comes from the Duewell-Newberry site in Brazos County (Carlson et al. 1984) where mammoth

remains, dating to sometime between 12,000 and 10,000 B.P., were recovered from deeply buried Brazos River alluvium. Although no artifacts were found in association with the remains, cut marks and impact scars on some of the bones indicate human modification. More-definitive evidence comes from the early lithic material recovered from sites to the west and south. Cultural remains dating between 9000 and 8500 B.P. (Fields 2004) have been recovered from excavated sites in Grimes County (Rogers 1995b) and Leon County (Fields 1990). Toward the end of the Early Paleoindian period, Dalton and San Patrice points appear. Both point types have been recovered from sites in Bastrop and Grimes Counties along the margins of the Prairie Savanna region (Johnson 1989; Rogers and Foster 1994:66).

In addition to Clovis points, several other types of well-made lanceolate, parallel-flaked projectile points such as Plainview, Angostura, and early side-notched points have been recovered from surficial and disturbed contexts (Hester 1980; McClure and Patterson 1989; Patterson et al. 1992; Wheat 1953). The presence of this early lithic technology reflects activities that would typically have occurred in areas farther inland where the environment is characterized by a mixture of deciduous and pine woodlands (Aten 1983a), which are habitats that would typically support low-density human populations. Archaeological evidence synthesized by Perttula (1993), Story (1990), and Ricklis (2004) points to a population organized around small nuclear family groups or bands, whose adaptive strategies included some mix of hunting and gathering that required a high degree of mobility in order to exploit large areas.

Archaic Period (ca. 7000–500 B.C.)

With the onset of the Holocene epoch, changes in world climatic conditions resulted in rising sea levels. In turn, inland prairies expanded and regional weather patterns changed (Aten 1983a). The regional long-lived period of cultural development ushered in by these changes is termed the Archaic, which has been further subdivided into Early, Middle, and Late stages based on variations observed in the archaeological record that roughly coincide with episodic shifts in the Holocene climate and environment. This regional archaic sequence can further be subdivided into distinct coastal and inland manifestations based on the distinctive adaptive strategies reflected in the archaeological record (Aten 1983a; Story 1990).

The Inland Archaic in southeast Texas is generally seen as beginning sometime around 7000 B.C. and lasting until the introduction of pottery around A.D. 100. These early inland Archaic groups maintained many of the patterns exhibited by their Paleoindian predecessors, and site density remained low (Aten 1983a; Perttula 1993; Story 1990). Despite a paucity of sites with intact Archaic components, data from the few sites that have been excavated (Hall 1981; Patterson 1980, 1994; Wheat 1953) indicate that early Archaic groups traveled in small bands, maintaining seasonal migration patterns and relying on a generalized projectile point technology to facilitate the hunting and gathering of a variety of faunal and vegetal foodstuffs. Sites that exhibit tight associational data

are relatively rare, and those that have been identified are all located on the inland coastal plain (Aten 1983a; Perttula 1993; Weinstein et al. 2013).

Since the coastline did not reach its present location until sometime during the Middle Archaic (ca. 3000 B.C.), information on Early to Middle Archaic occupations in the Coastal zone is largely inaccessible as these sites now lie offshore beneath Holocene bay, estuarine, and alluvial sediments (Ricklis 2004). This is supported by the analysis of *rangia* shell from core samples recovered from shell middens located along now-submerged upland stream margins (Gagliano 1977; Stright 1986, 1990). Thus, the archaeological record for the coastal zone begins largely in the Middle Archaic; however, the well-dated components of large shell midden sites such as the Harris County Boys School site (41HR80/85) (Aten et al. 1976), 41GV53 (Hines 1992), and the Eagles Ridge site (41CH252) (Ensor 1998) suggest that intensive shoreline occupation and resource extraction was well established in the area long before the Middle Archaic. In addition to the heavy dependence on estuarine resources (i.e., fish and shellfish), the presence of terrestrial mammal and reptile remains at sites such as the Eagle's Ridge indicate a mix of exploited resource zones (Ensor 1998; Ricklis 2004).

In general, Middle Archaic sites in the coastal zone yield a greater variety of nonlithic tool types made from bone and shell. Pitted stones and plummets begin to appear in the archaeological record (Ensor 1998), but given the greater distance from lithic raw material sources, stone tools are less common in coastal sites. This may be a function of restricted access to inland lithic sources or it may reflect cultural choices that minimized lithic procurement (Patterson 1995). When lithics are found, they often include dart points more common to Central Texas such as Bulverde (Ensor 1998; Patterson 1980, 1999) and Williams types (Patterson 1980).

During the early portion of the Middle Archaic period, site density on the inland coastal plain remained relatively low; however, somewhere between 3000 and 2000 B.C., there is evidence of decreased mobility and increased territoriality within which seasonal settlement and subsistence patterns are more fully developed (Aten 1983a; Perttula 1993; Story 1990). Evidence of this shift is reflected in the archaeological record by the appearance of several Middle-to-Late Archaic cemetery sites in Fort Bend County and neighboring Austin County (Hall 1981; Patterson 1980; Walley 1955). Middle Archaic lithic assemblages show an increase in the diversity of functional tool types and projectile point styles over earlier lithic assemblages; however, the level of craftsmanship and the use of fine exotic material declined (Perttula 1993; Ricklis 2004; Story 1990). Dart points recovered from Middle Archaic components at the Doering site (Wheat 1953) and the Owen site (Patterson 1980) include Gary, Kent, Bulverde, Pedernales, and Williams projectile point types. The presence of the Pedernales and the Williams point types suggests extra-regional interaction with Central Texas.

By the Late Archaic (ca 1000 B.C.), sea level had stabilized and the modern climatic pattern had settled into place (Aten 1983a). Along with this stabilization came a notable increase in the

frequency of archaeological sites in both the coastal and inland areas of the region. In the coastal zone, this shift toward a more mesic climate resulted in the formation of extensive estuarine shallows and increased productivity, thereby expanding the ecological basis and stimulating an increase in the human carrying capacity and population growth (Aten 1983a, 1983b; Ricklis 2004). The intensified use of estuarine resources is supported by archaeological data from a number of sites that show observable variation in the size and thickness of shell middens, which, in turn, argues for differences in group size and occupational frequency (Ambler 1967, 1970; Aten 1983a; Aten et al. 1976; Dillehay 1975; Gadus and Howard 1990; Weinstein and Whelan 1987). In addition, the presence of Late Archaic cemetery sites in Brazoria (Wilkinson 1973), Galveston (Aten et al. 1976), and Harris (Aten 1967) Counties point to a more complex social organization, and the inclusion of exotic grave goods in burials indicates the presence of a more widespread trade and exchange network (Perttula 1993; Story 1990).

In the inland zone, data from numerous sites reflect Late Archaic populations organized around a general foraging strategy operating on a highly scheduled basis. Sites on the inland coastal prairie were commonly located on the floodplains of major stream courses within riparian vegetation zones that provided an abundance of food sources such as nuts, seeds, deer, turtle, and fish (Ensor 1987; Ensor and Carlson 1988; Fields et al. 1983, 1986; Freeman and Hale 1978; Howard et al. 1991; Patterson 1980; Shafer 1968). Sites with Late Archaic components, such as those found at the Crawford site (Ensor and Carlson 1988), the Owen site (Patterson 1980), and sites 41MQ4 and 41MQ6 in the Lake Conroe/San Jacinto River Basin (Shafer 1968), provide strong evidence for a significant increase in population, intensive use and reuse of sites, and the possible establishment of territorial identification (Story 1985, 1990). The discovery of a number of formal cemeteries on the inland coastal prairie also provides support for this assumption (Hall 1981; Patterson 1999; Steele and Olive 1990; Story 1985, 1990; Walley 1955).

Late Archaic lithic assemblages are distinguished by expanding- and rectangular-stemmed projectile points such as Palmillas, Ellis, Gary, Kent, and Pontchartrain types. Since the latter type derives from western Louisiana and is typically found in northeast Texas along the Red River, the presence of Pontchartrain points in southeast Texas sites also suggests extra-regional interactions with Louisiana and far northeast Texas (Fields 1988; Turner and Hester 1993). Strong ties to the coast are evidenced at similar inland sites by the abundance of shell ornaments and tools made of marine shell (Story 1990).

Transitional Archaic/Early Ceramic Period (ca. 500 B.C.–A.D. 700)

During the Transitional Archaic/Early Ceramic period, cultural groups adapted to an environment of more sharply differentiated annual cycles. In response, settlement patterns and subsistence regimes took on increasingly seasonal emphases as groups moved from the occupation of fall/winter shoreline fishing camps to spring/summer hunting camps (Aten 1983a; Perttula 1993; Ricklis 2004). Although the archaeological evidence indicates a continuation of many of the same

cultural and technological patterns from the preceding Late Archaic period, the introduction of ceramic technology around 2,000 years ago, marks a shift in adaptive strategies, signaling a different means of processing, cooking, and/or storing plant and animal resources (Perttula 1993). Ceramic technology evolved rapidly, and there is evidence of increased ethnicity among the coastal groups as settlement patterns shifted in response to the integration of these new subsistence regimes (Aten 1983a; Ricklis 2004).

For the southeastern counties in Texas, the archaeological evidence shows that the technological traditions and adaptive strategies evinced during the later part of this cultural sequence represent regionally distinct manifestations that Story has labeled the "Mossy Grove Culture/Tradition" (Perttula 1993; Story 1990). Story (1990:Figure 39) presented this designation as a heuristic concept that links and facilitates discussion of a number of similar yet locally distinct cultural manifestations. In general, the Mossy Grove tradition defines the broad context of the Late Prehistoric cultures that encompass archaeological sites extending from the Brazos Delta/West Bay area eastward along the upper Texas Coast, inland to the northern reaches of Brazos County, and well into East Texas as far north and east as the Sabine River basin and the upper part of the Attoyac Bayou basin (Story 1990:Figure 39; Perttula 2013). At least in some cases, the prehistoric peoples that we refer to conveniently as the inland groups of the Mossy Grove culture may likely be ancestral to the prehistoric Caddo groups living in this part of East Texas after ca. A.D. 800; however, some researchers (Corbin 1998; Story 2000) have suggested that rather than an ancestral-descendant connection, these early inland Mossy Grove groups were contemporaries of the earliest Caddo who lived in East Texas, and these Woodland groups gradually adopted Caddo lifeways (Perttula 2013).

As in the preceding time periods, regional variations in settlement and subsistence patterns, technology, and ethnic affiliations indicate the presence of two subregions: the Coastal margins and the Inland Coastal Plain. Not surprisingly, each cultural region roughly corresponds to natural physiographic regions, with the adaptive strategies of the coastal groups being geared toward the Gulf Coast Prairies and Marshes and adaptive strategies of the inland groups being geared toward the Piney Woods. Research indicates that both temporal and spatial differences existed between the two subregions (Aten 1983a, Ellis and Ellis 1995; Perttula 1993; Ricklis 2004; Story 1990), with the presence of sandy paste ceramics being the most unifying trait.

Beginning around 2,500 years ago, the inland Mossy Grove culture encompassed Woodland period archaeological sites that extended as far inland as the Neches and Angelina River basin and into the upper portions of Attoyac Bayou in East Texas (Perttula 2008; Story 1990). In general, archaeological deposits are marked by small lithic scatters, small numbers of sandy paste sherds, a few ground stone tools, and FCRs. No midden deposits have been recognized and there is a general dearth of features (Perttula 2008). Sites in this area point to a people who were primarily "hunting-gathering foragers" with relatively mobile settlements and a material culture dominated by plain sandy paste ceramics and dart points (Perttula 2008).

Between A.D. 500 and 600, there appears to have been a shift in settlement location from the uplands or high ridge tops to the low sandy ridges overlooking the confluence of small drainages (Moore 1995; Perttula 2004), indicating increased sedentism that may be related to a shift in subsistence strategies (Cliff 1998; Corban 1998; Moore 1995; Perttula 2008).

Several sites in the Livingston Reservoir area, such as the Jones Hill (41PK8) site and 41PK21, also have Woodland/Early Ceramic period components (McClurkan 1967; McClurkan et al. 1968). For example, the Jones Hill site appears to represent a Transitional Archaic site that overlaps the Woodland/Early Ceramic period. Its earliest occupation has been dated to A.D. 540, and the artifact assemblage resembles similarly aged Mossy Grove sites with the presence of plain sandy paste pottery, Gary dart points, and contracting stem dart points (McClurkan et al. 1968).

Sometime between A.D. 600 and 700, small, straight, and expanding-stem arrow points appear in the archaeological record (for detailed discussions of arrow point chronology see Patterson 1991; Prewitt 1981, 1985, 1995; and Ricklis 2004). Prior to the introduction of this innovative new projectile point style, lithic technology varied, but changes in dart point style were more generalized in that they could be applied to a wide range of resource conditions and applications (Aten 1983a). With the introduction of the bow and arrow, a distinctive hunting technique was incorporated into the subsistence regime, and in southeast Texas, Scallorn points are clear markers of this early Transitional Archaic/Early Ceramic period (Ricklis 1994).

