CLASS VI PERMIT APPLICATION NARRATIVE
40 CFR 146.82(a)

Facility Information

Facility Name: Capio Sherburne Sequestration, LLC
Well Name: Capio Sherburne CCS Well No. 1

Facility contact: Peter Hollis, Capio Sequestration - President
Michael Neese, Capio Sequestration - Senior Vice President
Capio Sherburne Sequestration, LLC
109 N. Post Oak Ln, Suite 140, Houston, Texas 77024
832-551-3300 / pete@fidelisinfra.com

Well location: Sherburne Wildlife Management Area (WMA)
Pointe Coupee Parish, Louisiana
30.521385, -91.718429

Project Background and Contact Information

Fidelis New Energy, LLC ("Fidelis") is a Carbon Reduction and Climate Impact Company whose mission is to reduce carbon intensity of society and industry through the development, delivery, and operation of climate impact infrastructure. Fidelis collaborates with customers, partners, and local communities through the development, investment, and delivery of infrastructure that helps them achieve their carbon reduction and climate impact objectives.

Grön Fuels, a wholly owned subsidiary of Fidelis, is developing a facility designed to produce approximately 60,000 barrels per day of sustainable aviation fuel ("SAF") and renewable diesel ("RD") as well as green hydrogen and bioplastic feedstocks from more than 63,000 barrels per day of renewable feedstocks.

Fidelis is also actively developing two co-located, synergistic, and symbiotic project facilities to enhance the value of Grön Fuels and that will collectively comprise the Grön Fuels GigaSystem™. The facilities include Bio-Carbon Capture & Sequestration (through Capio Sherburne Sequestration, LLC ("Capio")) and Biomass Power with integrated carbon capture and sequestration (through Cyclus Steam & Power, LLC ("Cyclus")), all wholly owned Fidelis subsidiaries. Grön Fuels, Capio and Cyclus combined enable the Grön GigaSystem™ complex to produce the world's first carbon negative SAF and RD without taking new technology commercialization risks.

The GigaSystem™ is being developed on a site leased for 50 years from the Port of Greater Baton Rouge ("POGBR") located on North Line Road in West Baton Rouge Parish, Louisiana. The POGBR is an independent political subdivision of the State of Louisiana. The project design includes proven and bankable technologies and carbon reduction design features to intentionally deliver and optimize the reduction of the carbon intensity ("CI") of Grön Fuels' renewable fuels made from renewable feedstock sources. The location of the facility provides for optimal logistics for both incoming feedstock as well as outgoing fuels that includes barge and deep-water access via the Mississippi River, truck and until train access as well as pipeline connectivity to the largest

capacity clean products pipeline in the United States that connects the US Gulf Coast refining markets to the Eastern and Southern United States and can transport SAF and RD to deep-water tank terminals and airports at the New York Harbor and surrounding areas. Grön Fuels' facility at the POGBR was issued its minor source air permit in April 2021, executed an EPC contract with an affiliate of Koch Industries in June 2022 and is scheduled for commercial operation in 2025.

Capio Sherburne Sequestration as the permit applicant, is developing the carbon capture and sequestration assets for the Grön Fuel complex. The objective is to address the climate crisis by mitigating the emissions products by chemical production, petroleum refining, and all other industrial producers of greenhouse gas emissions. The initial CCS assets are being developed in the industrial corridor between Baton Rouge and New Orleans along the Mississippi River.

Specific to the Grön Fuel complex, Capio Sherburne Sequestration LLC (Capio) is developing a program of CO_2 sequestration in the Sherburne Wildlife Management Area (WMA) located in southern Pointe Coupee, Iberville, and northern St. Martin Parishes, Louisiana. The leased portion of WMA is owned by the Louisiana Department of Wildlife and Fisheries and is not located on Indian lands. This permit application is for an initial injection well and Capio intends to permit an additional five injection wells to support the overall project. The CO_2 source for initial injection is the Grön Fuels Renewable Diesel Facility, which will be located near Baton Rouge, Louisiana. Capio expects to sequester 1.6 million metric tons during its first year of operation. In the following years and with additional sources of CO_2 from the Grön GigaSystem™, Capio expects to inject up to 5 million metric tons of CO_2 per year.

The facility name and contact information is provided above. Contact information for the Louisiana Department of Natural Resources (LDNR) Office of Conservation is included below. An injection depth waiver or aquifer exemption expansion is not being requested.

LDNR- Office of Conservation
Stephen Lee – Director - Injection and Mining Division
617 North 3rd Street
8th Floor
Baton Rouge, LA 70802
(225) 342-5515

A table with anticipated permits for the Class VI well has been included as Table 2-4. Also included are the anticipated permits for the pipeline and CO2 source. Additionally, a search for state or EPA-approved subsurface cleanup sites did not reveal any in the area of review. The nearest site that was identified is located approximately 1 mile to the west.

Site Characterization

Regional Geology, Hydrogeology, and Local Structural Geology [40 CFR 146.82(a)(3)(vi)]

The proposed sequestration area is a lease obtained by Capio from the State of Louisiana, located in southwestern Pointe Coupee Parish in the lower Louisiana coastal plain of the Gulf of Mexico sedimentary basin. The Class VI well is to be located in Section 27, Township 6 South, Range 7 East. The well site is located approximately 26 miles northeast of Lafayette, Louisiana and approximately 32 miles west-northwest of Baton Rouge. The planned Class VI well site is located

approximately 0.7 miles east of the Atchafalaya River, 2.8 miles south of U.S. Highway 190, 11.8 miles north of Interstate I-10, and 2.5 miles southeast of Krotz Springs, Louisiana. **Figure 2-1** shows the location of the project site on a US Geological Survey topographic map.

The lease area also includes a Class V test well Sherburne #1 (State Serial Number 975895) in Section 24, Township 6 South, Range 7 East, which is located approximately 5,200 feet north of the planned Class VI well. The Class V test well was drilled by Capio in July 2022 to provide data on the site stratigraphy and to collect data on the proposed injection and confining zones. The project Area of Review (AOR) as defined by EPA guidance is the portion of the sequestration area in which the CO_2 plume is forecasted to occur in the injection zone and in which the pressure in the injection zone is expected to exceed the critical pressure. The AOR Evaluation and Corrective Action Plan portion of the permit application provides information on the characteristics of the AOR based on numerical modeling of the CO_2 injection. The lease area is larger than the modeled area of the AOR and is used in this permit application as a basis for evaluating the geologic conditions in the AOR.

The proposed injection zone consists of thick fluvial sand deposits of Lower Miocene age that occur between approximately 6,000 and 6,500 feet below mean sea level (msl). The proposed injection zone is confined above and below by extensive, laterally-continuous clay zones. The geologic and physical characteristics of the proposed injection zone and the confining zone are described in detail in their respective section of this narrative.

Summary of Area Stratigraphy

This subsection describes the stratigraphic framework of the lease area based on published regional cross sections (Bebout and Gutierrez, 1982) and geologic reports, reports on nearby petroleum fields (McCampbell and Sheller, 1964; Harrison and others, 1970), geophysical well logs from the proposed sequestration area from the LDNR Strategic Online Natural Resources Information System (SONRIS), and regional summaries (Bebout and others, 1992; Brown and Loucks, 2009; Snedden and Galloway, 2019). In addition, well log and core data from the Sherburne #1 also has been used to support the evaluation of the site stratigraphy.

Figure 2-2 summarizes the stratigraphic column from the land surface to the base of the Paleocene Series, which occurs at a depth of over 15,000 feet. This depth interval includes the formations containing the Underground Source of Drinking Water (USDW), the proposed sequestration/injection zone and its upper and lower confining zones, and other deeper zones that could potentially be used for sequestration in future permitting efforts. The underlying Mesozoic formations are discussed briefly in the subsection on Tectonic History. The stratigraphic column includes ages, stratigraphic group names, and locally-used lithostratigraphic nomenclature.

The surficial geology of area is Holocene and Pleistocene alluvium of the Atchafalaya River. The alluvium extends from the land surface at elevations of 20 to 25 feet msl downward to elevations of approximately -280 to -300 feet msl (Saucier, 1969). The lower 100 to 150 feet of the alluvium consists of sand known as the Atchafalaya aquifer (Winner and others, 1968). The Atchafalaya aquifer alluvium is part of the larger body of Pleistocene alluvium that has filled the Mississippi River valley. On the east side of the Atchafalaya River in Pointe Coupee Parish, for example, the alluvium is referred to as the Mississippi River valley alluvium and the aquifer is known as the

Mississippi River alluvial aquifer. The Hydrologic and Hydrogeologic Information narrative provides a detailed description of the occurrence of fresh groundwater in the Atchafalaya aquifer.

Pleistocene clay and sand zones underlie the Atchafalaya alluvium and extend to elevations of -400 to -500 feet msl (Nyman, 1984). Pleistocene sand intervals make up the Chicot aquifer, which is of fluvial origin.

Pliocene series clay and sand zones underlie the Chicot aquifer to elevations of -1,900 to -2,000 feet msl. The Pliocene deposits are referred to locally as the Evangeline aquifer. The sand zones of the Evangeline aquifer have been named in the Pointe Coupee Parish area in reference to the aquifer sand depths in the Baton Rouge area to the east (Winner and others, 1968). The Evangeline aquifer sands include the 800-Foot Sand, 1,000-Foot Sand, 1,200-Foot Sand, 1,500-Foot Sand, and 1,700-Foot Sand. On the west side of the Atchafalaya River in St. Landry Parish, the Pliocene deposits are not differentiated and are referred to as the Evangeline aquifer. The Evangeline aquifer sands are fluvial and deltaic in origin. The Hydrologic and Hydrogeologic Information narrative provides a detailed description of the occurrence of fresh groundwater in the Evangeline aquifer.

The top of the Miocene series clay and sand zones occurs at approximately -1,900 to -2,000 feet msl (Winner and others, 1968). The entire Miocene series is referred to as the Fleming Group in the Louisiana and Texas Gulf Coast (Galloway and others, 1986) and includes the lower, sand-rich Oakville Formation and the overlying mud-rich Lagarto Formation. The base of the Miocene deposits is at -6,300 to -6,500 feet msl in the sequestration area. The thickness of the Miocene is approximately 4,300 to 4,500 feet. The Lower Miocene series is the proposed sequestration zone for this project. A thick clay predominated interval at the base of the Middle Miocene series is proposed to make up the upper confining zone for sequestration. In addition, the proposed injection interval is directly overlain by a primary confining zone clay. The narrative on Characteristics of the Injection and Confining Zones provides a detailed description of the Miocene sand zones proposed for sequestration of CO_2 and the Miocene confining zone(s).

The shallowest Miocene sands in the sequestration area include the 2,000-Foot Sand, the 2,400-Foot Sand, and the 2,800-Foot Sand. The base of the Underground Source of Drinking Water (USDW) occurs within the shallowest Miocene sands at elevations between 2,535 feet and 2,655 feet below sea level. The Hydrologic and Hydrogeologic Information narrative provides a detailed description of the occurrence of fresh groundwater in the Miocene sands and the depth of the base of the USDW.

The Anahuac Group of Oligocene age underlies the Miocene deposits. The top of the Anahuac Group occurs at approximately -6,300 to -6,500 feet msl. The Anahuac Group consists of clay interbedded with proximal deltaic sand deposits. The Anahuac Group is proposed to be the lower confining zone for sequestration in the Miocene deposits. The base of the Anahuac Group is at -7,000 to -7,200 feet msl at the project area. The thickness of the Anahuac Group is 650 to 830 feet in the area. Brown and Loucks (2009) classified the Anahuac Group as a transgressive member of the underlying Catahoula Group, which includes the Frio Formation. However, in this document the term Anahuac Group will be retained, in accordance with stratigraphic terms used in Louisiana. The narrative on Characteristics of the Injection and Confining Zones provides a detailed description of the Anahuac Group section that is to be the lower confining zone.