Late Prehistoric Period (ca. A.D. 700 to 1528)

Chronological divisions for the Late Prehistoric have been defined for both the inland coastal plain (Story 1990) and the coastal margins (Aten 1983a). There are, however, regional variations in settlement and subsistence patterns and technology that indicate both temporal and spatial differences between the two subregions (Ellis and Ellis 1999; Perttula 1993; Ricklis 2004; Story 1990).

Building on more than 25 years of archaeological work in the region, the 1983 published version of Aten's dissertation research provided the first formal synthesis of the Late Prehistoric period and has become one of the standard references on the prehistory of the region. Following Phillips's (1970) taxonomic scheme for the Lower Mississippi Valley, Aten (1983a) devised a ceramic taxonomy based on changes in paste technologies, with various decorative treatments being used to split gross paste types into finer types or to denote the specific varieties within each type. Using these established types, graphic ceramic seriations for the three relatively distinct archaeological areas in the region were developed: the Conroe-Livingston sequence, the Brazos Delta-West Bay sequence, and the Galveston Bay-area sequence. The most developed was the Galveston Bay area, in that the available data for this area allowed for individual chronological controls such as associated diagnostic artifacts, radiocarbon dates, and geomorphological data. The seriations for the Conroe-Livingston area and the Brazos Delta-West Bay area were then correlated against the Galveston Bay

area sequence (Ambler 1967, 1970, 1973; Aten 1979, 1983a). The stated goal was to "map" the time/space distribution of ceramic artifacts in the region.

Based on the Galveston Bay ceramic seriation, Aten (1983a:Figure 14.1) defined six chronological periods for the Late Prehistoric in the Southeast Texas Archaeological Region: Clear Lake (A.D. 100 to 425); Mayes Island (A.D. 425 to 650); Turtle Bay (A.D. 650 to 1000); Round Lake (A.D. 1000 to 1350); Old River (A.D. 1350 to 1700); Orcoquisac (A.D. 1700 to 1810); and Late Historic (A.D. 1810 to 1840(?). Subsequent research has called into question just how fine-grained the Galveston Bay seriation actually is (Ellis and Ellis 1995; Ricklis 1994; Weinstein 1991), suggesting that its usefulness is primarily as a relative sequence and should not be relied upon as an accurate calendric scale (Ricklis 1994). In addition to this issue, excavations at several stratified, well-dated, ceramic-bearing sites have refined the temporal placements of ceramics within the chronology (Ellis and Ensor 1998; Ricklis 1994, 2004; Moore 1995; Winchell and Ellis 1991).

Extensive work at the Eagle's Ridge site (41CH252) in the Wallisville Reservoir area has added significantly to our knowledge of the Early Ceramic period and serves to refine the temporal placement of ceramics within the Galveston Bay seriation (Ensor 1998). At the Eagle's Ridge site, more than 14,000 sherds were recovered, and analysis of the stratified and well-dated ceramic assemblage has yielded some of the earliest pottery recovered from relatively secure contexts, effectively pushing the earliest occurrence of ceramics back to sometime around 200 B.C. (Ellis and Ensor 1998). The range and distinct variability of the ceramics recovered at the site suggest that pottery making, while definitely in its early stages, was fairly well established in the region by the beginning of the Clear Lake period. If the assemblage at 41CH252 is broadly representative, ceramics in the coastal zone started out as highly diverse, and the frequency of types found at the Eagle's Ridge site varies significantly from Aten's (1983a:Figure 14.1) seriation. In addition, a much broader range of decorative styles and motifs was observed on the early period ceramics found at Eagle's Ridge than is commonly found on later-period ceramics, and the early southeast Texas potter's repertoire also included a broader range of technological approaches to paste choice, primary forming, and surface treatment. However, by the A.D. 700s, the range of technological styles had narrowed considerably in the sense that both manufacturing processes and decorative techniques changed to include a smaller suite of technical procedures. This narrower range of technical procedures stabilized into a predominant pattern in which decoration in general (and the range of decorative techniques specifically) was much less common. In general, it appears that the emphasis came to be on the primary and secondary forming stage of the pottery production process and less on the embellishment of the finished pot. In essence, southeast Texas potters settled on a combination of technical attributes, and they deviated from that overall style relatively little. This is also confirmed by a number of other studies that have explored the regional range of stylistic variability in ceramics (Black 1989; Ellis and Ellis 1995; Ricklis 1994), as well as variability in forming techniques and surface treatment (Ellis 1992, 1994, 1995, 2000; Ellis and Ellis 1996a, 1996b, 1999; Ellis and Ensor 1998; Hamilton 1988; Howard 1990; Winchell and Ellis 1991). Many of the individual technological aspects may have distinct spatial properties (Ellis and Ellis 1999).

The data on coastal settlement patterns resulting from excavations at the Eagle's Ridge site in Chambers County points to a strong correlation between changing environmental conditions and cultural adaptations (Ensor 1998). Occupations at the site spanned 2,700 years from 4,300 to 1,600 years ago, and the archaeological evidence indicates a gradual increase in population density, less group mobility, and more seasonally focused use of littoral areas. Most intriguing are the indications that the separate settlement/subsistence systems for inland and coastal groups may have emerged at the end of the Late Archaic.

One of the more ambitious studies pertaining to variation in inland settlement patterns was undertaken by Moore (1995). Using Story's (1990) Mossy Grove Culture/Tradition, Moore (1995) developed what he termed, the "Mossy Grove Model" of long-term hunter-gatherer adaptation in inland southeast Texas, by focusing on Ceramic-period settlement patterns along stream channels. Using both technological variations in lithic and ceramic data, he tested the hypothesis that social groups in the inland coastal area were organized on the basis of watersheds and that these watersheds marked important social boundaries. Although limited by the availability of technological data, Moore's study yielded viable results that merit further research.

Lithics occur more frequently in inland sites than in coastal sites. Sometime during the early Turtle Bay period (A.D. 650 to 900), dart points and the use of the spear were largely replaced by bows and arrow points in the coastal margin area (Patterson 1995). In the Brazos Delta-West Bay area and on the inland coastal plain, Gary and Kent dart points continued to be used during the early portions of the Late Prehistoric, and Scallorn arrow points appear to have been used simultaneously. Perdiz points come to dominate the later part of the Late Prehistoric period (Ensor 1990; Patterson 1995; Story 1990; Ricklis 2004).

Among those inland counties lying along the northeastern boundary of the Southeast Texas Archaeological Region, assemblages found in Walker (Gadus and Fields 1997), and Grimes (Rogers 1994, 1995b) counties often denote commingled Late Prehistoric occupations with ties to both the southeast Texas Mossy Grove cultures and the Caddo cultures. For example, in Grimes County, site 41GM281 produced over 100 Perdiz points, point fragments, and preforms (Rogers 1995b). These lithic artifacts differ visibly from specimens found in central and southern Texas primarily due to their wide blades, out flaring barbs, and short stems. Scallorn and Catahoula points were also present, but represented by only 10 and 2 specimens, respectively. Radiocarbon samples provided dates ranging from A.D. 1150 to 1400, although the majority of the occupations appear to have taken place between A.D. 1300 and 1400. Ceramics from the site were primarily sandy paste or sandy paste and bone-tempered plain wares, some of which closely resemble the upper Texas coastal and Caddo traditions.

Historic (A.D. 1528—present)

Contact period sites in southeast Texas (circa A.D. 1500 to 1800) are difficult to identify as they often resemble Late Prehistoric sites (Patterson 1995; Tunnell and Ambler 1967). Historic indigenous period sites are more easily identified by the presence of glass, metal artifacts, gunflints, and some European ceramics (Aten 1983a; Ensor and Carlson 1988; Patterson 1995); however, bulbar-stemmed and Guerrero arrow points are useful for identifying Historic aboriginal sites (Hudgins 1986; Patterson 1995; Ricklis 1994, 2004).

Most of what is known of the geography and early inhabitants of southeast Texas comes from the written accounts of early Spanish, French, and English explorers. The earliest and best account of the indigenous groups living along the upper Texas coast comes from the chronicles of Alvár Núñez Cabeza de Vaca, a Spanish shipwreck survivor who landed on Galveston Island in 1528 (Pupo-Walker 1993). For 7 years Cabeza de Vaca lived and traveled along the Texas coast from Galveston Bay to Corpus Christi Bay and onto the Coastal Plains, interacting with many of the distinct cultural groups living in the region. The chronicles of Cabeza de Vaca, as well as information from other archival sources, indicate that these early coastal people were part of numerous politically, culturally, and linguistically distinct groups that shared certain resource-based territory.

Using the large body of ethnohistoric information and accumulated archaeological data, Aten (1983a:Figures 3.1 and 3.2) reconstructed native group territories from the time of first contact until the nineteenth century. According to Aten's research, the region was originally populated by four linguistically distinct groups (see Aten 1983a; Glass 1989; Hamilton 1988; Newcomb 1961; Story 1990): (1) several Karankawa-speaking groups whose territory encompassed the Brazos Delta-West Bay area and extended southward down the central coast; (2) several Akokisa groups whose territory occupied a sizeable portion of the region from Galveston Bay northward toward the Spring Creek and San Jacinto River drainages; (3) several Atakapa groups whose territory extended from the Neches River westward into Louisiana; and (4) the Bidai, who occupied territory in the Conroe-Livingston area. Over the next 3 centuries, French, Spanish, and Anglo explorers, missionaries, soldiers, and settlers encountered these Native American groups with devastating effects. After 1700, European settlement in the region severely disrupted the indigenous groups, and by the late 1800s, most of the indigenous population in the region had been displaced or had fallen victim to diseases that the European settlers introduced.

Historic Indian sites are distinguished by the presence of European and nonaboriginal American trade goods that date from the sixteenth through mid-nineteenth centuries. Debris on historic Indian sites indicates a continuing nomadic hunting and gathering existence (Aten 1983a; Tunnell and Ambler 1967).

PREVIOUS INVESTIGATIONS

A review of previous investigations in the Navasota River Basin and the Gibbons Creek flood plains identified 26 previously recorded sites, located during six cultural resources surveys within 1 km (0.6 mile) of the proposed La Bahia Pipeline Corridor (Espy, Houston and Associates 1986, 1992; Haster Collins 1967; Prewitt and Associates 2001; Ray and Briggs 1971; Sorrow and Cox 1973). More extensive investigations by personnel from Espy, Houston and Associates included additional testing of historic and prehistoric sites, geomorphic studies, and data recovery excavations at prehistoric sites. Four (41GM322, 41GM323, 41GM329, and 41GM330,) of the 26 previously recorded sites fall within 300 ft (91.4 m) of the project ROW. All of the four sites are of prehistoric origin and consist of small lithic scatters within sandy loam soils, located on top of hills outside of the floodplains. None these site boundaries extended into the pipeline ROW. Two previous investigations (McWilliams and Fields 2001; Rogers and Foster 1992) of 41GM323 determined intact soils existed within its boundaries and recommended additional testing.

Of the 26 previously recorded sites within 1 km (0.6 mile), all but two are identified as prehistoric open campsites with lithic scatters, pieces of burned sandstone, and occasionally ceramic sherd fragments. Many of the sites are typically located on small rises or terraces, just above the floodplains in what is presently cleared cattle pasture. These pastures were likely previously populated with heavy underbrush beneath the pine and oak trees that are native to the area (Blair 1950). Ceramic sherds from most excavated sites throughout southeast Texas have a sandy paste temper and are dated from Late Archaic to Late Prehistoric contexts. Another common cultural material located in most sites with hearth features has been burned nutshells. The occurrence of sites having burned rock within their context suggests processing activities in the area were especially important (Fields 1995).

One site within the Navasota River Basin is 41GM2, initially recorded at Millican Reservoir by Haster Collins (1967), and revisited by Ray and Briggs (1971), Sorrow and Cox (1973), and Espy, Houston and Associates (1986). The site is situated along the erosional edge of a west-facing slope, at the eastern edge of the Navasota River floodplain, and 200 m (656.2 feet) north of State Highway 30 (SH 30). One of the earliest investigations suggests a burial had been identified at the site, but later revisits were unable to relocate it. No field notes, sketches, or photographs from 1967 survey were encountered at the archives. The 1986 investigation recovered an artifact assemblage containing lithic debitage, biface fragments, two scrapers, two ceramic sherds, two dart points, and a hammerstone between the surface and 60 centimeters below the surface (cmbs). As a consequence of the natural topography of the landform and the stability of the underlying sandy soils, much of this Prehistoric-Neo American open campsite has been impacted by natural (erosion, bioturbation) and artificial elements (burrow area, pasture clearing, plowing, and a lack of proper archaeological site documentation).

Additionally, four sites recorded during the Espy, Houston and Associates (1992) survey of the TMPA's Gibbons Creek Lignite Mine East Area V project (41GM313, 41GM319, 41GM320, and 41GM331) are within 1 km (0.6 mile) of the project corridor and are located in a mixture of hardwood forests and open pastureland in the Gibbons Creek floodplain. Sites 41GM313 and 41GM331 have historic components, while sites 41GM319 and 41GM320 are prehistoric campsites. The historic structures at sites 41GM313 and 41GM331 are similar to dwellings typical of the late nineteenth century, which featured a rectangular, central hall plan with chimneys incorporated externally on opposing end walls. All historic structures were in an advanced state of deterioration when they were recorded in 1992; rock rubble mounds from chimneys and sandstone foundations pier were the only observable remnants. Prehistoric artifacts uncovered on the 41GM319 and 41GM320 included lithic debitage, petrified wood flakes, FCR, and charcoal. Of the two, site 41GM320 contained the greater density of cultural materials and its assemblage resembled those of prehistoric sites located within the Navasota River Basin.