The Frio Formation of Oligocene age occurs at approximately -7,000 to -7,200 feet msl. The Frio Formation is included in the Catahoula Group. The Frio Formation consists of clay interbedded with distal deltaic sand deposits. The deltaic sand zones of the Frio Formation extend downward to elevations of -9,400 to -9,750 feet msl. The thickness of the Frio Formation is approximately 2,300 to 2,650 feet thick in the sequestration area. The base of the Frio Formation is identified as the base of the deepest deltaic sand zone that occurs at any given location.

Figure 2-3 shows a west to east cross section through the location of the Sherburne #1 well. The cross section extends from the land surface to an elevation of approximately -7,000 feet msl to show the general relationships of the sequence of formations from the alluvial aquifer to the top of the Frio Formation. The Lower Miocene section has been subdivided into eleven sand units, which are separated by clay confining units. The proposed injection zone is to be in two sands (Sands 10 and 11) at the base of the Lower Miocene. Important confining units for the proposed injection zone sands consist of the overlying clay interval (primary confining unit) above Sand 10 and the underlying Anahuac Group (lower confining unit) below Sand 11. In addition, a thick clay interval above the Lower Miocene makes up the upper secondary confining unit for the entire Middle Miocene sand complex. The base of the USDW occurs above the upper confining unit. The narrative section Characteristics of the Injection and Confining Zones provides detailed description of the injection zone sand units and confining zones.

The Vicksburg Group of Oligocene age underlies the Frio Formation. The Vicksburg consists of marine clay, and overlies the Jackson Group of Eocene age. The Jackson Group also consists of marine clay. The thickness of the Vicksburg Group and the underlying Jackson Group is approximately 1,000 feet in the sequestration area.

The Jackson Group is underlain by older Cenozoic deposits including the Claiborne Group of Eocene age, the Wilcox Group of Eocene and Paleocene age, and the Midway Group of Paleocene age. The underlying Mesozoic formations extend to the Paleozoic basement at depths of approximately 40,000 feet (Snedden and Galloway, 2019).

Structure

Located away from major structural features of the Louisiana Gulf Coast the project area is located in an area of simple geologic structure with generally uniform dip to the south and south-southwest. This area of uniform geologic structure is approximately twenty-seven miles south of the Lower Cretaceous shelf-margin trend and approximately 7 miles north of the inland limit of the South Louisiana Miocene growth faulting province. The sequestration area is in the northernmost part of the South Louisiana Salt Basin.

The dip of the formations in the sequestration area increases with depth and to the south because of the southward increases of subsidence and growth faulting in older formations. The dip of the Pleistocene near-surface formations is estimated to be approximately 20 feet per mile based on south-north cross section A-A' of Winner and others (1968). The dip of the Evangeline aquifer sands is approximately 40 feet per mile. The Miocene sand zones have dips ranging from 40 to 60 feet per mile in the sequestration area and the base of the Miocene dips at approximately 75 feet per mile. The base of the Anahuac Group dips south-southwestward at approximately 115 feet per mile. The upper portion of the Frio Formation dips south-southwestward at approximately

150 feet per mile and the base of the Frio Formation dips south-southwestward at approximately 250 feet per mile.

Figure 2-4 shows regional geologic structural features including faults and salt domes located in the vicinity of the sequestration area. **Figure 2-4** also shows the locations of gas and oil fields located in the area. These include the Sherburne Gas Field located to the north of the proposed location of the Class VI well, the Krotz Springs Oil and Gas Field located to the west, and the Fordoche Field located to the east, as well as other fields located at greater distances. The gas and oil fields shown in Figure 3 primarily are located adjacent to faults and generally include structural traps related to the occurrence of the mapped faults. The gas and oil fields in the area are depleted and have little or no production at the present time (2022). The producing intervals in all of the gas and oil fields located in the area have been from the deeper sediment that comprise the Oligocene and Eocene.

Figure 2-4 shows three normal faults north of the sequestration area. This trend of faulting in the area north of the sequestration area has been referred to as the Eocene fault zone (Galloway, 2008). The normal faults dip toward the south and developed during periods of rapid sedimentation in response to Eocene and Oligocene sedimentary loading. These "growth" faults have an expanded sedimentary section at the depths of the Eocene and Oligocene in the downthrown blocks to the south. The displacement on the faults generally decreases upward as the faults became less active during the Miocene.

The site seismic data shows the growth fault that is located in the area north of the Sherburne #1 well and north of the Sherburne Gas Field. The site seismic data is described later in this section under the description of Project Data Sources. This fault has been mapped from the north side of the Krotz Springs Gas and Oil Field (Duchin, 1964) eastward to the Fordoche Gas and Oil Field (Wright, 1965 and Pierson, 1970). This fault shows significant expansion of the Eocene series sediments at depths greater than 10,000 feet and was a growth fault during that time. The displacement on this fault decreases upwards and is approximately 100 feet in the upper part of the Anahuac Group. The displacement in the Miocene section is less than 50 feet and the displacement across the fault appears to terminate at the top of the Miocene (depth of approximately 2,000 feet). There is no evidence of thickening of Miocene sedimentary layers across the fault. The dip of the fault in the Miocene section is 45 degrees. The modeled AOR for the Class VI well location does not extend outward to the location of this fault. The Faults and Fractures narrative provides more information on this fault.

Faults in the Eocene fault zone have displacements that terminate in the upper part of the Miocene. The fault located north of the Ravenswood, Bayou Gerance, and Bayou Fordoche Fields (northernmost fault shown in **Figure 2-4**), however, shows displacement from within the Eocene upwards into the Pliocene section.

The South Louisiana Miocene growth faulting province occurs to the south of the sequestration area. The growth fault on the north side of the Happytown Gas and Oil Field is located approximately 7 miles south of the sequestration area. This fault shows significant displacement in the Miocene and marks the northern boundary of the Miocene growth faulting province. The Miocene growth faults were activated during rapid sedimentation during the Miocene depocenters. **Figure 2-4** also shows the western portion of the Baton Rouge Fault, a Miocene growth fault which

extends westward from the Baton Rouge area to the area of the Rosedale Field. The western end of the Baton Rouge Fault is approximately 14 miles southeast of the sequestration area. The locations of other Miocene growth faults further to the south are not shown in **Figure 2-4**. The modeled AOR does not extend to the locations of the Miocene growth faults.

There are no known salt structures at the sequestration area (Beckman and Williamson, 1990). The nearest mapped salt domes are the Port Barre Salt Dome, the Bayou des Glaises Salt Dome, and the Plumb Bob Salt Dome. The Port Barre Salt Dome is located approximately 11.5 miles west of the sequestration area. The top of salt at the Port Barre Dome is approximately 3,900 feet deep. The Bayou des Glaises Salt Dome is located approximately 11.4 miles to the south of the sequestration area. The top of salt at the Bayou des Glaises Dome is approximately 3,800 feet deep. The Plumb Bob Salt Dome is located approximately 10.5 miles to the southwest of the sequestration area. The top of salt at the Plumb Bob Dome is approximately 8,900 feet deep. These salt domes do not show any influence on the structural configuration of the geologic formations in the sequestration area.

The formation pore water is normally pressured from the land surface to the Eocene series. Overpressured (geopressured) conditions occur at depths of 11,500 to 12,500 feet in the Cockfield or at the top of the Wilcox Group in the vicinity of the sequestration area (Bebout and Gutierrez, 1982). Therefore, there is no impact of overpressured conditions on the CO2 injection zones.

Subsurface temperatures have been measured in petroleum wells in the vicinity of the sequestration area. The temperatures range from 115 °F at 3,300 feet to 133 to 143 °F at 6,500 feet and show a temperature gradient of approximately 9 to 11 °F per 1,000 feet. The temperature gradient increases to 11 to 14 °F per 1,000 feet in the depth range of 10,000 to 15,000 feet. The heat flow in the sequestration area is in the range of 40 to 44 milliWatts per square meter (mW/m^2) according to the Geothermal Map of North America (Blackwell and Richards, 2004). The subsurface temperatures in the proposed sequestration zones are suitable for injection and storage of CO_2.

Tectonic History

The study of the tectonic history of the Gulf of Mexico sedimentary basin has developed a large body of literature. The summary contained herein is derived from Snedden and Galloway (2019), which provides a detailed description of the current state of understanding of the basin's tectonic history. This summary of the tectonic history addresses major depositional and tectonic events in the region of the sequestration area.

The Gulf of Mexico sedimentary basin initiated with the deposition of the Louann Salt of Jurassic age. During this time, the sequestration area was located in the northern part of the South Louisiana Salt Basin, which was an important area of Louann Salt accumulation. Opening of the Gulf of Mexico began as an intrusive phase of oceanic crust generation below the accumulating mass of evaporite sediments. As the sedimentary basin grew through rifting and extension, clastic sediment input developed from sources in the newly-emerged Laramide highlands to the west and northwest and from the rejuvenated Appalachian Mountains to the northeast.

The Jurassic and Cretaceous Periods included extensive carbonate sedimentation with the Smackover, Sligo, Glen Rose, Stuart City, and Austin Chalk shelves and platforms. During this

time interval, the sequestration area was located in a basinal setting to the south of the shelf margin. Sedimentation in the basin area included carbonate and siliciclastic input to the Haynesville Shale, Bossier Shale, Paluxy, Woodbine, Tuscaloosa, and Navarro-Taylor sequences.

The Paleogene Period opened with continuing conditions of high sea level and transgressive and aggradational deposition of the Midway Group deep-water basin and shelf mud. The Western Interior of the North American plate underwent Laramide orogeny and this resulted in a long-term surge of siliciclastic sediment into the Gulf of Mexico sedimentary basin from the west and northwest. The large sediment influx resulted in the deposition of the Wilcox Group of Paleocene-Eocene age. The Laramide compression enhanced the gulf-ward tilt of the basin and reactivated basement structures. The Wilcox Group deltas and coastal plain pro-graded over the Cretaceous shelf edge located to the north of the sequestration area. The Wilcox deposition extended southward in the basin to the south of the sequestration area. The extensive sedimentation into the basin activated growth faulting in the former deep-water basin and along the basin margin. The Holly Springs Delta associated with the ancestral Mississippi River drainage system was the main Wilcox sedimentation feature in the sequestration area. Eocene deposition continued with the Queen City mud shelf, the Sparta deltaic and coastal deposits, and the Cockfield and Jackson deltaic and fluvial deposits.

The Oligocene Epoch tectonism and sediment influx caused the most rapid sedimentation in the history of the Gulf of Mexico. At the sequestration area, the Vicksburg Group is a shelf mudstone resulting from the shallow submergence of the shelf that began during deposition of the Jackson Group. During the following period of Frio deposition, the Mississippi River drainage system delivered sediment in the Louisiana Delta across the sequestration area to a major depo-center to the south. In the sequestration area, Frio sediments with present-day thickness of approximately 2,700 feet were deposited in less than 10 million years. The Hackberry Embayment developed to the southwest of the sequestration area after evacuation of salt due to the sediment loading. Growth faulting was activated during the Oligocene and continued through the Anahuac transgression, which culminated in regional maximum flooding and deposition of marine muds across the sequestration area.