IV. METHODS

INTENSIVE TERRESTRIAL SURVEY

Atkins performed a pedestrian survey, including visual surface inspection and shovel testing of areas within the project area identified as being USACE jurisdictional areas plus a 300-ft (91.4-m) buffer. Based on the results of the background review, areas with a high probability for containing buried cultural resources were subject to shovel tests, which were spaced at 30-m (98.4-ft) intervals or placed according to the project archaeologist's discretion. The central portion of the proposed pipeline ROW encompasses site 41GM323; consequently, Navitas proposes using horizontal directional drilling (HDD) to avoid the site by boring 20 ft (6.1 m) beneath it. The THC has not yet concurred with this proposed avoidance plan. At site 41GM323, the depth of intact soil deposits was determined using a 3.5-inch (8.9 centimeters [cm]) diameter, steel soil auger. The central and west portions of the proposed project contain soils with a low to moderate geoarchaeological potential. Therefore, this area was subject to systematic shovel testing at 30-m (98.4-ft) intervals. However, the remaining proposed project areas located outside of the USACE jurisdictional areas were subject to shovel testing only if a previously recorded site came within 300 ft (91.4 m) of the APE. Where portions of the ROW traversed TMPA property, shovel tests were excavated in areas containing visually undisturbed soils.

For each of the shovel tests, the following was recorded on Atkins shovel test forms: location, maximum depth, soil strata, soil color and texture, and the presence or absence of cultural resources. Soil matrices were screened through ¼-inch mesh hardware cloth unless the matrix was dominated by clay. Clay matrices were finely divided by hand tools and visually inspected for cultural remains. The survey also included an investigation for prehistoric and historic cultural resources visible along the shoreline. The visual inspection was conducted to identify any additional cultural resources, such as historic structures.

When an archaeological site was located, a program of systematic shovel testing was implemented in an effort to determine the site boundaries within the proposed corridor, the depth of the site, and the potential integrity of the cultural deposits. All cultural materials recovered were recorded in the field but not collected. Cultural resource sites were recorded on State of Texas Archeological Site Survey Forms.

V. RESULTS

INTENSIVE TERRESTRIAL SURVEY RESULTS

On behalf of Navitas Products Operating LLC, Atkins conducted an intensive cultural resources investigation for the proposed La Bahia Pipeline in Brazos and Grimes Counties, Texas, during September and October 2014. The investigations consisted of an intensive terrestrial cultural resources survey for a proposed 13-mile pipeline, which originates near the Gibbons Creek Reservoir and terminates at a new gas-processing facility west of the Navasota River. The overall APE is about 200 ft (61 m) wide with a depth of impacts that averages between 6 to 8 ft (1.8 to 2.4 m), except for deeper impacts where HDD will be used to bore under existing roads and utilities. Thus, the overall APE is about 315.15 acres (127.5 ha); however, the cultural resources survey was limited to portions of APE that coincide with USACE jurisdictional areas, which include the 100-year floodplain, plus an additional 300 ft (91.4 m) onto the first terrace. The surveyed areas were also within 300ft of three previously recorded cultural resources sites (41GM322, 41GM323, and 41GM329). Approximately 662 shovel tests were excavated along 13.12 miles (21.13 km) of the surveyed project corridor. Areas within the proposed project 200-ft (61-m) buffer labeled as wetlands were pedestrian surveyed and judgmentally shovel tested to identify whether their underlying soils had potential for buried cultural material, in accordance with the scope of work.

Sites that are within the APE were evaluated according to the criteria in 36 CFR 60.4, which states: The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) that have yielded, or may be likely to yield, information important in prehistory or history.

Previously recorded prehistoric site 41GM323 was revisited during the course of this survey and was shovel tested and soil probed with an auger to delineate both its horizontal and vertical boundaries. Subsequently, site 41GM323 was mapped using a handheld Trimble, photographed, and recorded on a State of Texas Archeological Site Data form. The pipeline ROW adjacent to previously recorded sites 41GM322, 41GM329, and 41GM330 was investigated, but no remnant of the sites was encountered; thus, none of the sites extend within the survey corridor. Sites 41BZ174 and 41GM469 are newly recorded sites that are detailed below.

Site 41GM322

Environment

Site 41GM322, a previously recorded prehistoric isolated find, is located in Grimes County north of the intersection of SH 30 and Berger Easement along a large transmission line. The site is 10 m (32.8 ft) from the road and on the west side of the easement. Soils at this location are mapped as Burlewash fine sandy loam and Gomery loamy fine sand, each with 5 to 12 percent slopes. Gibbons Creek Reservoir is 609.6 m (2,000 ft) north of the site, while Gibbons Creek is 150 m (492.1 ft) north of it. The area is currently a short-grass pasture for cattle, allowing surface visibility of 5 percent. Prior disturbances include the clearing of the easement and construction of the transmission line, vegetation clearing of the pasture, and cattle grazing (Figure 5).

Figure 5: Overview of site 41GM322, facing east.

Previous Investigations

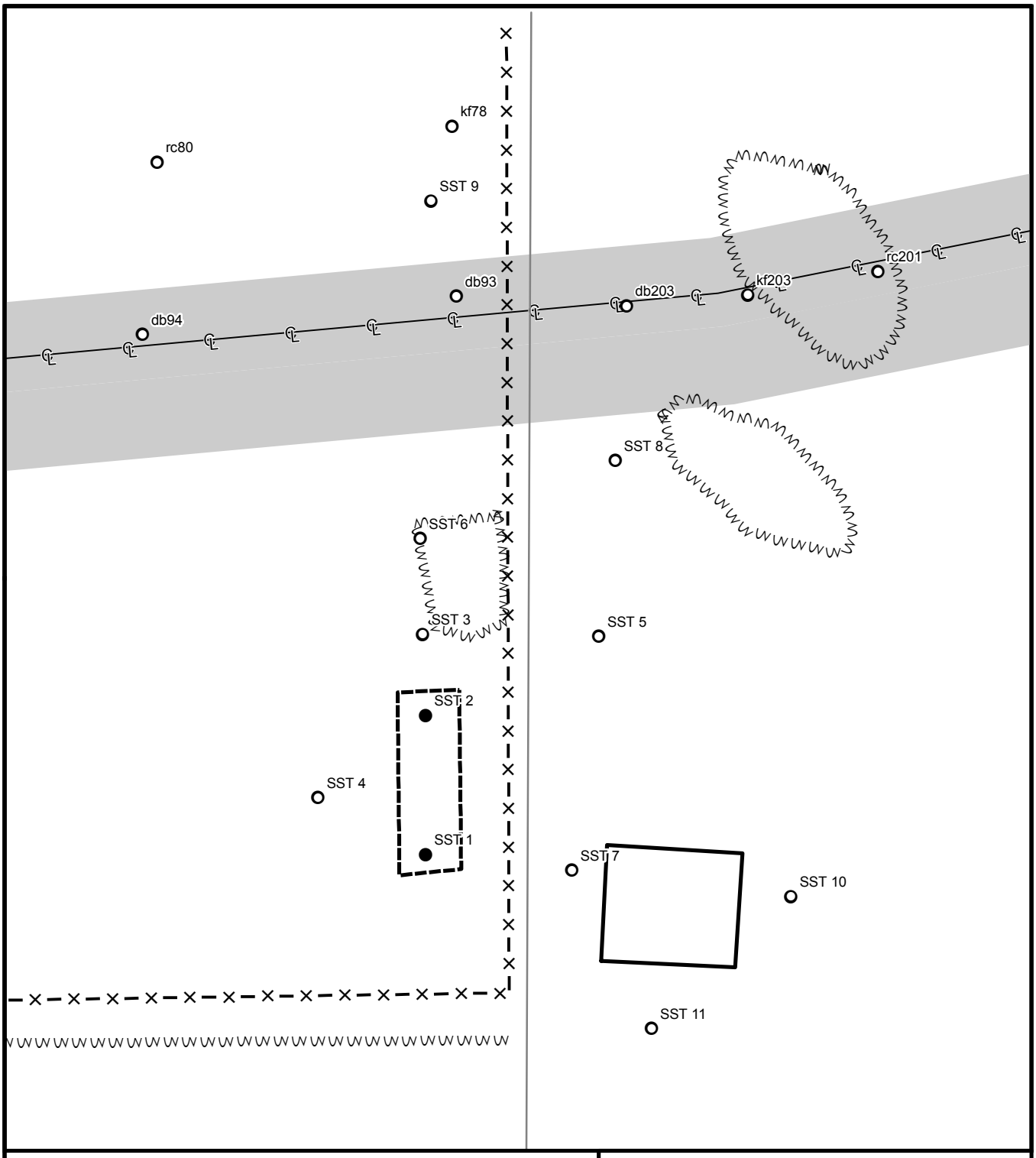
Previous investigations at site 41GM322 were conducted by Espey, Huston, and Associates (EH&A) in 1992. Eleven shovel tests were excavated, two of which tested positive at 30 cmbs with a total of two flakes. EH&A noted that the site was being impacted by erosion and developing pasture, but no recommendations for further work or an evaluation of the site's NRHP eligibility were recorded.

Work Performed

When a prerecorded site was identified as being within 300 ft (91.4 m) of the APE, systematic subsurface testing occurred within the adjacent pipeline ROW to determine if the site extended into the APE. Using the site's central datum as a guide, shovel tests were excavated to 80 cmbs or pre-Holocene soils. Five shovel tests were placed within the APE adjacent to site 41GM322; however, all were negative for cultural material (Figure 6). After the survey corridor shifted south (towards the site) and was reduced to proposed workspaces and permanent ROW, three additional shovel tests were needed to confirm that the site did not extend into the APE. Shovel test depth on the west side of the site averaged 30 cmbs, while shovel tests on the east side of site averaged 80 cmbs through brownish-gray, fine sand. No artifacts were encountered in any subsurface investigation.

Conclusions and Recommendations

Based on our inability to locate site 41GM322 within the project corridor despite systematic shovel testing, Atkins recommends that there is little potential to impact buried intact cultural during the proposed construction activities in the vicinity of site 41GM322. The site was initially recorded on the basis of an isolated find; therefore, it is very unlikely that more intensive investigation will yield any significant additional information. Atkins does not recommend any further investigations within the APE adjacent to site 41GM322.



Legend

- Negative Site Shovel Test
- Positive Site Shovel Test
- Site Boundary
- Barn
- Trees
- Easement Rd
- Fence
- Proposed Route
- Survey Corridor

N W E S

0 10 20 Meters

ATKINS

Figure 6
Site 41GM322
Sketch Map

Prepared for: Navitas Midstream Partners, LLC

Job No.: 100041559

Prepared By: Atkins/18827 | Date: Nov 21, 2014

Path: N:\M_N\Navitas\100041559\geo\figs\CR_map\Sketch_Maps\Sketch_41GM322.mxd

Site 41GM323

Environment

Site 41GM323, a prehistoric lithic scatter, is located in Grimes County north of the intersection of SH 30 and Berger Easement along a transmission line. The site is 600 m (1,968.5 ft) west of Berger Easement road along Gibbons Creek. Soils at this location are mapped as Nahatche Clay Loam that is frequently flooded. Gibbons Creek Reservoir is 609.6 m (2,000 ft) north of the site and Gibbons Creek is 10 m (32.8 ft) north of the site. The area is currently a short-grass pasture for cattle, allowing surface visibility of 5 percent(Figure 7).

Figure 7: Overview of site 41GM323, facing northeast.

Previous Investigations

EH&A recorded prehistoric campsite 41GM323 in 1992. The site measured 15 x 25 m (49.2 x 82.0 ft). Flakes, sandstone, and a ceramic sherd were recovered as deep as 1 m. The recorders noted disturbances from erosion and pasture development. The THC concurred with EH&A's recommendation for additional testing to determine the site's eligibility for inclusion to the NRHP. Five backhoe trenches were subsequently excavated in the Gibbons Creek floodplain and included geoarchaeological investigations. In 2001, site 41GM323 was revisited by Prewitt and Associates

and lithic debitage, a biface, and a ceramic sherd were recorded within intact soils to a depth of 100 cmbs. Prewitt and Associates also recommended the site for additional testing based on the depth of intact soils and the high density of lithic debitage.

Work Performed

Site 41GM323 is recorded within the pipeline APE. When it was located the crew was conducting shovel tests at 30-m intervals, and along two transects that were 20 m apart. Twenty-eight shovel tests were initially performed, including 14 that were positive for cultural material . After the survey corridor shifted to the south, closer to the site, and was reduced to the proposed workspaces and permanent ROW, nine additional site shovel tests were dug, two of which were positive for cultural materials. To determine the depth of intact soils containing cultural material, three auger tests were excavated to 250 cmbs where a clay submatrix was encountered. Auger testing was employed to assist Navitas in evaluating the feasibility of using HDD to avoid the site without changing the proposed pipeline corridor. The boring pits associated with the proposed HDD would be placed outside of the site boundaries. However, Navitas has elected to shift the project corridor to the south, outside of the site. As a result, the current alignment, construction should not impact the site.

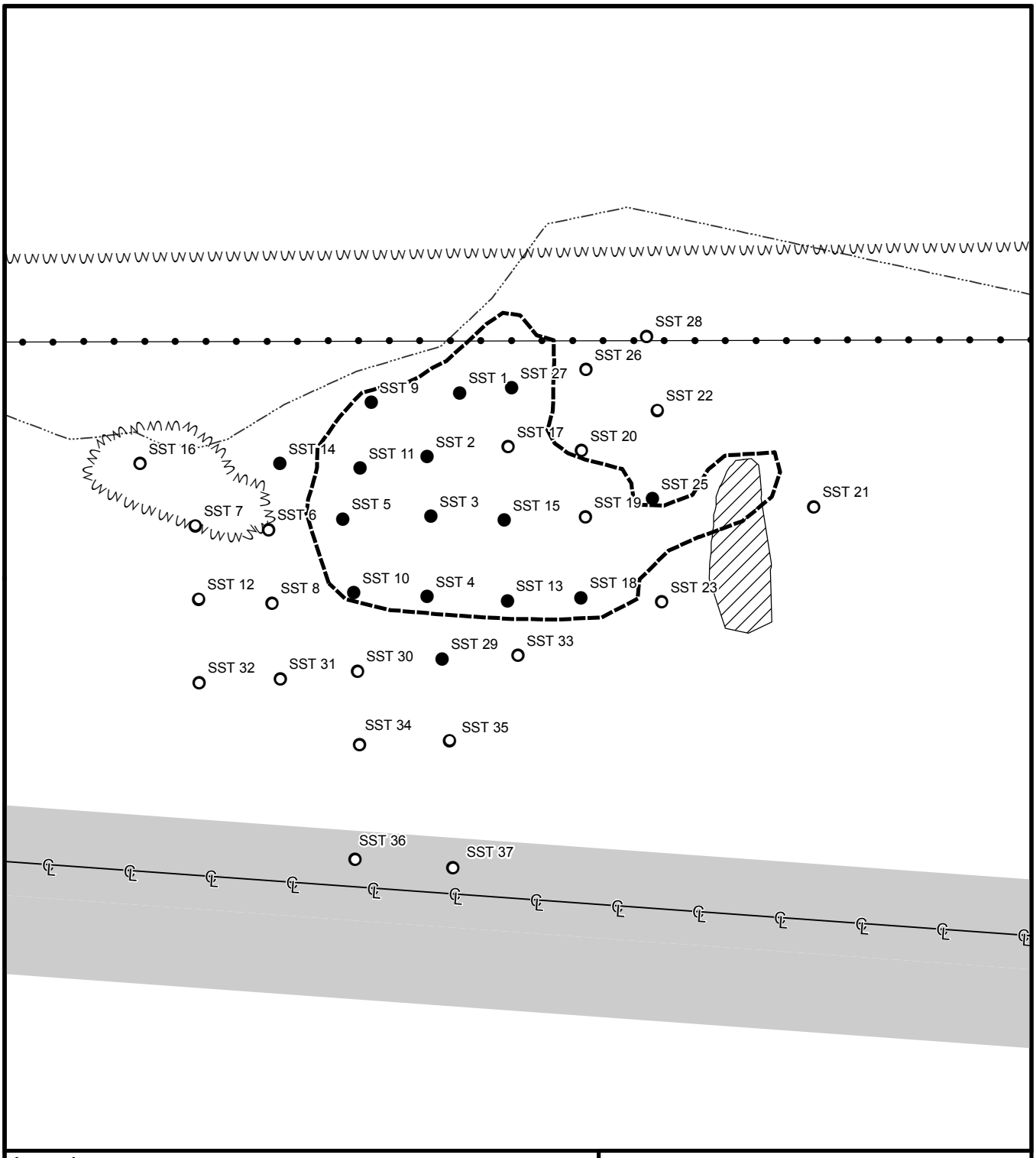
Site size after delineation is now 50 m (164.0 ft) east to west by 40 m (131.2 ft) north to south. Average shovel test depth was 80 cmbs through brownish-gray, fine sand. Artifacts found were analyzed in field but not collected and included primary, secondary and tertiary lithic flakes of both chert and petrified wood, charcoal, one ceramic rim sherd, one tested chert cobble, FCR, and fired clay. The ceramic rim sherd is possibly from the Late Archaic era, based on the sandy temper (Figure 8). This sherd is very similar to that found during the 1992 investigation of the site and is likely from the same occupation.

Figure 8: Photo of ceramic rim sherd.

Conclusions and Recommendations

During shovel-testing at 41GR323, an AP (plowzone/till zone) horizon extending from the surface to 30 cmbs was observed occurring consistently throughout a majority of the test grid (Figure 9). An alluvial horizon of fine sand, occurring in some instances at depths of 80 to 100 cmbs, was encountered below the AP horizon. Artifacts found in such sandy strata may have migrated from their original in situ positions in the plowzone. This potential for migration called into question the integrity of the assemblage detected.

Analysis of the artifacts collected revealed a lithic intensive assemblage with 65 pieces of lithic material, primarily chert with lesser amounts of heat-treated material and petrified wood, and 13 artifacts including a hammerstone, burned clay, a ceramic rim sherd, and burned sandstone. Six of



Legend

- Negative Site Shovel Test
- Positive Site Shovel Test
- Wahsed Out
- Site Boundary
- Inundated
- Trees
- Gibbons Creek
- Transmisson Line
- Proposed Route
- Survey Corridor

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ATKINS

Figure 9
Site GM323
Sketch Map

Prepared for: Navitas Midstream Partners, LLC

Job No.: 100041559

Prepared By: Atkins/18827 | Date: Nov 21, 2014

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the 14 positive shovel tests encountered artifacts at depths greater than 30 cmbs. A Chi-squared test for independence was conducted to determine the statistical probability of the artifacts found above and below 30 cmbs representing independent collections due to soil movement, flooding, erosion, and thus artifact migration.

Accounting for the probability of a false positive (set at 0.05 or 5 percent), the test results confirmed a null hypothesis (H_0: The two collections are independent). It is recommended that this result should not be looked at as a concrete indicator of true independence as the test itself does not account for such variables as the mathematical equation for soil particle drift, and mechanical factors that impact the site such as bioturbation (ants, cattle, worms, field rodents, and plants) and human factors such as plowing and modifying the landscape with heavy machinery (Sanford 2010).

Site 41GM323 was evaluated according to 36 CFR 60.4d. The site has experienced disturbance caused by erosion, particularly the northern part of the site that is sliding into Gibbons Creek, and by artificial impacts from the construction of the transmission line and from clearing vegetation to create a cattle pasture. However, given the repeated instances of the site yielding a high density of artifacts, and the extent of intact soil identified through auger testing, and backhoe trenching during a prior survey, it is very likely that more intensive investigation would yield significant additional information. For these reasons, Atkins recommends additional testing to determine whether site 41GM323 is eligible for inclusion to the NRHP. Initially, Navitas proposed placing bore pits associated with HDD outside of the site boundaries for the purposes of boring underneath the eligible portions of site 41GM323. Atkins recommended that the depth required to safely pass below the site without impacting any potentially in situ cultural materials would be approximately 12 ft (3.7 m). Ultimately, Navitas elected to shift the final alignment south, safely outside of the site boundaries. Thus, impacting the site during construction of the pipeline should be unlikely. In light of this information, Atkins recommends no further work at site 41GM323.

Site 41GM329

Environment

Site 41GM329, a prehistoric lithic scatter and open campsite, is situated near the intersection of SH 30 and Berger Easement Road in Grimes County. It is located 600 m (1,968 ft) east along the transmission line that crosses Berger Easement Road. The area is currently used for hunting and disturbances from erosion and feral hog activity are evident (Figure 10). The vegetation adjacent to the utility easement is comprised of a mostly coniferous-pine forest with thick underbrush. Soils are mapped as Burlewash fine sandy loam with 5 to 15 percent slopes. Gibbons Creek Reservoir is located about 1.85 km (1.15 miles) north of the site.

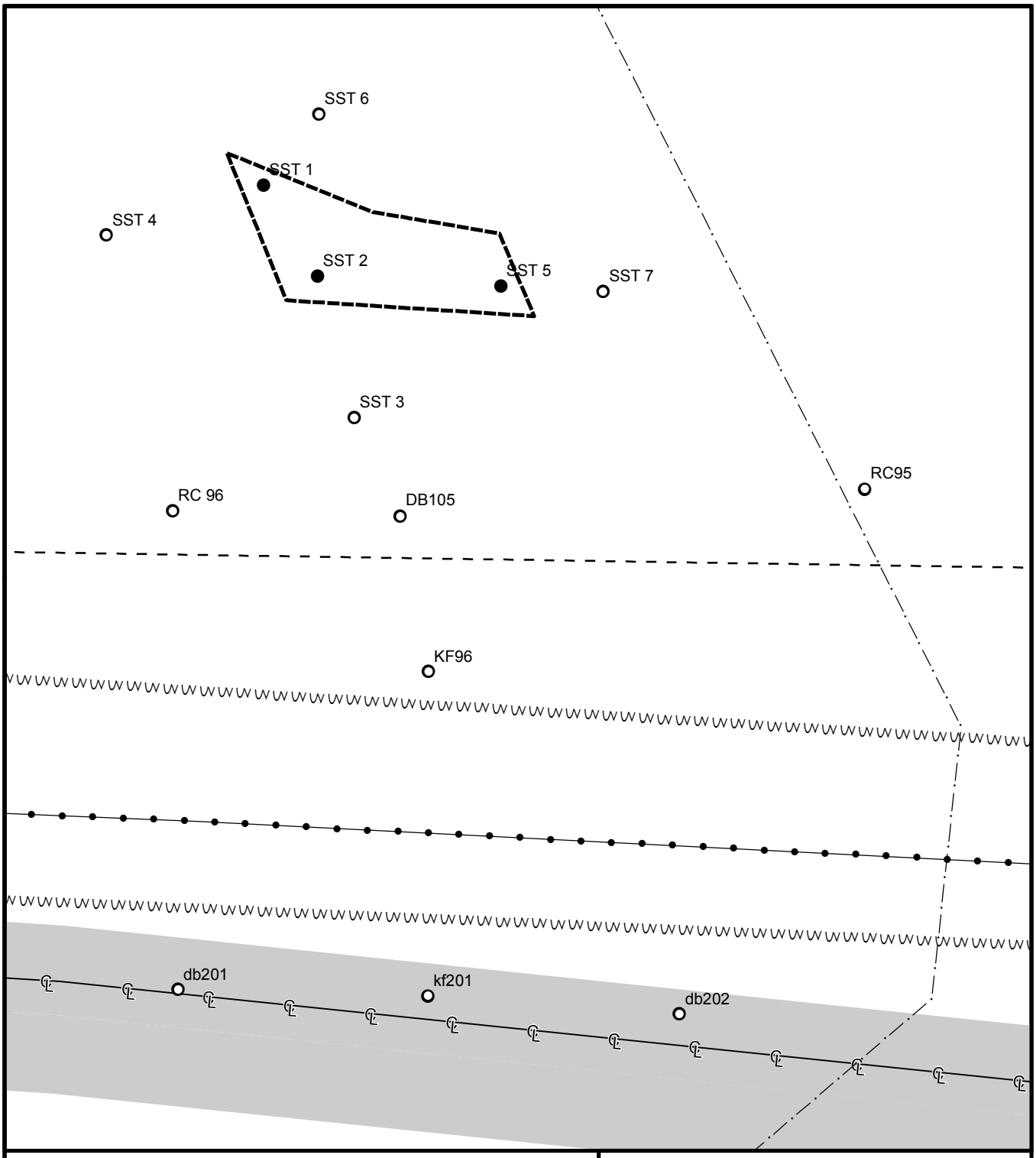
Figure 10: Site 41GM329 overview, facing east.

Previous Investigations

Site 41GM329 was originally recorded by EH&A in 1992. Seven site shovel tests yielded three that were positive for cultural material, including five lithic flakes and one possible hammerstone. The open campsite measured 10 x 15 m (32.8 x 49.2 ft) when initially recorded, with disturbances noted from erosion and livestock grazing.

Work Performed

Site 41GM329 was recorded within 300 ft (91.4 m) of the APE; therefore, the survey focused systematic subsurface testing efforts on the adjacent project ROW (Figure 11). Using the site's central datum as a guide, shovel tests were excavated to 80 cmbs or pre-Holocene soils to determine whether the site boundaries extended into the project APE. Two pedestrian transects at 30-m intervals were placed traversing the previously recorded site location. Five shovel tests were placed within the APE adjacent to site 41GM329; however, all were negative for cultural material.



Legend

- Negative Site Shovel Test
- Positive Site Shovel Test
- Site Boundary
- Transmission line
- Previous Centerline
- Trees
- Unknown Tributary
- Proposed Route
- Survey Corridor

N
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0 10 20 Meters

ATKINS

Figure 11
Site 41GM329
Sketch Map

Prepared for: Navitas Midstream Partners, LLC

Job No.: 100041559

Prepared By: Atkins/18827 | Date: Nov 21, 2014

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Conclusions and Recommendations

Based on our inability to locate site 41GM329 within the project corridor despite systematic shovel testing, Atkins recommends that there is little potential to impact buried intact cultural during the proposed construction activities in the vicinity of site 41GM329. Disturbances from erosion and grazing activities were noted when the site was initially recorded, and these conditions persist. Additionally, the general area is heavily used for hunting with numerous blinds and feeders; therefore, it is very unlikely that intact cultural features or deposits remain. Atkins does not recommend any further investigations within the APE adjacent to site 41GM329.