During the Early Miocene Epoch, high sediment influx continued in the Mississippi Delta, which extended across the sequestration area. Two depositional episodes named Lower Miocene 1 and Lower Miocene 2 occurred at this time and were separated by the Marginalia shale (index foraminiferid Marginulina ascensionensis of 18-million-year age). The Mississippi fluvial-deltaic deposits prograded rapidly across the Anahuac shelf and developed a major shore zone and progradational slope depo-center near the present-day gulf shoreline to the south of the sequestration area. Both fluvial and deltaic sedimentation occurred at the sequestration area during this time interval. Miocene extensional faulting and salt-canopy loading occurred to the south of the sequestration area in the areas of maximum sediment accumulation. The sequestration area shows no evidence of post-Oligocene extensional faulting or other deformation. The Lower Miocene depositional events were followed by a regional transgression in the Northern Gulf basin margin that deposited the Amphistegina shale (Amphistegina B index foram at approximately 15 million years).

Rapid sedimentation continued in the Middle Miocene and Late Miocene Epochs. The Mississippi River and Tennessee River drainage systems converged into the northern Gulf of Mexico in the

Middle Miocene and rapidly prograded the deltaic and shelf deposits southward. Fluvial sedimentation occurred at the sequestration area during the Middle and Late Miocene. The Late Miocene ended with transgression at approximately 6 million years before present.

The Pliocene and Pleistocene series included fluvial deposition in the Mississippi River drainage system. The major depocenters were in the continental slope to the south of the present-day Gulf shoreline. The Holocene rise of sea level resulted in the aggradation of the Mississippi River alluvium and Atchafalaya River alluvium across the sequestration area and its vicinity.

Project Data Sources

The principal project data sources for subsurface geologic information included geophysical logs of legacy petroleum wells in and adjacent to the sequestration area, existing 2D and 3D seismic data in the sequestration area, and the Class V stratigraphic test well with geophysical logs, core samples, and mud logging. In addition, publications of the Louisiana Geological Survey, U.S. Geological Survey, the Lafayette Geological Society, the Gulf Coast Geological Society Library and the New Orleans Geological Society have provided detailed information on the stratigraphy and structure of the area including type sections and structure maps of the nearby depleted gas and oil fields.

Geophysical Logs of Legacy Wells

Legacy wells in the sequestration area and its surroundings were identified from the LDNR Strategic Online Natural Resources Information System (SONRIS) and utilized to assess the local stratigraphy. If available the geophysical logs were obtained from SONRIS. The geophysical logs from a number of wells in the area were not available in SONRIS and were obtained from TGS, a commercial petroleum industry data company.

The identification of legacy wells in the sequestration area was supplemented by searching for wells with the following services: TGS, and the Gulf Coast Geological Library In addition, regional structure maps from Geomap Corporation were reviewed to assess if any additional wells occur in the sequestration area.

Table 2-1 lists the legacy petroleum wells in the project area that had geophysical logs used in the evaluation of the subsurface stratigraphy of the area. These wells are identified by their State Serial Number and API Number. Other information listed in this table includes well name, location information, section-township-range, parish, and well status. The State Serial Numbers of the wells are used in this permit application to identify the legacy wells because it is briefer than the API Number. This table provides a cross reference for identifying legacy wells by API number if necessary.

Existing Seismic Data

Two 2D seismic lines and a licensed area of a 3D seismic survey have been used to assess the stratigraphy and structure of the sequestration area.

Two 2D seismic lines in the planned project area were used to provide a portion of the preliminary geologic characterization. These dip-oriented 2D seismic lines are located in the area adjacent to the Capio Sequestration #001 well site are licensed by Seismic Exchange, Inc (SEI). The two 2D

seismic lines include line B603-E run by Oryx-Sun in 1967 (reprocessed in 1986) and line 4811-1 run by Texaco in 1969 (processed in 1972). The locations of the two seismic lines are shown in **Figure 2-5.** The licensed data is proprietary to SEI and subject to confidentiality terms of the license to Capio.

Table 2-1. Interpreted Wells for Geologic Modeling

State Serial Number	API Number	Well Name	Well Status	Easting (ft)	Northing (ft)	Latitude	Longitude	Total Depth (ft)	Township	Range	Section
39827	17077001210000	VJ KURZWEG ET AL 001	P&A	3160797	740371	30.5352972	-91.71462269	11,011	06S	07E	24
42338	17097001610000	KROTZ SPRINGS UNIT 011	P&A	3144893	730680	30.50849723	-91.76502184	11,100	06S	07E	19
42512	17077001290000	U CKF RA SUA;V J KURZWEG 002	P&A	3163631	740398	30.53539704	-91.70562143	10,704	06S	07E	38
44904	17077001200000	SHE 9300 STR RA SU;KURZWEG U1 003	P&A	3158496	739542	30.53299666	-91.72192234	12,249	06S	07E	23
44973	17077001440000	SHE 9300 STR RA SU 001	P&A	3166370	740389	30.53539646	-91.69692154	12,252	06S	08E	37
45523	17077001220000	V J KURZEG ET AL 004	P&A	3162233	736620	30.52499702	-91.71002238	12,400	06S	07E	28
47141	17097001540000	MRS JEANETTE R HAAS ET AL 001	P&A	3151838	735528	30.52189658	-91.74302384	12,503	06S	07E	15
47699	17077001190000	SHE 9300 STR RA SU;MERAUX U1 001	P&A	3155697	740315	30.53509562	-91.73082101	10,500	06S	07E	20
47999	17077001450000	LA. CENTRAL LAND CO. INC. 001	P&A	3169172	740417	30.53549757	-91.6880219	10,800	06S	08E	37
49189	17077001170000	MID CF RA SUA;SL 1843 PER U1 001	P&A	3153496	741305	30.53779641	-91.73782305	10,800	06S	07E	18
49505	17077001260000	LOCAL INVESTORS 003	P&A	3160614	751646	30.56629551	-91.71532338	10,500	06S	07E	35
50950	17077001300000	E A JUMONVILLE ETAL 001	P&A	3157046	729909	30.50649741	-91.72642284	10,093	06S	07E	41
51082	17077001280000	SHE 9300 RA SU; LA CENTRAL 003	P&A	3162160	743203	30.54309605	-91.71032305	10,750	06S	07E	36
54216	17077001150000	A WILBERTS SONS LBR & SNGLE CO 005	P&A	3152014	749312	30.55979677	-91.74262121	9,300	06S	07E	10
56183	17077001160000	DON B HEARIN JR ET AL UNIT 1 001	P&A	3153284	743561	30.54399712	-91.73852177	9,483	06S	07E	16
67947	17097001550000	HAAS-HIRSCH 001	P&A	3150469	739970	30.53409618	-91.74742252	9,728	06S	07E	8
87519	17077001430000	UP CKF RB SUA;LA CENT LD CO 005	P&A	3167054	747588	30.55519569	-91.69482118	11,800	06S	08E	36
114439	17077003460000	LA. CENTRAL LD. CO. INC. 006	P&A	3166040	745591	30.54969622	-91.69802234	15,539	06S	08E	36
118209	17077200180000	LOCAL INVESTORS INC 004	P&A	3163941	748580	30.55789578	-91.70472108	10,150	06S	07E	35
119161	17097200300000	NATHALIE H HIRSCH ET AL 001	P&A	3146388	734712	30.51959846	-91.76032235	10,020	06S	07E	14
123045	17077200740000	V J KURZWEG ETAL 001	P&A	3167792	732165	30.51279717	-91.69232295	14,908	06S	08E	4
123314	17077200800000	DON B HEARIN JR ET AL B 001	P&A	3151616	743676	30.544297	-91.74382155	14,500	06S	07E	15
124565	17099200880000	IBERVILLE LAND CO 001	P&A	3164649	723774	30.48969861	-91.70222104	10,215	07S	07E	3
138204	17077201430000	LOCAL INVESTORS INC 001	P&A	3161588	751061	30.56469597	-91.71222259	9,200	06S	07E	35
143399	17077201540000	SHE 9300 RA SU;KURZWEG 005	P&A	3159705	743248	30.54319735	-91.71812187	9,450	06S	07E	37
147041	17077201590000	VUA;JUMONVILLE A 001	P&A	3150138	726951	30.49829745	-91.74832414	14,977	06S	07E	43
150256	17077201650000	JOHN S KEAN 001	P&A	3162940	750511	30.563196	-91.70792131	9,230	06S	07E	35
156213	17097204480000	DOUCET ETAL 001	P&A	3149072	736702	30.52509701	-91.75182179	10,074	06S	07E	15
156543	17077201770000	JOHN S KEAN 001	P&A	3164328	751452	30.5657956	-91.70352109	9,600	06S	07E	35
157947	17077201840000	A WILBERT & SONS L&S CO 001	P&A	3156828	748895	30.55869661	-91.72732238	10,421	06S	07E	34
158443	17077201860000	SHERBURNE LAND CO 001	P&A	3162124	734064	30.51796839	-91.71034184	15,500	06S	07E	29
159504	17077201910000	A WILBERT & SONS L & S CO 002	P&A	3158954	749824	30.56127074	-91.72057804	9,933	06S	07E	34
162229	17077201980000	9250 RA SUA;KURZWEG 006	P&A	3158593	741414	30.53814455	-91.7216344	9,460	06S	07E	22
165121	17077202090000	9000 STRAY RA SUA;MERAUX 003-ALT	P&A	3156053	742344	30.54067765	-91.72971256	13,500	06S	07E	19
184553	17097207390000	OPELOUSAS ST LANDRY SEC CO 001	P&A	3145425	722574	30.48621512	-91.76323908	9,500	06S	07E	24
205018	17077203900000	DONALD A JONES SWD 001	Injection Well	3160619	749228	30.55964743	-91.71528188	11,600	06S	07E	35
205587	17077203990000	SP B RA SUB;JONES 002	P&A	3163723	749469	30.56033809	-91.70542284	12,000	06S	07E	35
206954	17077204170000	A WILBERTS SONS LBR & SHGL CO 001	P&A	3150848	748419	30.55733004	-91.74631541	11,590	06S	07E	11
208938	17077204400000	SP B RA SUD;WILBERTS 001	Shut-in	3158095	748903	30.55873051	-91.7232972	11,650	06S	07E	34
221739	17077205250000	PMMI 001	P&A	3161971	740869	30.53667711	-91.71089897	12,299	06S	07E	25

225682	17077205390000	VUA;MERAUX 001	Orphan Well	3158123	743259	30.54321291	-91.72314723	9,675	06S	07E	19
249609	17077206220000	CF RB SUA;A WILBERTS SONS LLC 001	P&A	3159121	750246	30.56243255	-91.72005199	10,510	06S	07E	34
975895	17077880290000	SHERBURNE 001	Observation	3160789	740388	30.53534387	-91.71464828	6,500	06S	07E	24
NA	NA	Proposed Class VI	NA	3159582	735315	30.521385	-91.718429	NA			

	Denotes wells outside 3D seismic boundary
	Denotes wells inside 3D seismic boundary

Line B603-E is 3.693 miles long and extends from Shot Point (SP) 110 on the south to SP 148 on the north. The line is located in Pointe Coupee Parish less than 100 feet west of the Class V test well Sherburne No.1 in Section 24, T. 6 S., R. 7 E. Sherburne No.1 is adjacent to the location of a plugged and abandoned gas production well Kurzweg No.1 (Texas Company API Number 17077001210000 and State Serial Number 39827) that provides stratigraphic data from its Spontaneous Potential (SP) log. The shot point spacing of line B603-E is 500 feet, with a 6-fold gather. Processed products delivered were SEG-Y data and wiggle-trace displays of an un-migrated stack and a migrated line.

Line 4811-1 is 4.25 miles long, running north to south from SP1-SP68, with shot point spacing of 330 feet and 12-fold gather. Products delivered were SEG-Y data and a wiggle trace display of an un-migrated stack.

The upper 2.5 seconds of two-way reflection time (TWT) of the two seismic sections was interpreted to assess shallow subsurface conditions. This TWT interval corresponds to a depth range of approximately the upper 10,000 feet of the subsurface. Line B603-E was reviewed in detail because of it having a migrated section and its location adjacent to the Class V test well. Line B603-E also included results of the velocity analysis listing the interval velocities at five locations along it. In addition, the log of the Kurzweg No.1 well (SSN 39827), which is located close to SP 136 and SP 137, has been compared to the sequence of reflections in line B603-E.

The two 2D seismic lines show a sequence of reflections dipping at low angle from north to south. In the upper portions of the sections to depths of 1.8 to 2.0 seconds TWT, the reflections are continuous over length scales of 2,000 to 5,000 feet from north to south and some reflections show continuity up to 20,000 feet. The terminations of reflections are convergent or show down lapping to the next deeper reflection. Based on the velocity analysis of line B603-E, the interval from 0.95 to 1.1 seconds TWT was interpreted to represent the fine-grained section from depths of 3,000 to 3,600 feet at the base of the Middle Miocene. This interval has discontinuous reflections with low and variable amplitude. Prominent, continuous reflections occur at approximately 1.2 seconds TWT, at 1.5 seconds TWT, and at 1.65 seconds TWT and are separated by intervals of discontinuous reflections. Based on time-depth conversion estimates, this section was interpreted to represent the Lower Miocene age interval, consisting of thick, channelized fluvial sands separated by clay-rich abandonment surfaces. The observed patterns are consistent with that type of depositional environment. **Figure 2-6** shows the Lower Miocene interval in a portion of line B603-E.

Three high-amplitude reflections at approximately 1.75 to 1.85 seconds TWT are continuous throughout the lengths of both lines. Based on the velocity analysis of line B603-E, time-depth conversion suggests that these high-amplitude reflections are at a depth of 6,300 to 6,500 feet and represent the top of the Anahuac Group of Oligocene age. One or two high-amplitude reflections occur at 1.95 to 2.0 seconds TWT, corresponding to depths of 7,000 to 7,300 feet. These reflections could represent the base of the Anahuac Group. The Anahuac Group interval has discontinuous and variable-amplitude reflections within it, which could be related to the presence of thin or discontinuous depositional units. The Anahuac Group is a regional transgressive fine-grained deposit with thin sand zones deposited in distal deltaic and shelf environments. The Anahuac Group interval in line B603-E is indicated in **Figure 2-6**.

In the northern portions of both seismic lines, a growth fault is shown by an expanded section deeper than approximately 3.0 seconds TWT. The expanded section is on the south side of the normal fault. The migrated section of line B603-E shows down to the south displacements of reflections deeper than approximately 2.4 seconds TWT (approximately 9,500 feet depth). The normal fault trends from west-northwest to east-southeast based on its intersections with the seismic lines.

The evaluation of the 2D seismic lines by SCS showed that the major stratigraphic zones (Miocene and Anahuac Group) can be identified from seismic data. The characterization of the stratigraphy is consistent with offset well logs in the area. However, the resolution of the 2D seismic data is not high enough to identify the thicknesses and extents of individual sand zones (potential injection intervals) or the extent and displacement magnitudes of the normal fault. The resolution of the 2D seismic lines is limited by the low fold of the data gathers, large shot point spacing, and age of the data acquisition and processing.

To refine the area's interpretation, Capio licensed 8 square miles of the HappyTown 3D seismic survey. The HappyTown seismic survey was shot and processed by CGGVeritas Land (US), Inc. in 2010. The licensed 8-square mile area was selected to include the location of the Sherburne #1 well drilled in July 2022 and the proposed location for the first Class VI sequestration well to be permitted. The HappyTown survey covers 90.03 square miles in southern Pointe Coupee Parish, northern St. Martin Parish, northwestern Iberville Parish, and western West Baton Rouge Parish.

Figure 2-7 shows the licensed area of the HappyTown 3D survey. The licensed area of the HappyTown 3D seismic data is in yellow. The adjacent areas of the remainder of the HappyTown 3D survey are shown in blue. In this figure, the lease boundary line is shown in green. The licensed area is located in Sections 16 through 31, Sections 34 through 41, and Sections 44 through 47 of Township 6 S., Range 7 E., Sections 1, 18, 25, 36, and 37 of T. 6 S., R. 8 E., and Sections 16 and 17 in T. 7 S., R. 7 E.

The north-south extent of the licensed area is approximately 5.1 miles in T. 6 S., R. 7 E. and T. 6 S., R. 8 E. The east-west extent is approximately 1.56 miles and widens to approximately 2.1 miles and the southern part. A segment of licensed area in T. 7 S., R. 7 E. is approximately 0.4 mile from north to south and up to 0.62 mile from west to east. This segment is separated from the reminder of the licensed area by a no-permit area

The licensed data is proprietary to Seismic Exchange, Inc. and subject to confidentiality terms of the license to Capio.

The north boundary of the licensed 3D data is approximately 1.38 miles north of the north boundary of the Capio lease and is approximately 1.6 miles north of U.S. Highway 190. The north boundary of the HappyTown 3D survey is approximately 1 mile north of the north side of the licensed area.

Capio drilled the Sherburne #1 test well (marked with a red star in Figure 7) and proposes to install the Class VI injection well at a location approximately 5,200 feet to the south of the Sherburne #1 well.

Class V Stratigraphic Test Well

The Class V Well History and Work Resume Report for the stratigraphic test hole (Sherburne No. 1, Serial No. 975895) described the drilling of the Class V test well. The following information as included with the report:

LDNR Form UIC-42, *Class V Well History and Work Resume Report*

Wellbore Schematic of the completed Sherburne No. 1 Well

Electronic Log identifying the lowermost extents of the USDW

This information is included in **Appendix 1-A** of this permit section.

The Louisiana Office of Conservation Injection & Mining Division permitted the Sherburne #1 well on March 24, 2022. The well was spud on July 2, 2022 and completed on July 23, 2022. Casing within the Class V well is comprised of

- 16-in OD conductor driven to 211 ft
- 9⅝-in OD 40# J55 surface casing cemented with Class A lead cement to 2990 ft, and
- 5½-in OD 20# L80 production casing cemented with Class H CO2 resistant cement with latex additive to total depth (6493 ft).

Geophysical logs were performed by Schlumberger from surface to total depth and include

- Surface casing hole from depth of approximately 2,990 feet
  - Open hole. Spontaneous Potential (SP), Resistivity (array induction), Gamma, Neutron porosity, Density, caliper
  - Cased hole. Cement bond log
- Production hole from 2,990 feet to 6,495 feet
  - Open hole. SP, Gamma, Spectral Gamma, Resistivity (array induction), Neutron porosity, Density porosity, Sonic Scanner, Formation Image (FMI)
  - Cased hole. Cement bond log, Casing Locator Log

Mud logging was conducted during drilling from the base of the surface casing to the total depth of 6,500 feet. The mud logging included classification of samples collected at 30-foot depth intervals and monitoring of gases. The frequency of sample collected was increased to 10-foot depth intervals in the 100 feet shallower than each coring point.

No reservoir tests were performed within the Class V well on the basis of concern for communication and upward migration in the adjacent wellbore of well 39827. The well was pressure tested, filled with drilling mud, and completed with pressure monitoring gauge on a

surface tree. The site has been secured by removing and storing the valve handles and providing a locking grate over the cellar.

The drilling of the Class V test well included obtaining five cores. The core were from the upper confining zone, Lower Miocene sand zones, and the underlying Anahuac Group (lower confining zone). The core samples have been tested by Core Laboratories, Inc. for routine core analysis and for special core analysis tests. The following table summarizes the drilled depths, recovered depth ranges, and stratigraphic intervals of the cores:

Table 2-2. Drilled Depths, Recovered Depth Ranges & Stratigraphic Intervals

Core Number	Drilled Depth (feet KB)	Actual Recovered Depth Range (feet KB)	Stratigraphic Interval
1	3,390 to 3,412	3,390 to 3,393	Miocene upper confining zone
2	3,420 to 3,450	3,420 to 3,434	Miocene upper confining zone
3	4,240 to 4,270	4,240 to 4,242.75	Lower Miocene sand
4	5,000 to 5,029	5,000 to 5,014.2	Lower Miocene sand
5	6,400 to 6,428	6,400 to 6,408.67	Anahuac Group lower confining zone

Maps and Cross Sections of the AOR [40 CFR 146.82(a)(2), 146.82(a)(3)(i)]

The size of the AOR has been evaluated with numerical modeling of CO_2 injection in the proposed storage zone. The numerical modeling of the AOR is presented in the AOR Evaluation and Corrective Action Plan of this permit application. The extent of the AOR is shown in **Figure 2-8**. The AOR includes the model-predicted CO_2 plume in which separate-phase CO_2 occurs in the pore space and an area of pressure buildup in the formation water. The AOR is defined by the extent of the CO_2 plume, not pressure build up, as the transmissive nature of the injection zone mitigated pressure effects in the reservoir. The maximum predicted dimensions of the CO_2 plume are 7,000 feet from west to east and up to 10,000 feet from south to north. There is no significant pressure buildup in the formation water in the AoR.

Figure 2-9 shows a north-south vertical seismic line passing through the Sherburne #1 well location. This seismic section displays the seismic data with respect to two-way time (TWT). The location of this seismic section is shown in **Figure 2-7**.

The sonic and density logs from the Sherburne #1 test well were used to convert the seismic data from time to depth. **Figure 2-10** shows the depth-converted seismic section. This section covers a depth interval from shallower than 1,000 feet to approximately 7,000 feet below sea level. Positive depths below sea level are referred to as subsea true vertical depth (SSTVD). The geologic ages shown include the Pliocene Series to approximately 1,900 to 2,000 feet SSTVD, the Miocene Series to approximately 6,300 feet SSTVD, and the top of the Oligocene Series below

that. The top of the Lower Miocene is at approximately 3,000 feet SSTVD. The depth-converted cross section image includes the lithologic log of the Class V well from approximately 2,700 feet to 6,500 feet SSTVD. In addition, the sonic and density logs from well 138204, located in the northern part of the licensed seismic data volume, were also used for time-depth conversion.

Figure 2-11 shows three depth-converted seismic lines from the 3D seismic data extending from west to east at the locations shown in the inset map. Section A is located south of the planned Class VI well location. Section B extends through the location of the Sherburne #1 well. Section C is located in the northern part of the seismic data volume.

The 3D seismic data was used to evaluate the configurations and thicknesses of the injection zone sands and confining zones. As described in the permit section on Injection and Confining Zone Details, Capio is proposing to conduct CO_2 sequestration within the two basal sand units of the Lower Miocene section. These are denoted as Sand 10 and Sand 11.

Evaluation of the 3D seismic data in relation to well logs including the Sherburne #1 well and other petroleum logs in the area showed that the sand units of the Lower Miocene and the associated confining zones have consistent seismic reflections at the tops and bottoms of the units. Therefore, the tops and bottoms of the units are mappable and this provides a comprehensive correlation of the sand units within the 3D seismic volume. The internal reflections within the sand units are discontinuous and can downlap to the base or to internal reflections suggesting that each sand unit was deposited as a series of prograding and downlapping sedimentary bodies.