Site 41GM330

Environment

Site 41GM330, a prehistoric isolated find and possible campsite, is situated near the intersection of SH 30 and Berger Easement Road in Grimes County(Figure 12). It is located 600 m (1,968.5 ft) east along the transmission line that crosses Berger Easement Road. The site mirrors site 41GM329, which is to the south and on the opposite side of the ROW. Site 41GM330 is recorded 45 m (147.6 ft) south of the APE in area that is currently used for hunting. Evident are disturbances from erosion and feral hog activity. The vegetation adjacent to the utility easement is comprised of a mostly coniferous-pine forest with thick underbrush. Soils are mapped as Gomery loamy fine sand with 1 to 5 percent slopes. Gibbons Creek Reservoir is located about 1.85 km (1.15 miles) north of the site.

Previous Investigations

Site 41GM330 was originally recorded by EH&A in 1992. Six site shovel tests yielded one that was positive for cultural material between 20 and 80 cmbs, including one distal fragment of biface knapped from petrified wood and an unspecified amount of chert and petrified wood lithic debitage. The open campsite measured 120 x 120 m (393.7 by 393.7 ft) when initially recorded, with disturbances noted from erosion and livestock grazing.

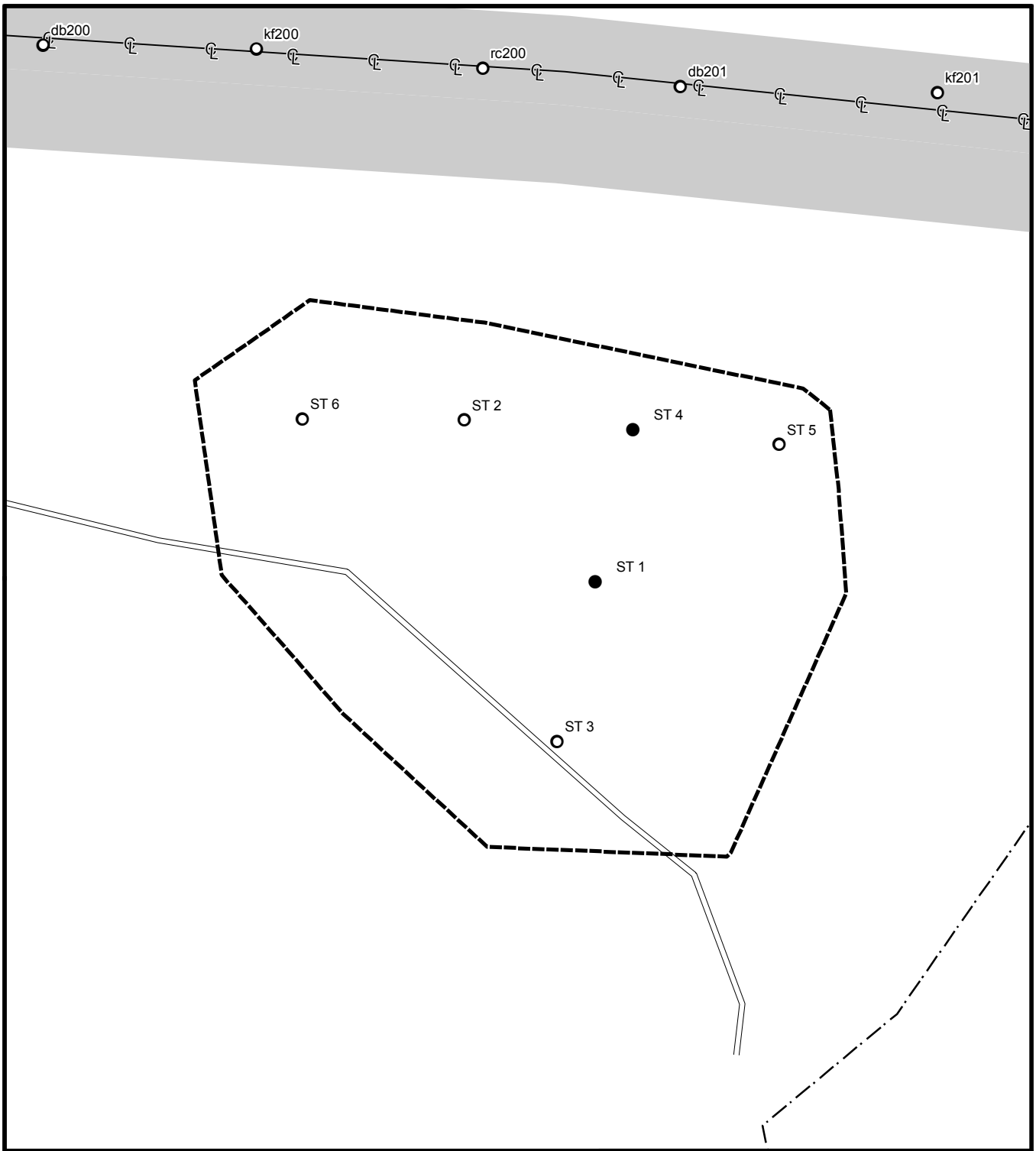
Work Performed

Site 41GM330 was recorded within 300 ft (91.4 m) of the APE; therefore, the survey focused systematic subsurface testing efforts on the adjacent project ROW (Figure 13). Using the site's central datum as a guide, shovel tests were excavated to 80 cmbs or pre-Holocene soils to determine whether the site boundaries extended into the project APE. One 30-m pedestrian transect was placed traversing the previously recorded site location. Seven shovel tests were placed within the APE adjacent to site 41GM330; however, all were negative for cultural material and the isolated find was not relocated.

Figure 12: Site 41GM330 overview, facing southeast.

Conclusions and Recommendations

Based on our inability to locate site 41GM330 within the project corridor despite systematic shovel testing, Atkins recommends that there is little potential to impact buried intact cultural during the proposed construction activities in the vicinity of site 41GM330. Disturbances from erosion and grazing activities were noted when the site was initially recorded, and these conditions along with disturbances from feral hogs persist. Additionally, the general area is heavily used for hunting with numerous blinds and feeders; therefore, it is very unlikely that intact cultural features or deposits remain. Atkins does not recommend any further investigations within the APE adjacent to site 41GM330.



Legend

- Negative Site Shovel Test
- Positive Site Shovel Test
- Site Boundary
- Drainage
- Field Road
- Proposed Route
- Survey Corridor

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0 10 20 Meters

ATKINS

Figure 13
Site 41GM330
Sketch Map

Prepared for: Navitas Midstream Partners, LLC

Job No.: 100041559

Prepared By: Atkins/18827 | Date: Nov 21, 2014

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Site 41GM469

Environment

Site 41GM469, an organic material scatter, is situated within a transmission line easement at the intersection of SH 30 and Berger Easement Road in Grimes County. At an elevation of 70.4 m (231 ft) AMSL, this newly recorded site occupies a short grass cattle pasture across rolling hills, with an existing transmission line above the site's northern perimeter(Figure 14). The soils are mapped as Burlewash fine sandy loam with 5 to 12 percent slopes, and Elmina loamy fine sand with 1 to 5 percent slopes. Typical ground surface visibility was 5 percent, except in places where cattle have worn paths through the property. Site 41GM469 exhibits disturbances caused by erosion, the construction of the transmission line, and by clearing vegetation to create a cattle pasture.

Figure 14: Overview of site 41GM469, facing east.

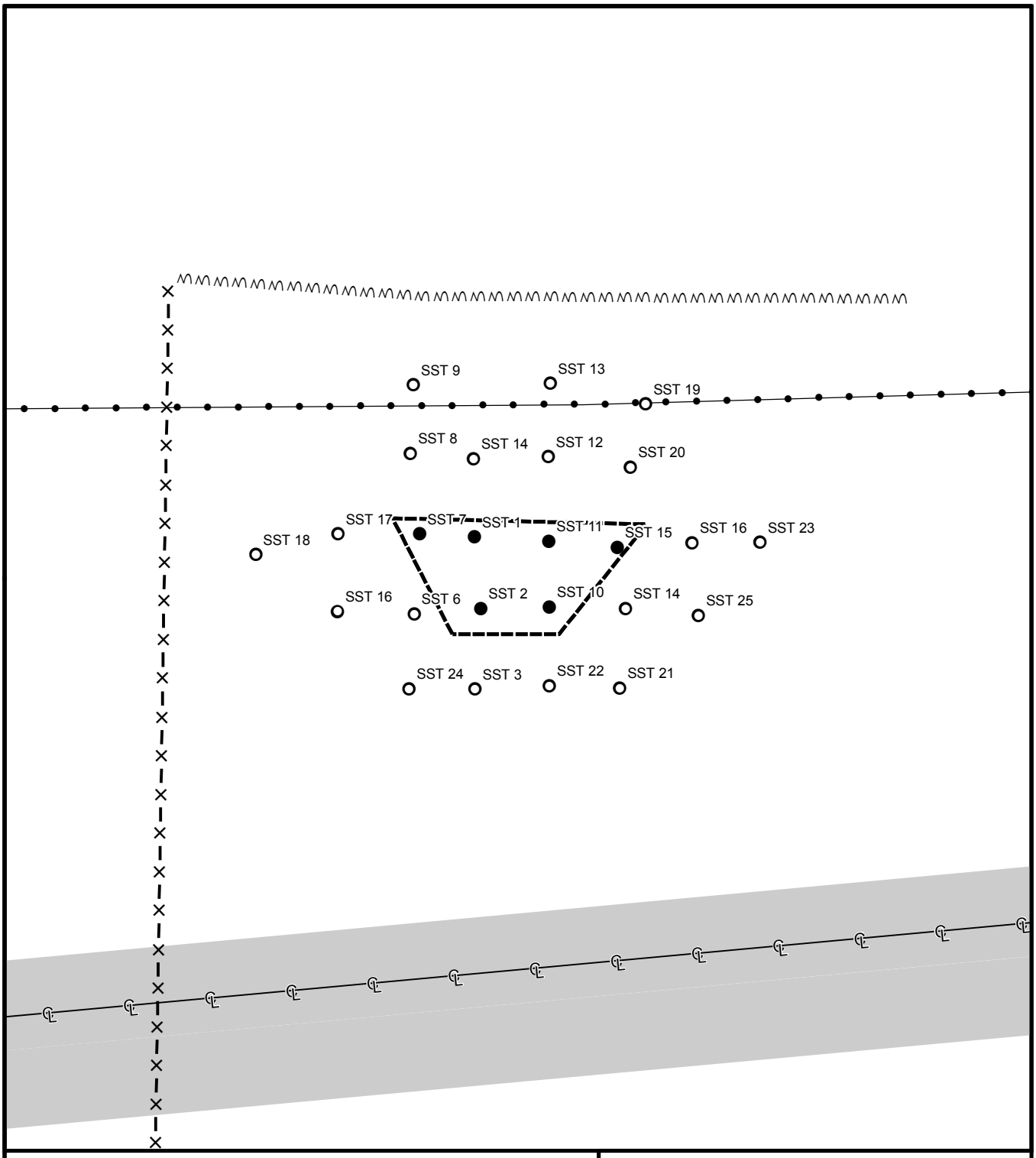
Work Performed

Two 30-m pedestrian transects were placed traversing the APE, and shovel tests were placed at intervals along these transects to a maximum depth of 50 cmbs. A total of 25 shovel tests were excavated at site 41GM469, of which six were positive for organic materials. Site delineation was guided by positive shovel tests and continued in proximity to sites 41GM322 and 41GM323

(Figure 15). The site 41GM469 assemblage includes burned clay pebbles, charcoal flecks and nodules, an ash lens, and FCR. The charcoal and ash are interpreted as the modern remains of a brush pile that was burned subsequent to the field being cleared of vegetation.

Conclusions

Site 41GM469 was evaluated according to 36 CFR 60.4d. The numerous disturbances noted at site 41GM469 have affected the integrity of the site's cultural deposits. The elements of a burned rock feature were recognized in six shovel tests, but the frequency and density of artifacts were low. The feature was not encountered intact, and no diagnostic artifacts were found in association with the charcoal and ash. In fact, the charcoal and ash are most likely associated with the burning of a brush pile related to vegetation clearing. Decomposing tree roots and branches were encountered within the top 30 cm (11.8 inches) of soil, suggesting these represent modern disturbances. The field has been modified for agricultural practices or cattle pasture. Given the extent of prior disturbances, site 41GM469 is unlikely to yield any significant additional information. Therefore, Atkins recommends that there is little potential to impact buried intact cultural deposits during the proposed construction activities at site 41GM469. Atkins does not recommend any further investigations within the APE at site 41GM469.