The proposed injection sand units Sand 10 and Sand 11 occur at depths of 5,800 to over 6,200 feet SSTVD in the sequestration area. The proposed injection sand units are deeper than the base of the USDW throughout the area. The base of the USDW ranges from 2,535 to 2,655 feet SSTVD in the sequestration area.

Figure 2-12 shows the depth contours (feet SSTVD) of the top of Sand 10 as derived from the 3D seismic data. This structure map shows that the top of Sand 10 generally dips southward. **Figure 2-13** shows the isopach map of Sand 10. The thickness of Sand 10 varies from 50 to 110 feet in the sequestration area and increases to over 200 feet to the north.

Figure 2-14 shows the depth contours (feet SSTVD) of the top of Sand 11 as derived from the 3D seismic data. This structure map shows that the top of Sand 11 dips southward. **Figure 2-15** shows the isopach map of Sand 11. The thickness of Sand 11 varies from 235 to 275 feet in the sequestration area.

The confining zones for the proposed injection zone sand units include the primary confining unit directly overlying Sand 10. The primary confining unit includes a sequence of clay that occurs between the base of Sand 8 and the top of Sand 10. The primary confining unit includes a minor sand unit denoted as Sand 9. The primary confining unit is deeper than the base of the USDW.

Figure 2-16 shows the depth contours (feet SSTVD) derived from the 3D seismic data of the top of the primary confining unit (base of Sand 8) that overlies Sand 10. This structure map shows that the top of the primary confining unit dips southward. **Figure 2-17** shows the isopach map of the primary confining unit. The thickness of the primary confining unit varies from 300 to 400 feet in the sequestration area.

In addition, a regional transgressive clay interval makes up the upper confining unit overlying the Lower Miocene section. The upper confining unit is correlated with the Amphistegina shale (Amphistegina B index foram of approximately 15-million-year age) that occurs widely in the Northern Gulf Coast basin. The top of the upper confining unit is deeper than the base of the USDW. The upper confining unit is 400 to 500 feet thick throughout the sequestration area and vicinity.

Figure 2-18 shows the depth contours (feet SSTVD) for the top of the upper confining unit as derived from the 3D seismic data. This structure map shows that the upper confining unit dips to the south. **Figure 2-19** shows the depth contours of the base of the upper confining unit (top of Sand 1 of the Lower Miocene sand units). This structure map also shows that the base of the upper confining unit dips southward. **Figure 2-20** shows the isopach map of the upper confining unit. The thickness of the upper confining unit ranges from 440 to over 500 feet in the sequestration area. The upper confining unit forms a regional barrier to any potential movement of fluids from the Lower Miocene injection zone sand units.

Sand 11 at the base of the Lower Miocene is underlain by the Anahuac Group. The Anahuac Group is made up primarily of clay and constitutes a lower confining unit for the proposed injection zone sands. The thickness of the Anahuac Group ranges from 650 to 830 feet in the sequestration area. The Anahuac Group forms a regional barrier to any potential downward movement of fluids from the Lower Miocene injection zone sand units.

Based on the 3D seismic data and correlations with well logs in the vicinity of the sequestration area, there are no observed regional pinch outs of the injection zone sand units or of the confining zones.

The injection zone sand units Sand 10 and Sand 11 have variable top elevations with local relief of 20 to 40 feet. The variability of the top elevations can provide for local structural trapping of CO2. In addition, the CO2 trapping has been evaluated to include residual trapping and dissolution trapping.

The injection zone sand units and confining zones are continuous throughout the vicinity of the sequestration area.

Structure maps and isopach maps also have been prepared for the area encompassed by the dynamic numerical model developed for modeling of the injection and movement of CO_2 in the injection zone sand units. The model area extends 5.3 miles from west to east and 6.2 miles from north to south. The model area is larger than the area of the licensed 3D seismic data. The top and bottom surfaces of the primary confining unit, Sand 10, and Sand 11 were geostatistically modeled from the licensed 3D seismic data and from depths of those surfaces in the well logs from the wells in the model area.

Figures 2-21, 2-22, and 2-23 show the structure maps of the top and base and the isopach map of Sand 10.

Figure **2-24** shows the isopach map of the confining unit clay interval between the base of Sand 10 and the top of Sand 11. This clay interval is 60 to 100 feet thick in the sequestration area.

Figures 2-25, 2-26, and 2-27 show the structure maps of the top and base and the isopach map of Sand 11.

Figures 2-28 and 2-29 show the structure map of the top and the isopach map of the primary confining unit.

Figures 2-30, 2-31, and 2-32 show the structure maps of the top and base and the isopach map of the upper confining unit.

Figures 2-33 and 2-34 show the structure of the base and thickness of the Anahuac Group. The Anahuac Group is made up primarily of clay and constitutes a lower confining unit for the proposed injection zone sands. The structure map shows that the Anahuac Group dips southward. The thickness of the Anahuac Group ranges from 650 to 830 feet in the sequestration area. The Anahuac Group forms a regional barrier to any potential downward movement of fluids from the Lower Miocene

Figure 2-35 shows the location of geologic cross section A-A' oriented from southwest to northeast across the model area. **Figure 2-36** shows cross section A-A' to display the occurrence of Sand 10 and Sand 11 throughout the model area. **Figure 2-37** shows the location of geologic cross section B-B' oriented from west to east across the model area. **Figure 2-38** shows cross section B-B' through the Sherburne #1 well location to display the occurrence of Sand 10 and Sand 11 in the model area.

Faults and Fractures [40 CFR 146.82(a)(3)(ii)]

The seismic line of **Figure 2-10** shows a normal fault located approximately 6,200 feet north of the Class V well at the level of the base of the Miocene. This fault dips southward at 45° in the depth interval shown by the seismic section. The location of this fault at the base of the Miocene is shown in **Figure 2-7**. The unconsolidated Gulf Coast deposits do not fail by fracturing, so it is not likely that any fractures occur in the injection zone or confining zones.

This fault is not located within the AOR and is approximately 3,000 feet north of the northernmost extent of the AOR.

The displacements on this fault generally range from 30 to 50 feet within the Lower Miocene section and decrease upward. Displacements up to approximately 100 feet occur at some horizons. The displacements of Sand 10 and of Sand 11 generally are not sufficient to offset these sands in the down-dropped hanging wall (south side) from the sands in the foot wall (north side). The structure map of the top of Sand 10 (**Figure 2-12**) shows approximately 100 feet of downward change in elevation along the trace of the fault. The thickness of Sand 10 in the area of the fault ranges from 110 to 250 feet.

At the elevation of the upper confining unit, there appears to be no measurable displacement. Therefore, there is no threat to containment by the confining zones. There is no apparent displacement at the top of the Miocene. Based on the distribution of displacements on the fault, the fault has been inactive since the Late Miocene over 5 million years ago.

The maximum displacement in the underlying Anahuac Group is approximately 100 feet. The thickness of the Anahuac Group ranges from 450 to over 700 feet.

In the deeper portion of the seismic data volume, this fault shows larger displacements and stratigraphic expansion in the Anahuac Group, Frio Formation, and underlying formations.

The dynamic model of CO_2 injection was used to predict the fluid pressure buildup in the AOR. The fault is located approximately 11,000 feet north of the proposed location of the Class VI well. There is no pressure buildup at this distance from the Class VI well. Therefore, there is no predicted pressure change that would result in changes of stress to reactivate movement of the fault.

Injection and Confining Zone Details [40 CFR 146.82(a)(3)(iii)

There are eleven sand zones in the Lower Miocene between the base of the upper confining zone at approximately 3,620 feet subsea total vertical depth (SSTVD) and the top of the Anahuac Group at 6,300 feet SSTVD. The identified sand zones range from 30 feet thick to 445 feet thick with a total net sand thickness of 1,555 feet. The net to gross ratio of the sands over this depth range is approximately 58%. These sands were identified based on the logs of the Sherburne #1 test well, the Kurzweg No. 1 (SSN 39827) located next to the Class V well, and logs of other wells near the Sherburne CCS Well #1 (proposed Class VI well) location including SSN 50950 and SSN 159443.

The identified Lower Miocene sand zones are continuous throughout the licensed seismic volume and appear to be bounded by continuous, identifiable reflections. The 3D seismic data throughout the licensed area shows that the reflections are continuous and have low dip (40 to 60 feet per mile). Reflections within the thicker sand zones generally are low amplitude and can be discontinuous or down lapping to the base of the sand zone or to other internal reflections.

The clay intervals between the sand zones in the Lower Miocene also are continuous throughout the seismic data volume. In particular, the predominantly-clay interval from the top of Sand 10 to the base of Sand 8 is continuous and ranges from 250 to 350 feet in thickness. This clay confining interval is the primary confining unit.

The upper confining zone from approximately 3,000 feet to 3,600 feet depth is continuous and includes a small number of discontinuous, high-amplitude reflections that appear to show discontinuous sand intervals.

This permit application is for CO_2 injection and sequestration in the lowest two identified sand intervals (Sand 10 and Sand 11) in the Lower Miocene. The other upper sand intervals in the Lower Miocene section are anticipated to be used for sequestration in the future as part of subsequent permitting efforts.

The following table lists the depths and characteristics of the eleven (11) Miocene sand zones based on data (Spontaneous Potential and Gamma logs) from the Sherburne #1 test well SSN 975895. The depths are listed to the nearest 5-foot increments and include the SSTVD, the depth relative to the kelly bushing (KB) measuring point, and depth in feet below ground surface (BGS). The ground surface at the well site is approximately 24 to 25 above msl. The KB reference point

was approximately 15 feet above the drill pad for both well SSN 39827 and for the Sherburne #1 test well.

The depths of the sands at the Class VI injection well location are expected to be approximately 50 to 100 feet deeper based on the rate of dip in the area.

Table 2-3. Sand Zone Depth & Thickness

Sand Zone Number	Depth SSTVD/KB/BGS	Sand Thickness (feet)
1	3620-3810/ 3660-3850/ 3645-3835	190
2	3910-4020/ 3950-4060/ 3935-4045	110
3	4180-4625/ 4220-4665/ 4205-4650	445
4	4710-4740/ 4750-4780/ 4735-4765	30
5	4890-5115/ 4930-5155/ 4915-5140	225
6	5210-5280/ 5250-5320/ 5235-5305	70
7	5330-5390/ 5370-5430/ 5355-5415	60
8	5540-5610/ 5580-5650/ 5565-5635	70
9	5815-5880/ 5855-5920/ 5840-5905	65
10	5930-6070/ 6010-6110/ 5995-6095	100
11	6110-6300/ 6150-6340/ 6135-6325	190

Note: Green - Zones targeted for initial permitting and injection | Blue - Zones available for future injection

Sand 10 and Sand 11 were selected for the initial permitting based on their potential capacity and their position at the base of the Miocene section. Sand 10 has a uniform SP log signature with minor occurrences of clay on the gamma log. Sand 11 contains clay interbeds that could have additional stratigraphic trapping, which could lead to locally higher storage efficiency values and larger capacity.

The top of Sand 10 ranges from depths of 5,960 to 6,060 feet SSTVD in the sequestration area. The thickness of Sand 10 ranges from 70 to 250 feet. The top of Sand 11 ranges from depths of 6,120 to 6,180 feet SSTVD in the sequestration area. The thickness of Sand 11 ranges from 175 to 275 feet. Sand 10 and Sand 11 are laterally extensive and show no significant changes in thickness in the sequestration area and vicinity.

The containment of the CO_2 in the storage zone would be provided by the combination of the low permeability upper confining zone consisting of Miocene clay intervals, residual trapping, and structural trapping in anticlinal structures and at sealing faults.

Volumetric analysis (U.S. DOE, 2012; SPE, 2022) was used to estimate the CO_2 storage capacity of the storage zone. The CO_2 storage capacity is the mass of CO_2 that can be stored in a reservoir zone based on the reservoir-zone volume and physical properties such as porosity and pore-water saturation. The theoretical storage capacity is the amount of CO_2 that can displace the pore water leaving pore water only at the irreducible water saturation Swirr. The theoretical storage capacity is given by

$$G = V\,\emptyset\rho(1 - Swirr)$$

where G is the mass of CO_2, V is the volume of the reservoir, ø is the porosity, and ρ is the density of the CO_2 phase. The theoretical storage capacity is the maximum storage capacity and can be achieved in a structural or stratigraphic trap configuration in which the CO_2 is constrained to occupy the volume of the trap and fill all available pore space except the pore space occupied by irreducible formation water saturation. In this formulation, the volume V is the volume of the storage zone within the trapping region and is calculated by multiplying the storage zone area by the net thickness of the sand zones.

CO_2 storage in flat-lying and dipping reservoir zones is affected by fluid dynamic effects including residual CO_2-phase saturation and buoyant transport so that the CO_2 fills only a fraction of the available pore space as the CO_2 plume expands and moves. The effective storage capacity accounts for these effects with a storage efficiency factor ε as follows:

$$G = V\,\emptyset\rho\varepsilon(1 - Swirr)$$

The storage efficiency factor can vary depending on the degree of structural trapping.

For this calculation the following parameter values were used:

Parameter	Value
Storage Zone Thickness	Sand 10: 100 feet Sand 11: 190 feet
Porosity	0.33 (33 %)
Density of Supercritical CO2	43.6 pounds/cubic foot at specific gravity of 0.7
Irreducible Water Saturation	0.2 (20%)
Storage Efficiency Factor	0.08 and 0.12 (minimum residual trapping) 1.0 (structural trapping)

The volumetric analysis of the storage capacity for the one-half (0.5)-mile radius of the Class VI well was based on residual trapping with a storage efficiency factor of 0.08 in 75% of the plume area and structural/stratigraphic trapping with a storage efficiency factor of 1 in 25% of the plume area. This is expected to be a median-range value (approximate P50) of storage capacity. Median-case capacities have large uncertainty because the actual range of storage efficiency is not known at this time. The modeling results together with future monitoring of the plume will be the basis for assessing the most probable trapping scenarios and their associated storage capacity. If structural or stratigraphic traps are more widely present, the storage capacity could be significantly higher.

Sand Zone Number	Depth SSTVD/KB	Sand Thickness (feet)	Median Capacity *	Porosity	Notes
10	5930-6070/ 6010-6110	100	3.5	33%	
11	6110-6300/ 6150-6340	190	6.6	30-33%	This zone has up to 12 clay interbeds, which could provide traps with higher capacity. This zone could have finer grain size based on well-log characteristics.

Note: Green - Zones targeted for initial permitting and injection | Blue - Zones available for future injection
**(Residual Trapping and Minor Structural Trapping) | (Million metric tons in a one-half mile radius area)*

The dynamic numerical model of CO_2 injection and movement provides a more comprehensive evaluation of the transport and fate of supercritical CO_2 in the injection zones. This is presented in Permit Section 3 in the AOR Evaluation and Corrective Action Plan.

Upper Confining Zone

The upper confining zone has been identified from available geophysical information contained within logs of wells included in the project area. Information from the Sherburne #1 test well includes gamma logs, image logs, mudlogging of well cuttings, core gamma scans, and core photographs. Two wells located approximately 1,000 feet east of the Class V test well also have gamma logs in the LDNR SONRIS files. The gamma logs from these and other wells in the project area have been used to support the identification of the upper confining zone.

The upper confining zone consists of intervals with shale baseline SP values interbedded with thin intervals with low deflections of the SP log from the shale baseline. The fine-grained intervals have SP values coincident with the shale base line in the logs at shallower and deeper depths. The interbedded less clay-rich zones have low deflections of the SP, suggesting that these intervals are mud-rich. Based on the gamma logs from the Class V test well and other wells, the gamma response of the upper confining zone is intermediate between that of sand zones and clay zones. Based on the gamma readings throughout the upper confining zone, the volume of shale (Vsh) in the upper confining zone is estimated to be approximately 36% to 42% and the shale index ranges from 33 to 70%. The upper confining zone appears to coincide with a transgressive sequence of interbedded clay and sand located at the top of the Lower Miocene that is characterized by the Amphistegina B index foraminiferal zone.

The upper confining zone was present at all of the well locations in the project area. The thickness of the upper confining zone ranges from 180 feet to 865 feet. The median thickness of the upper confining zone is approximately 310 feet based on the thickness values in the project area. Half of the measured thickness values occur within the interquartile range of the data set from 240 feet to 490 feet.

The elevations of the top of the upper confining zone range from -2,700 feet to -3,640 feet in the project area. The bottom elevations of the upper confining zone range from -3,180 to -3,900 feet in the project area. The upper confining zone occurs deeper than the critical depth for CO2 to exist in the supercritical phase. The bottom elevation of the upper confining zone is the elevation of the top of the storage zones occurring within the Lower Miocene.

The containment provided by the upper confining zone is supplemented by continuous clay intervals that occur between each of the Lower Miocene sand zones. The thicknesses of each of the clay intervals are uniform throughout the project area. The thicknesses of the individual clay intervals range from 40 feet to 200 feet and the median thickness of these intervals is 90 feet. The primary confining unit between the base of Sand 8 and the top of Sand 10 ranges from 300 to 360 feet in thickness.

Anahuac Group

The Anahuac Group consists of clay with interbedded sands. The Anahuac is a basal confining zone for the Lower Miocene storage zone and an upper confining zone for the underlying Frio Formation storage sands. The Anahuac Group was deposited during a major transgressive phase of sedimentation in South Louisiana.

The thickness of the Anahuac Group ranges from approximately 200 feet to over 1,000 feet in the project area, but principally ranges from 600 feet to 760 feet and the median thickness is 680 feet. The sand zone percentage in the Anahuac Group in the project area is approximately 50%, but the sand intervals are separated by continuous clay intervals.

The confining zones in the project area are continuous and have significant thicknesses. The confining zones will provide vertical containment for the CO_2 injected into the storage zones.

The Lower Miocene storage zone (zones 1-11) is overlain by the upper confining zone. The Miocene upper confining zone consists of a clay-rich sequence of mud interbedded with thin sand and/or silt layers. The upper containment provided by the upper confining zone will be supplemented by the continuous clay zones that occur between each of the Miocene storage zone sands.

Geomechanical and Petrophysical Information [40 CFR 146.82(a)(3)(iv)]

The geophysical logs of the Sherburne #1 well are the principal source of petrophysical data for the sequestration. The geophysical logs provide physical properties information for identifying and characterizing the injection zone sand intervals and the confining units.

The stratigraphy was characterized with the SP, gamma, spectral gamma, and formation image logs.

Physical property information was derived from the neutron porosity, density porosity, and sonic scanner logs. The sonic scanner log provided geomechanical information including Poisson's ratio, Young's modulus, and estimates of the minimum horizontal stress.

Information on pore water salinity was derived from the SP and resistivity logs.

In addition, the geophysical logs from other wells in the area were evaluated and compared with the Sherburne #1 well logs. The logs from other wells included SP and resistivity logs primarily, but other logs including gamma and sonic logs have been available.

Appendix 1-B includes copies of the geophysical logs from the Sherburne #1 well.

Five core samples were collected including two cores from the upper confining unit, two cores from Miocene sand units, and one core from the Anahuac Group lower confining unit. The testing of the cores includes core photography, grain size analysis, measurements of porosity and permeability, core gamma scans, mercury injection capillary pressure, relative permeability, geomechanical testing, and measurement of residual saturation of CO_2. In addition, dual energy CT scanning of the cores was conducted to guide the selection of core plug points and to provide additional information on density, classification of sediment types, porosity, compressional and shear velocities, dynamic Poisson's ratio, dynamic Young's modulus, and unconfined compressive strength.

Seismic History [40 CFR 146.82(a)(3)(v)]

SCS reviewed the USGS Quaternary Faults map of the United States. According to the map, no evidence of mapped Quaternary faults exist within Louisiana. Multiple studies, however, have documented displacement along the Baton Rouge fault, east of Pointe Coupee Parish and the Capio Sherburne CCS Well site. Up-dip limits of faults within the Louisiana growth-fault province lie south of the project location, and consist of normal growth faults of Miocene age. The Baton Rouge and Tepetate normal fault systems lie east and west of the WMA, respectively, and a tentatively identified normal fault denoted as the Bancroft fault lies north and west of the project location (Heinrich and McCulloh, 2013). These faults appear to be aseismic, likely due to a low friction coefficient, high pore pressure, and relatively low tectonic stresses. Displacement along faults within the area ranges from 0.01 to 0.025 inches per decade (USGS, 2018). A more complete discussion of faults within the region is presented in the Faults and Fractures section of this narrative.

Recorded seismicity for Louisiana is sparse. The 1983 Seismicity Map of Louisiana (Stover et. al., 1987) reports 17 events for the state between the years 1843 and 1983. The USGS National Earthquake Information Center (NEIC) reports two “felt” earthquakes (both M 3.0) in the southern half of Louisiana in the past 25 years, both of which were east of Baton Rouge.

The 2018 Long-term National Seismic Hazard Map (USGS, 2018) shows the majority of Louisiana, including Pointe Coupee Parish and the surrounding areas, as the second lowest risk category for earthquake hazards in the United States. The Short-Term Induced Seismicity Model (USGS, 2018) shows induced seismicity generation for the region to be <1% chance of potentially minor-damage ground shaking.

Using the USGS Seismic Unified Hazard Tool, the peak ground acceleration and frequency was calculated for the proposed CCS well. Using a risk level of 2% for 50 years, the estimated peak ground motion is 0.0419 g, and the estimated annual frequency is 0.00049.

Based upon the results of the seismic history review of the WMA, and including Pointe Coupee Parish and southern Louisiana, the risk of seismicity for the region is low and presents no threat to carbon dioxide containment.

Hydrologic and Hydrogeologic Information [40 CFR 146.82(a)(3)(vi), 146.82(a)(5)]

The USDW consists of an aquifer or its portion which supplies any public water system, or an aquifer or its portion which contains a sufficient quantity of water to supply a public water system, and which currently supplies drinking water for human consumption, or contains less than 10,000 mg/L of total dissolved solids (TDS) and which is not an exempted aquifer. The USDW in the vicinity of the sequestration area consists of groundwater aquifers including the alluvial aquifer (Atchafalaya or Mississippi River alluvium), the Chicot aquifer, the Evangeline aquifer or Evangeline-equivalent aquifers, and the Jasper-equivalent aquifers as shown in **Figure 2-3**. The Evangeline-equivalent aquifers include the 800-Foot Sand, the 1,000-Foot Sand, the 1,200-Foot Sand, the 1,500-Foot Sand, and the 1,700-Foot Sand. All of these aquifers supply water for human consumption in the region surrounding the sequestration area.

The TDS content or salinity of the groundwater increases with depth and generally becomes greater than 10,000 mg/L in the Jasper-equivalent aquifers. The Jasper-equivalent aquifers include the 2,000-Foot Sand, the 2,400-Foot Sand, and the 2,800-Foot Sand. The deeper portions of the Jasper-equivalent aquifers contain groundwater with TDS content greater than 10,000 mg/L. The base of the USDW in the region of the sequestration area is identified as the depth at which salinity of the groundwater in deeper sand zones consistently becomes greater than 10,000 mg/L.