Legend

- Negative Site Shovel Test
- Postitive Site Shovel Test
- SITE BOUNDARY
- Fence
- TREE LINE
- Transmission line
- Proposed Route
- Survey Corridor

N
W
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S

0 10 20 Meters

ATKINS

Figure 15
Site 41GM469
Sketch Map

Prepared for: Navitas Midstream Partners, LLC

Job No.: 100041559

Prepared By: Atkins/18827 | Date: Nov 21, 2014

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Site 41BZ174

Environment

Site 41BZ174 is a prehistoric site occupying a low toeslope at an elevation of approximately 67 m (220 ft) AMSL. The landform lies between an ephemeral drainage to the east and the floodplain of Wickson Creek, which currently runs north-south roughly 270 m (82.3 ft) to the west (Figure 16). Soils at the site are mapped as belonging to the Dutek series of loamy fine sands. This alfisol formed in materials on high stream terraces, and typically consists of loamy fine sand extending to sandy clay at an average depth of approximately 85 cmbs. The top of the landform has been cleared in the past and is vegetated by thick, low grasses that inhibit ground surface visibility, while the surrounding slopes are covered with young oaks, scattered hardwoods, and a thick understory of yaupon and green briar. Scattered small mounds of soil are ubiquitous across the site, indicating some disturbance from bioturbation.

Figure 16: Site 41BZ174 overview, facing east.

Work Performed

The site was initially identified by the presence of a chert tertiary flake within a bioturbated mound, which led to the excavation of five shovel tests placed across the area in order to determine the site's horizontal and vertical boundaries. As currently defined, the site measures approximately 25 m (82 ft) from west to east, as determined by the margins of the landform. It occupies the entire width of the ROW from north to south, and likely extends outside the ROW boundaries to the north and, possibly, south. Of the five shovel tests excavated, four proved positive for cultural materials. Nineteen chert flakes—the majority of which were of tertiary stage of manufacture—and 1 undecorated ceramic sherd were encountered among the shovel tests and ranged in depth from 10 to 80 cmbs (3.9 to 31.4 inches), with no clear concentrations by level (Figure 17 and Figure 18). Clay was encountered at 40 cm (15.7 inches) in the two tests along the toeslope's spine; in contrast, soils exceeded shovel-reach in the remaining tests. No diagnostic lithic artifacts, organic materials, or evidence of features were encountered.

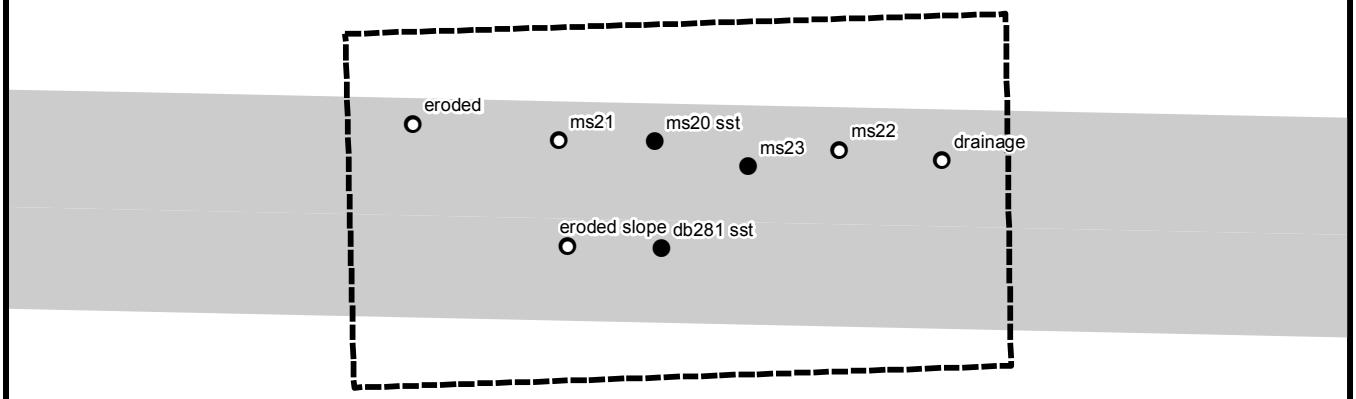
Figure 17: Lithic assemblage

Conclusions and Recommendations

Site 41BZ174 likely represents a short-term occupation during the Late Prehistoric period, as indicated by the presence of probable Caddo ceramics (Figure 19). The wide range in depths of subsurface cultural materials, combined with the presence of artifacts displaced onto the surface by bioturbation, suggests that significant movement of artifacts may have occurred within the relatively loose sandy soils, which may preclude intact archeological strata. Despite the lack of observed features or organic material, the occurrence of ceramics, the depth of the soils, and the relative density of lithic materials all support the site's potential to add further information about the local prehistoric life-ways. For this reason, avoidance of the site is recommended. However, Navitas has elected to horizontally directional drill (HDD) underneath Site 41BZ174. To ensure that construction of the pipeline will not impact the in situ cultural materials, a minimal depth of 6 ft (182.88 cmbs) is recommended. Doing so would result in no adverse impact to Site 41BZ174 during the construction activities of the proposed pipeline.

If that is not a viable option, additional work for the purpose of assessing site 41BZ174's NRHP eligibility (e.g., additional shovel testing or mechanical trenching to reach below the maximum shovel test depth) may be necessary prior to ground-disturbing construction activities.

Figure 18: Sand-tempered ceramic sherd



Legend

- Negative Site Shovel Test
- Positive Site Shovel Test
- Site Boundary
- Survey Corridor

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W
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0 10 20 Meters

ATKINS

Figure 19
Site 41BZ174
Sketch Map

Prepared for: Navitas Midstream Partners, LLC

Job No.: 100041559

Prepared By: Atkins/18827 | Date: Nov 22, 2014

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VI. CONCLUSIONS AND RECOMMENDATIONS

On behalf of Navitas Products Operating LLC, Atkins conducted an intensive linear cultural resources survey of waterway crossings along the 13-mile La Bahia Pipeline Project in Brazos and Grimes Counties, Texas. The work was performed in anticipation of the project requiring a Nationwide Permit 12 from the USACE Fort Worth District under Section 404 of the Clean Water Act. The investigations included an archaeological background records review and an intensive pedestrian survey with shovel testing and auger probes. The background literature review determined that 26 previously recorded sites and six cultural resources surveys are within 1 km (0.6 mile) of the proposed La Bahia Pipeline Corridor. Four of the 26 previously recorded sites fall within 300 ft (91.4 m) of the project ROW, including sites 41GM322, 41GM323, 41GM329, 41GM330,. Of these, only the boundary of site 41GM323 extends into the project APE. Sites 41GM469 and 41BZ174 were newly recorded during the current survey.

A total of 662 shovel tests and three auger probes were excavated in areas with the most potential to yield cultural deposits. Soils encountered within USACE jurisdictional areas consisted primarily of dense impenetrable clays that were encountered at an average depth of 15.7 inches (40 cmbs). However, the soil consistency of fluvial terraces varied from sandy loam to sandy clay loam, and ranged in depth from 23.5 to 39.5 inches (60 to 100 cm). Upland soils encountered were composed primarily of very fine sand and tended to be severely deflated due to colluvial erosion and a weak underlying matrix structure.

Despite disturbance by transmission ROW and ongoing erosion from farming activities, portions of 41GM323 remain intact within the survey corridor. The eligible portion contains a well-developed, midden-type soil with a high density-of cultural material to a depth of 39 inches (100 cm). It is recommended that impacts to site 41GM323 be avoided. Auger testing confirmed intact soils to a depth of 250 cm, which indicates that boring a minimum of 12 ft beneath the site will not impact any buried artifacts still in situ. However, after testing soil deposition, Navitas elected to shift the alignment south, outside of the site boundary. Doing so, would result in no adverse impact to 41GM323 during the proposed construction activities of the proposed pipeline.

Based on these investigations, site 41GM323 is recommended eligible for inclusion in the NRHP under 36 CFR 60.4d, and avoidance is recommended for the portion of the site that is within the project APE. Site 41BZ174 should be recommended for avoidance during construction activities. However, Navitas has elected to HDD underneath Site 41BZ174. To ensure construction of the pipeline will not impact the in situ cultural materials, a minimal depth of 6 ft (182.88 cmbs) is recommended. Doing so would result in no adverse impact to Site 41BZ174 during the construction activities of the proposed pipeline. If that is not a viable option, additional work for the purpose of assessing site 41BZ174's NRHP eligibility (e.g., additional shovel testing or mechanical trenching to reach depths below the maximum shovel reach) may be necessary prior to ground-disturbing construction activities.

Newly recorded site 41GM469 is recommended not eligible for inclusion to the NRHP and no further work is recommended for the site. In accordance with 33 CFR Part 325, Appendix C (Processing Department of Army Permits: Procedures for the Protection of Historic Properties; Final Rule 1990; with current Interim Guidance Document dated April 25, 2005), Atkins has made a reasonable and good faith effort to identify archaeological historic properties within the APE. As no properties besides site 41GM323 were identified that meet the criteria for listing in the NRHP according to 36 CFR 60.4, Atkins recommends no further work.

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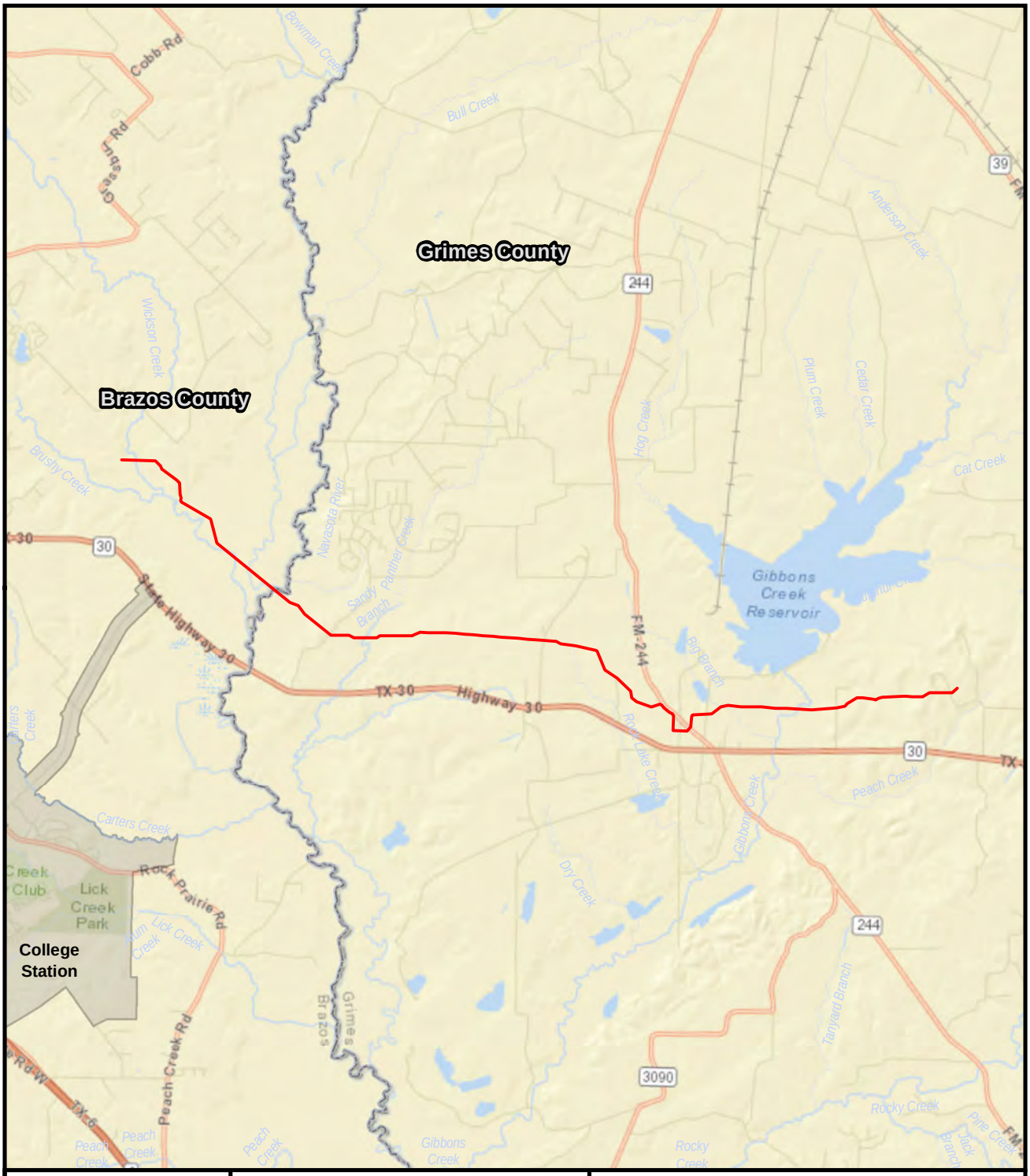
Appendix

Project Overview Maps
(not for public disclosure)



Proposed Pipeline Route
Populated Areas
County Boundary

Datum: NAD 1983
Projection: UTM
Zone: 15
Units: Meter

0 1 2 Miles

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Appendix
Vicinity Map
Navitas Midstream Partners, LLC
Proposed 20-Inch La Bahia Pipeline Project

Brazos and Grimes Counties, Texas

Prepared By: Atkins/WADD6088	Scale: 1 " = 2 miles
Job No.: 100041559	Date: Nov 20, 2014