The base of the USDW at the sequestration area is approximately 2,600 to 2,650 feet below ground level based on the deep induction resistivity logs of the Class V test well, plugged and abandoned gas well 39827, and other plugged and abandoned petroleum wells in the area.

The following criteria were used to assess the occurrence and base of the USDW in accordance with requirements of the LDNR:

- Ground surface to 1,000 feet depth: 3 ohm m or greater is the USDW;
- 1,000 feet to 2,000 feet depth: 2.5 ohm m or greater is considered to be the USDW; and
- 2,000 feet depth and deeper: 2 ohm m or greater is the USDW.

The base of the USDW is assigned at the base of the sand unit that contains the lowermost USDW.

Geophysical logs of petroleum wells in the vicinity of the sequestration area were reviewed to assess the regional distribution of the base of the USDW. The base of the USDW occurs at depths ranging from 2,380 to 2,840 feet along a west-east transect from 10 miles west of the sequestration area to 10 miles east of the sequestration area. The depth of the base of the USDW also is relatively uniform with depths of 2,500 to 2,650 feet in the area up to 11 miles north of the sequestration area and approximately 6 miles south of the sequestration area. The base of the USDW becomes shallower southward and is approximately 700 to 800 feet deep in the area near I-10 approximately 11 miles south of the sequestration area.

Groundwater in the Chicot aquifer, Evangeline-equivalent aquifers, and Jasper-equivalent aquifers is part of a regional groundwater-flow system known as the Southern Hills regional aquifer system (Griffith, 2003). Regional groundwater flow in the aquifer system is driven by topographic differences between higher-elevation source areas in southern Mississippi and the northern part of eastern Louisiana and the lower elevations of the Mississippi River valley and coastal areas of Louisiana. The sequestration area lies in the southwestern, downgradient portion of the regional aquifer system in the area of the approximate downdip limit of fresh groundwater.

Figure 2-39 shows the potentiometric surface of the Evangeline-equivalent aquifers in 1980. The potentiometric surface slopes southwestward from the source area in southern Mississippi toward the downgradient limits of the aquifer system. Groundwater-supply pumping in the Baton Rouge area generates a large cone of depression in the potentiometric surface. The western portion of the aquifer system in the area surrounding the sequestration area has relatively uniform groundwater levels of less than 20 feet relative to mean sea level. The potentiometric map shows a broad shallow cone of depression in southwestern Pointe Coupee Parish and eastern St. Landry Parish that could result from groundwater-supply pumpage from towns located along U.S. Highway 190 including Krotz Springs, Lottie, Fordoche, and Livonia. Periodic monitoring of groundwater

levels in this area by the U.S. Geological Survey shows that groundwater levels have shown increases to near sea level in this area since 1980.

Figure 2-40 shows the potentiometric surface of the Jasper-equivalent aquifers in 1984. These deeper aquifers show the same pattern of regional groundwater flow to the south and southwest from the source area in Mississippi. The southwestern limit of fresh groundwater occurs near and upgradient of the sequestration area. The hydraulic heads in the Jasper-equivalent aquifers show less drawdown in the downgradient limit of the aquifer system and have elevations of 20 feet above sea level and higher. A shallow cone of depression to the east of the sequestration area could result from groundwater-supply pumpage in the area of Fordoche, Livonia, and other towns. Periodic monitoring of groundwater levels in this area by the U.S. Geological Survey shows that groundwater levels have shown increases to near sea level in this area since 1984. The potentiometric map shows that the Baton Rouge Fault forms a barrier to groundwater flow into the cone of depression of the Baton Rouge area from the south side of the fault. The potentiometric map shows that the presence of the Baton Rouge Fault as far west as Rosedale affects groundwater flow at the depth of the Jasper-equivalent aquifer so that higher heads occur south of the fault.

Groundwater use is relatively minor in the sequestration area (Sargent, 2011). Groundwater from the alluvial aquifer (Atchafalaya aquifer or Mississippi River alluvial aquifer) is used for domestic and irrigation supply. The alluvial aquifer groundwater also has been used in the area for drilling rig water supply during drilling of petroleum wells. Groundwater from the Evangeline or Evangeline-equivalent aquifer is used for domestic, industrial, agricultural, and public supply in the region. **Figure 2-41** shows the locations of water wells in the sequestration area and vicinity. Within a one-mile radius of the proposed Class VI well, there are four water wells including three domestic wells and one irrigation well. Two of the domestic wells and the irrigation well are installed in the alluvial aquifer. There is one domestic well in the 1,200-Foot Sand (Evangeline aquifer).

Geochemistry

The pore fluid resistivities and salinities of the injection zone sands were estimated from the SP log of the Sherburne #1 well, the subsurface temperatures, and the measured resistivities of the drilling mud and mud filtrate. The formation water resistivities R_w ranged from 0.088 to 0.119 ohm-m. The NaCl-equivalent salinities were estimated to be from 37,000 ppm to 45,000 ppm in the Lower Miocene sand zones. The pore-water salinities were estimated to be 45,000 ppm in Sand 10 and 38,000 ppm in Sand 11. The salinity values suggest that the pore water consists predominantly of sea water or a diagenetically-altered sea-water solution. The Lower Miocene sands in the sequestration area do not have higher-salinity brines because of the distance to and greater depth of the salt domes that are located to the west and to the south of the sequestration area.

Core samples were collected during drilling of the Sherburne #1 test well. The selected analyses include X-ray diffraction (XRD) scans of samples from three samples from each core to identify the mineralogy and mineral abundances of the confining zone clay and injection zone sand. The XRD analysis includes separate analysis of the clay-size fraction to identify swelling clay. X-ray fluorescence (XRF) testing also is included for up to three samples per core. Grain mounts of sand also are included for petrographic analysis including sorting, framework grain size, description of

the fabric, and photomicrographs of the samples. The following table summarizes the drilled depths, recovered depth ranges, and stratigraphic intervals of the cores:

Core Number	Drilled Depth (feet KB)	Actual Recovered Depth Range (feet KB)	Stratigraphic Interval
1	3,390 to 3,412	3,390 to 3,393	Miocene upper confining zone
2	3,420 to 3,450	3,420 to 3,434	Miocene upper confining zone
3	4,240 to 4,270	4,240 to 4,242.75	Lower Miocene sand
4	5,000 to 5,029	5,000 to 5,014.2	Lower Miocene sand
5	6,400 to 6,428	6,400 to 6,408.67	Anahuac Group lower confining zone

The XRD, XRF, and petrography testing are in progress and this information will be provided upon receipt and interpretation.

During the drilling of the Sherburne #1, pore-fluid samples were not collected from the injection zone sand units. Pore-fluid samples will be collected from the injection zone sand units during drilling of the Class VI well. The pore-fluid samples will be analyzed for major cations and anions including sodium, calcium, magnesium, potassium, alkalinity (bicarbonate and carbonate), chloride, and sulfate to assess the composition of the pore fluid. The pore-fluid composition also will be used for modeling of the interaction of the pore fluid with CO2 to assess the potential for CO2 dissolution trapping and for modeling the geochemical interactions of the CO2-fluid mixture with the injection zone and confining zone minerals.

Site Suitability

40-CFR 156.83 requires Owners and Operators of Class VI injection well to demonstrate to the Director that the wells are within a geologic area appropriate for the intended use. The first specific requirement is to show the sufficient extent, thickness, porosity, and permeability to sequester the CO_2 permanently and that the site has an adequate storage capacity for the design volumes. The second criterion within the regulation is the integrity of the confining zone, faults within the project area, and the potential for pressure build-up compromising the confining zone.

The preceding narrative in this section addresses the questions presented above. The sequestration area is a simple monoclinal structure with a relatively uniform dip to the south. Detailed geologic mapping and geophysical (seismic) surveys have established the geospatial distribution of multiple sand zones of sufficient thickness to store large amounts of CO_2. Geophysical logs and analysis of drilling cores from a stratigraphic test well both support the porosity and permeability calculations. Additionally, the potential injection sands are well below the USDW.

These sands have the pore pressure to maintain the CO_2 in a supercritical state. Candidate injection zones are bounded by continuous, laterally-extensive low-permeability confining zone clay units

overlying and underlying the storage zone. Significant faulting or other tectonic features are not present in the area.

The following section of this document, the AOR review, presents a robust simulation of the migration and pressure front derived from CO2 injection operations. This model illustrates that the pressure build-up near the injection well is generally less than 40 psi, insufficient to compromise a confining zone. The following sections address engineering concerns, the AOR review, and many other topics needed to operate a safe and environmentally protective Class VI injection operation.

40 CFR 156.83 sets the minimum requirements for siting a Class VI injection well. The Site Characterization demonstrates that this project meets and exceeds the minimum need for a Class VI injection operation.