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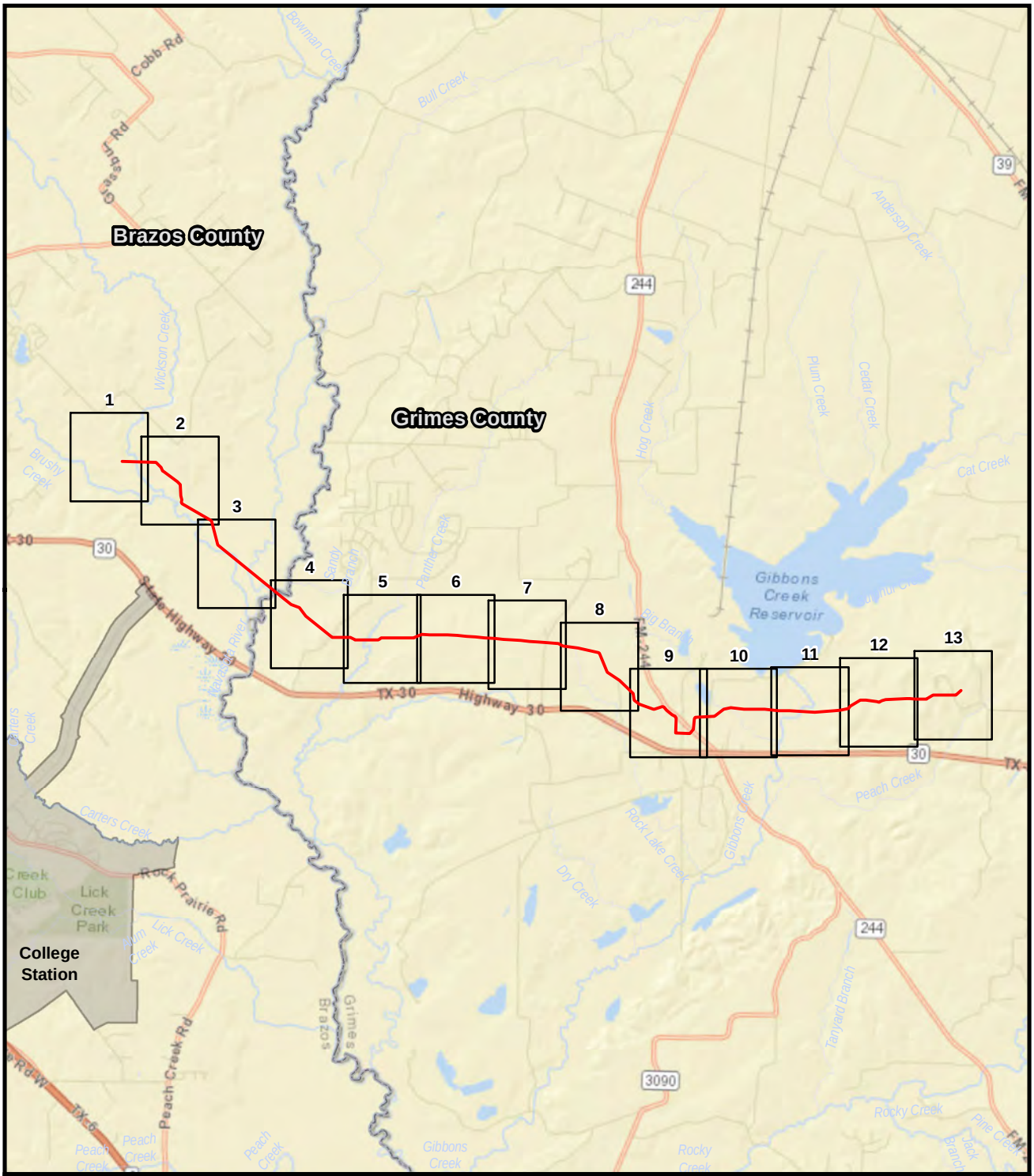

Proposed Pipeline Route
Map Sheet Index
Populated Areas
County Boundary

Datum: NAD 1983
Projection: UTM
Zone: 15
Units: Meter

0 1 2 Miles

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Appendix
Map Sheet Index
Navitas Midstream Partners, LLC
Proposed 20-Inch La Bahia Pipeline Project

Brazos and Grimes Counties, Texas

Prepared By: Atkins/WADD6088	Scale: 1 " = 2 miles
Job No.: 100041559	Date: Nov 20, 2014

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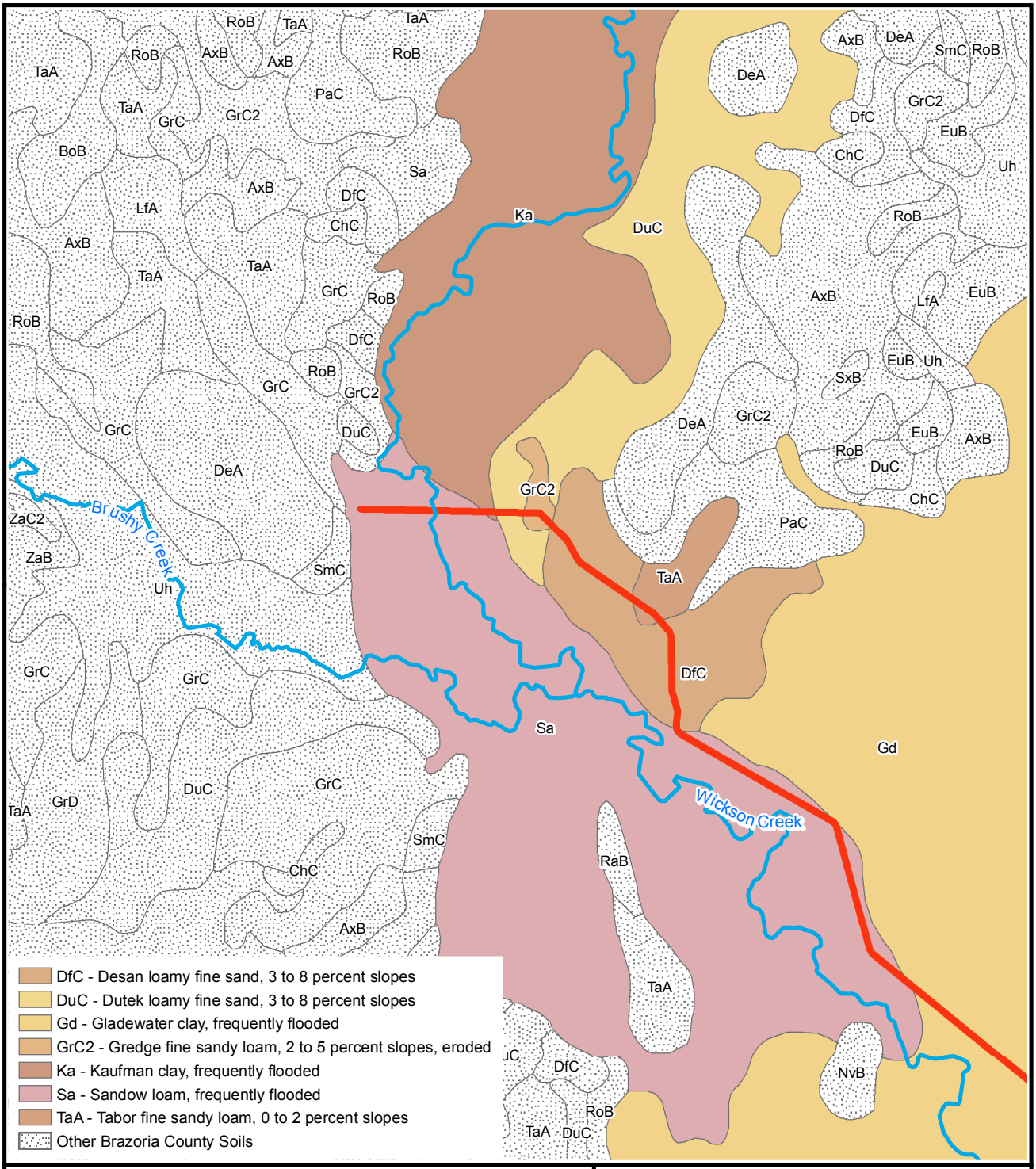

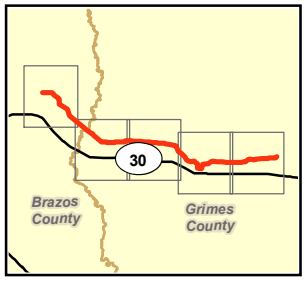

U.S. Named Stream
Proposed Alignment

Projection: UTM
Datum: NAD 1983
Zone: 15
Unit: Meter

0 1,000 2,000 Feet
0 250 500 Meters

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Appendix
Soils Key
Navitas Midstream Partners, LLC
Proposed 20-Inch La Bahia Pipeline Project

Brazos and Grimes Counties, Texas
Sheet 1 of 5

Prepared By: Atkins/FRIE8827	Scale: 1 " = 2,000 '
Job No.: 100041599	Date: Nov 21, 2014

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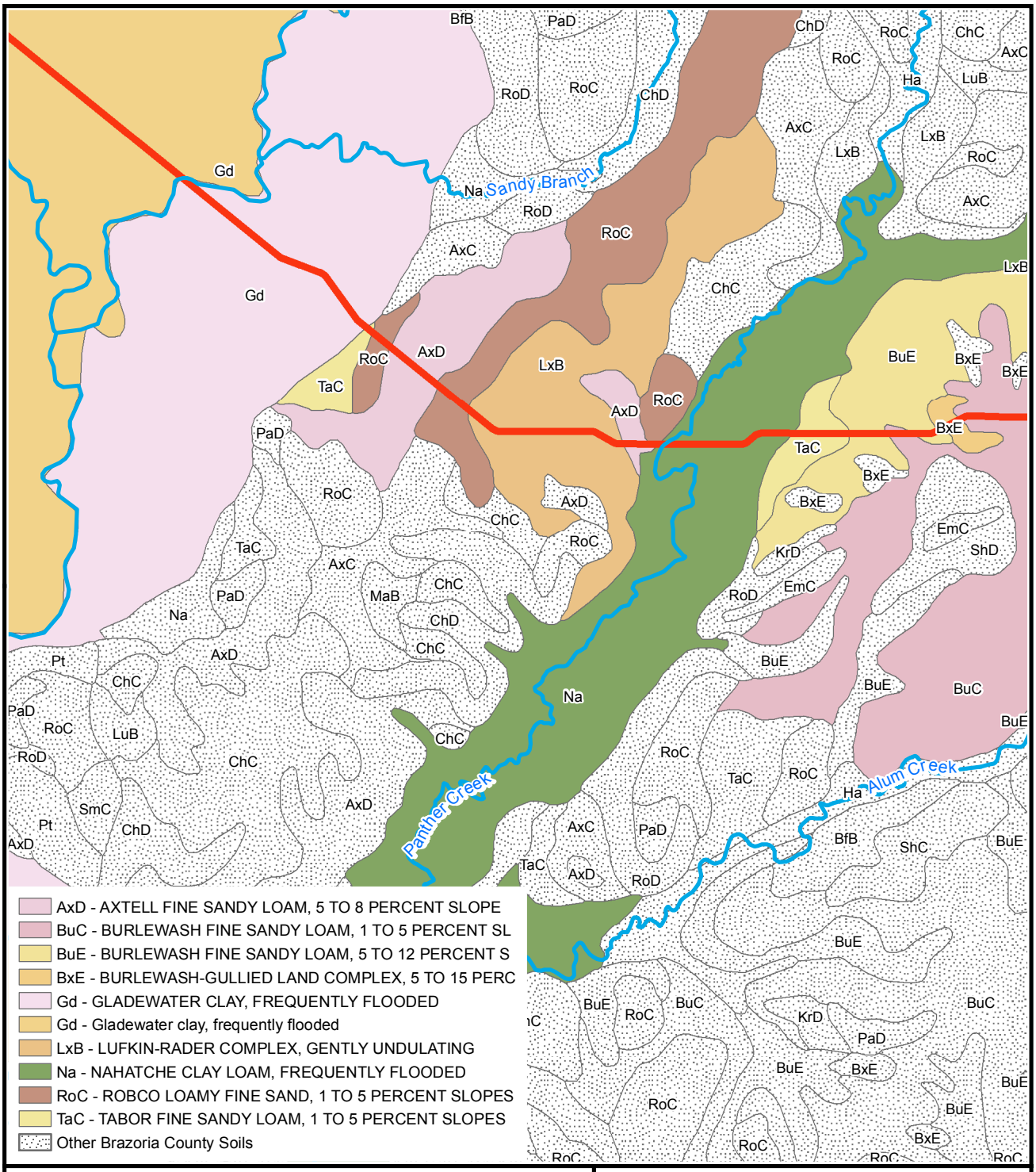

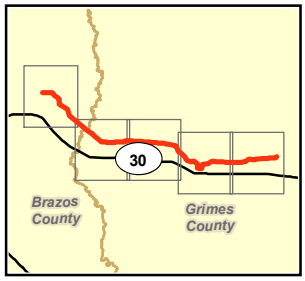

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Appendix
Soils Key
Navitas Midstream Partners, LLC
Proposed 20-Inch La Bahia Pipeline Project

Brazos and Grimes Counties, Texas
Sheet 2 of 5

Prepared By: Atkins/FRIE8827	Scale: 1 " = 2,000 '
Job No.: 100041599	Date: Nov 21, 2014

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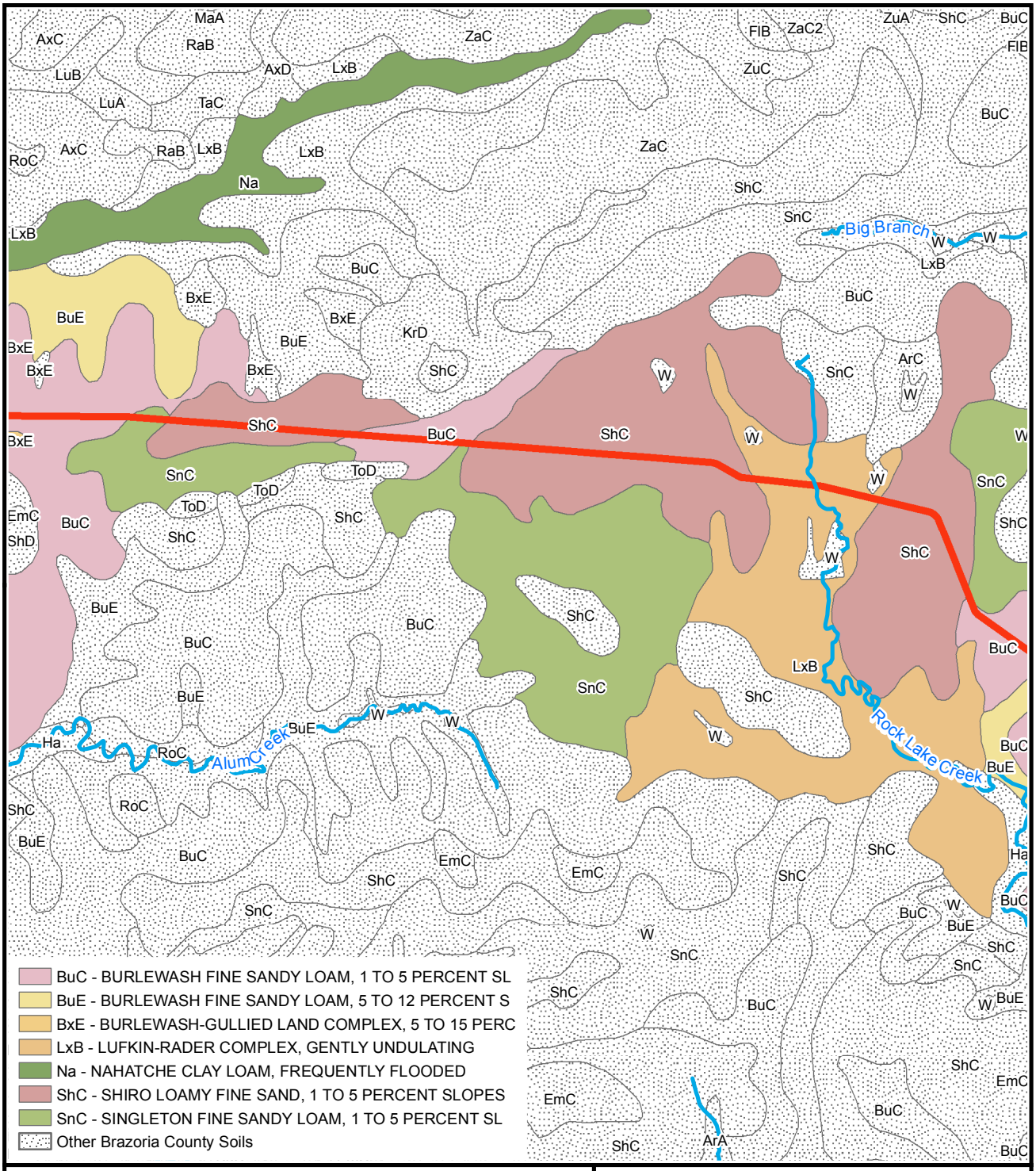

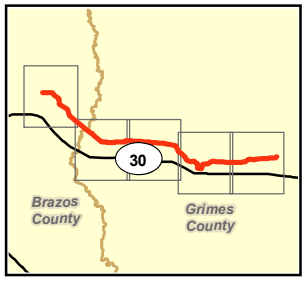

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Appendix
Soils Key
Navitas Midstream Partners, LLC
Proposed 20-Inch La Bahia Pipeline Project

Brazos and Grimes Counties, Texas
Sheet 3 of 5

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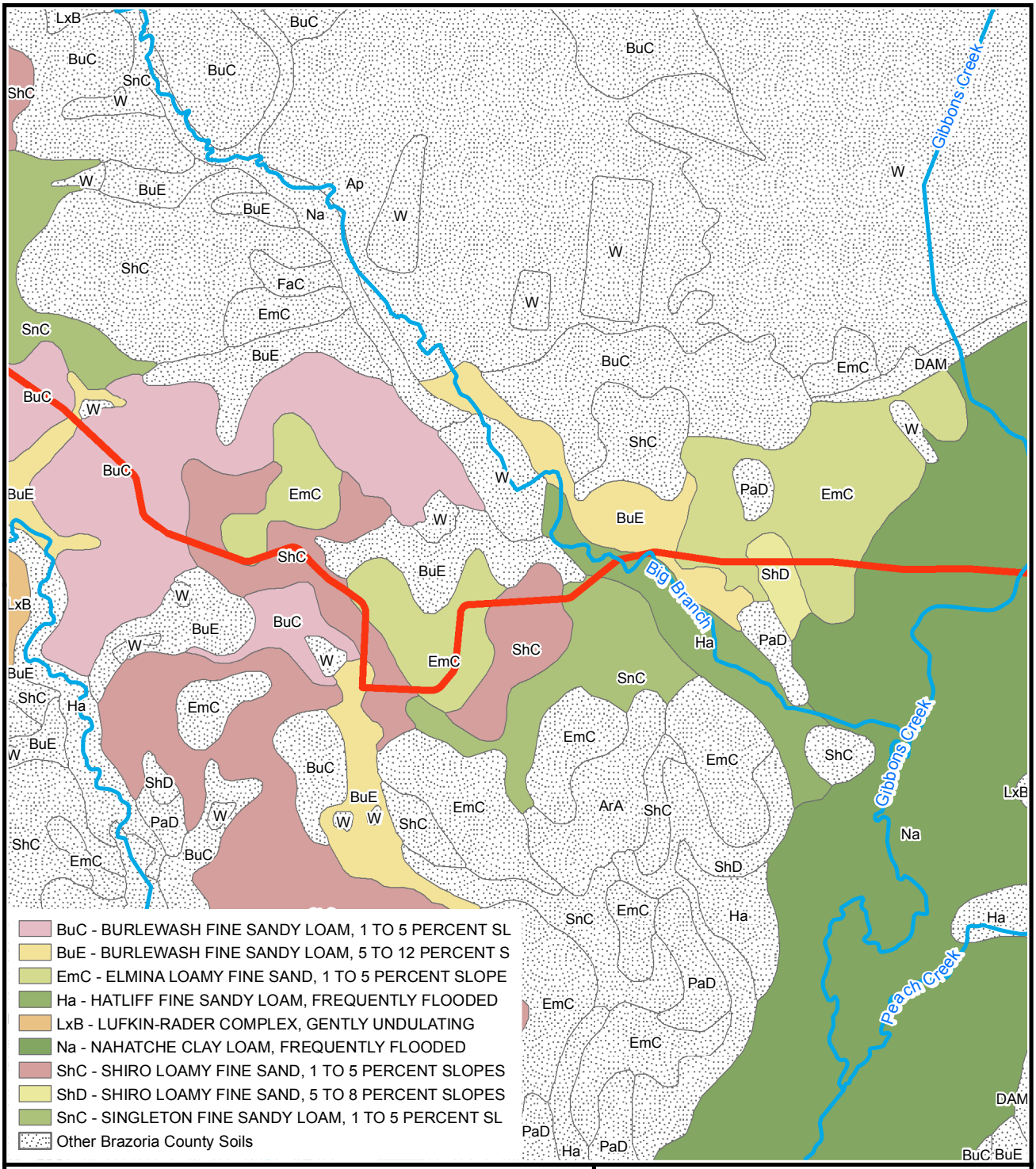

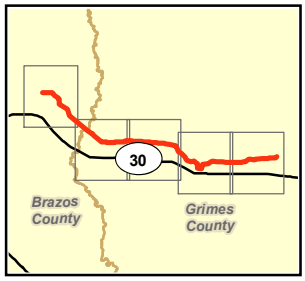

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Appendix
Soils Key
Navitas Midstream Partners, LLC
Proposed 20-Inch La Bahia Pipeline Project

Brazos and Grimes Counties, Texas
Sheet 4 of 5

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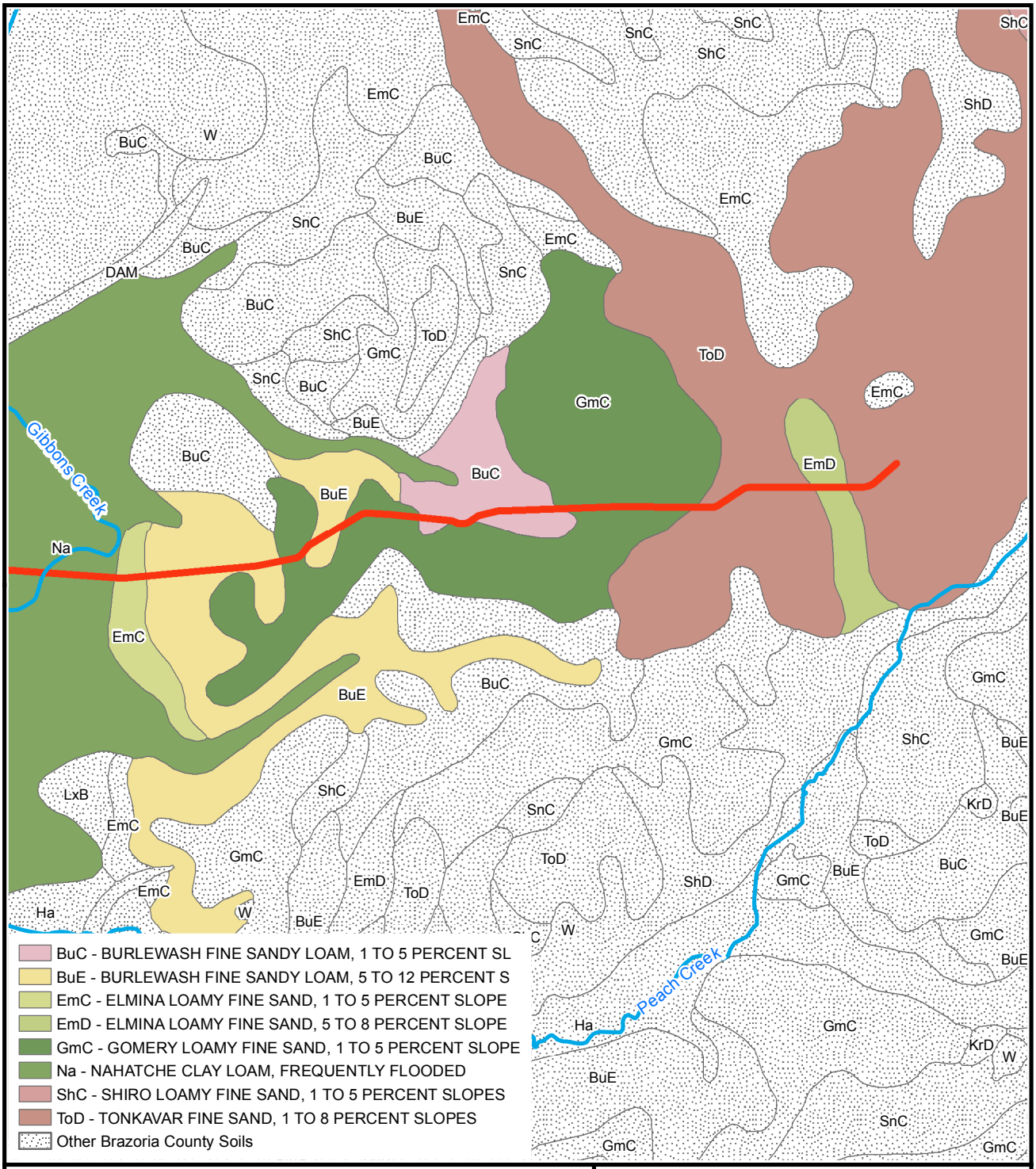

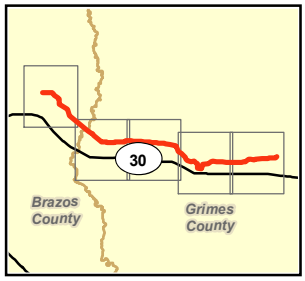

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Appendix
Soils Key
Navitas Midstream Partners, LLC
Proposed 20-Inch La Bahia Pipeline Project

Brazos and Grimes Counties, Texas
Sheet 5 of 5

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