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Table

Table 2-4 - Anticipated Permitting - Through to Startup

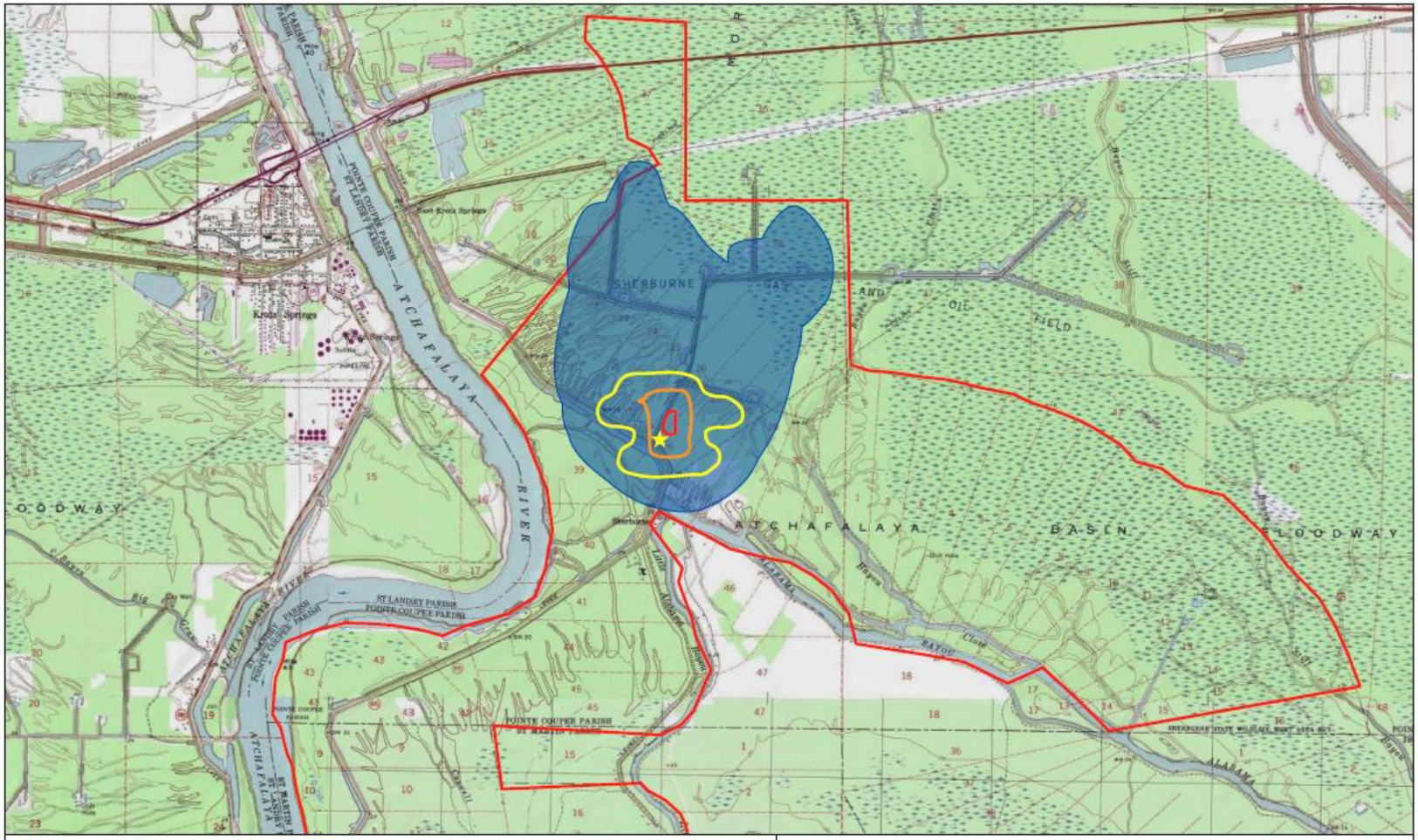
Regulatory Agency	Task Deliverable	Requirements	Agency Level	Priority	Timing	Injection Well Site	Pipeline Corridor	Capture Site (Gron)	Est. Start Date	General Comments/Applicability	Additional Notes
Lending Institution	Phase I Environmental Site Assessment (ESA)	Obligation	N/A	High	Prior to land option or financing	Applicable, if required by owner.	Applicable, likely on a parcel to parcel basis	Covered under Gron	1-Sep-22	Typically required when bank lending or a mortgage is used for the project. An Environmental Professional conducts environmental due diligence in accordance with ASTM E1527-00 for ESAs to determine the existence of Recognized Environmental Conditions (REC) associated with the site.	Phase I ESA will likely be required for DOE NEPA process. Still may be suggested even if DOE process does not move forward. Phase I ESA may be required on a parcel to parcel basis.
U.S. Environmental Protection Agency (EPA)	NEPA Compliance: Environmental Assessment Information	Approval	Federal	High	Pre-Construction	Applicable	Applicable	Applicable	1-Sep-22	Provide Environmental Assessment (EA) information in support of DOE or USACOE's preparation of Environmental Impact Statement (EIS) or Finding of No Significant Impact (FONSI). Reviewing reasonable alternatives will likely extend the permitting timelines for other permits noted below such as but not limited to Section 404, Section 10, SHPO cultural reviews, etc.	EA document will require multiple studies of different corridors to evaluate reasonable alternatives. Finalization of preferred corridor can take 12-24 months before EA can begin being finalized with accompanying USACE permits and other state/local approvals.
LDEQ	Underground Injection Control (UIC) Program	Approval	State	High	Pre-Construction	Applicable	Applicable	Likely Not Applicable	1-Sep-21	Detailed application for injection of fluids classified as industrial solid waste or hazardous waste into permeable underground reservoirs/sands. Client must also apply for no-migration petition from USEPA-Region VI.	Application will be completed in conjunction with the No-Migration Petition.
EPA - Region VI	"No-Migration Petition" for Underground Injection Control (UIC) Wells; Class 6 UIC	Approval	Federal	High	Pre-Startup	Applicable	Likely Not Applicable	Likely Not Applicable	1-Sep-21	If project will inject waste of any sort into underground permeable sand reservoirs, client must demonstrate to USEPA-Region VI in Dallas that the geological reservoir has sufficient capacity to hold 10, 20 or 30 years of the intended waste and will stay there for at least 10,000 years and the injection well will not endanger drinking water sources. Requires extensive geological data and modeling. Project must also apply to LA Dept of Natural Resources for construction of the UIC well.	Geotech investigations, test wells, and monitoring can take at least 24 months.
U.S. Army Corps of Engineers (USACE)	Wetlands & Waters of the U.S. Delineation Report	Obligation	Federal	High	Pre-Construction	Applicable	Applicable	Covered under Gron	1-Sep-22	Required to determine and map out the existence/boundary of potentially jurisdictional wetlands and waters of the U.S. The findings of the report are considered only a suggestion of jurisdictional wetlands/waters and is still subject to USACE review.	Wetland delineation studies may be required for multiple alternatives and project routes/locations for DOE EA document.
U.S. Army Corps of Engineers (USACE)	Preliminary/Approved Jurisdictional Determination (JD)	Approval	Federal	High	Pre-Construction	Applicable	Applicable	Covered under Gron	1-Jan-23	Only the USACE has jurisdiction to determine whether wetlands/waters or considered jurisdictional under Section 404. This requires the wetlands delineation to be submitted to the USACE for their review and issuance of a preliminary/approved JD.	Results of wetlands delineation will determine whether a preliminary or approved JD should be pursued.
USFWS & LDWF	Threatened & Endangered Species Survey - Compliance/ Consultation	Approval	Federal	High	Pre-Construction	Applicable	Applicable	Covered under Gron	1-Sep-22	Required prior to issuance of USACE Wetlands, Levee Crossing, and Dock permits; the Corps will require a letter from the US F&WS confirming that no impacts to T&E species will occur if the project is allowed to move forward.	A Threatened & Endangered Species survey will be completed during the wetland delineation.
LA Office of Cultural Development - SHPO	National Historical Preservation Act Clearance Letter	Approval	State	Urgent	Pre-Construction	Applicable	Applicable	May be completed previously by Gron	1-Sep-22	SHPO review/approval is triggered upon submission of the wetlands permit application to the USACE. SHPO may require a Phase I Cultural Resources Survey to be conducted by a qualified 3rd party archeologist to identify archeological sites of historic significance on the site.	Section 106 review will be required for any federal permit/funding.
LDEQ - Water Permits Division	CWA §401 Water Quality Certification (WQC)	Approval	State	Moderate	Pre-Construction	Applicable	Applicable	Applicable	1-Oct-23	Required prior to USACE issuance of USACE Wetlands, Levee Crossings, and Dock permits; LDEQ evaluation of water quality impacts.	LDEQ WQC will be completed during 404 permit timeline.
USACE - New Orleans District and USACE approved wetlands mitigation bank	Compensatory Wetland Mitigation Credits	Obligation	Federal	High	Pre-Construction	To be determined	Applicable	Covered under Gron	1-Feb-24	Required to offset impacts to jurisdictional wetlands (not waters). Purchase of wetland mitigation credits is the last milestone prior to issuance of 404 Permit; Cost of wetland mitigation is subject to change based on the amount of impacted wetland by the project and cost of available mitigation credits at time of purchase/need.	Discussions with approved wetland mitigation banks can also begin once a general understanding of impacts is known. Mitigation credits can also be purchased/reserved in the beginning stages of USACE permitting to consolidate timelines.
U.S. Army Corps of Engineers (USACE)	Clean Water Act (CWA), Section 404 - "Wetlands Permit"	Permit	Federal	High	Pre-Construction	To be determined	Likely Applicable	Covered under Gron	1-May-23	Required for any proposed impacts to jurisdictional wetlands/waters. Once permit application/drawings are submitted and considered administratively complete, the application will be placed on public notice and triggers approval needs from USFWS, LDWF, SHPO, LDEQ and other agencies. Once public comments have been addressed, the USACE will determine the amount of wetland mitigation required to offset impacted wetlands.	Wetland permit is subject to change based on USACE review. Permit must include all infrastructure required for project to function and be constructed for its intended use. This include temporary construction measures.
U.S. Army Corps of Engineers (USACE)	Clean Water Act (CWA), Section 10 - "Navigable Waters Permit"	Permit	Federal	High	Pre-Construction	Not Applicable	Likely Applicable	Not Applicable	1-May-23	Required for any proposed impacts and/or crossings to navigable water bodies. GIWW will be considered section 10 waters. Permit is completed in part of Section 404 permit application and submitted as one to the USACE.	Section 10 permit is subject to change based on USACE review.
Atchafalaya Basin Levee District Approval	Regional Levee Board Approval	Approval	Local	Moderate	Pre-Construction	Not Applicable	Likely Applicable	Not Applicable	1-Jun-23	Crossing levee system will also require regional levee board approval prior to permit issuance. levee district comments to be addressed during public notice.	Ultimately subject to Section 408 permit.
U.S. Army Corps of Engineers (USACE)	Clean Water Act (CWA), Section 408 - "Levee Permit"	Permit	Federal	High	Pre-Construction	Not Applicable	Likely Applicable	Not Applicable	1-May-23	Required for any activities across or within proximity to USACE federal projects such as an accredited levee system. Permit is completed in part of Section 404 permit application and submitted as one to the USACE. Crossing levee system will also require regional levee board approval prior to permit issuance. levee district comments to be addressed during public notice.	Wetland permit is subject to change based on USACE review.
LDEQ - Air Permits Division	State-Only Minor Source Air Permit (Minor Modification)	Permit	State and/or Federal	High	Pre-Construction	Applicable	Applicable	Likely covered under Gron	1-Sep-21	Anticipated to be included as a minor modification to existing Gron air permit.	Subject to change based on Gron and Cyclus construction and permit timelines.
Parish Zoning Commission	Parish Zoning Permit	Permit	State	High	Pre-Construction	To be determined.	To be determined.	Not Applicable	1-Sep-22	Location of the injection well site, capture area and potentially pipeline corridor may require industrial zoning depending on the municipality and/or parish.	rezoning requirements will be determined once proposed layouts for CAPIO are developed.
LDEQ - Water Permits Division	NOI for Storm Water General Permit for Large Construction Activities	Permit	State	Low	Pre-Construction	Applicable	Applicable	Applicable	1-Aug-23	Required for construction site disturbing five or more acres; construction SWPPP must be in place prior to submittal of NOI.	Will likely be required for all aspect of the CAPIO project.

Table 2-4 - Anticipated Permitting - Through to Startup

Regulatory Agency	Task Deliverable	Requirements	Agency Level	Priority	Timing	Injection Well Site	Pipeline Corridor	Capture Site (Gron)	Est. Start Date	General Comments/Applicability	Additional Notes
LA Department of Transportation & Development (LADOTD)	Project permit for utility crossings and installation across state highways	Permit	State	Moderate	Pre-Construction	To be determined	Applicable	Likely included in Gron	1-Jan-23	Based on load sizes and route; road upgrades may be required. Subsurface utility engineering work may be required to locate existing utilities. Cased pipeline must extend from right-of-way to right-of-way, and be properly vented and marked at or beyond the right-of-way line. The casing shall have at least four feet of cover below the roadway and two feet of cover below ditches or drainage structures. Crossings shall be made at as nearly right angles to the highway as possible.	Applicability will be determined based on possible road crossings for pipeline and access needs for capture site and injection well.
Union Pacific	Project permit for utility installation and crossings for UP rail lines.	Permit	Union Pacific	Moderate	Pre-Construction	Not Applicable	Applicable	Not Applicable or Included in Gron	1-Jan-23	Anticipated that Route 302 will cross one (1) UP main line. Rush handling can be requested for pipelines crossings that are less than 40" in diameter and do not deviate from standard UP engineering specifications. Encroachment agreements can not be rushed.	Anticipated that Capio will only require a crossing agreement. Encroachment agreements can take a minimum of 6 months to complete.
Federal Aviation Administration (FAA)	FAA Notification Letter	Approval	Federal	Low	Pre-Construction	Likely applicable	Likely applicable	May be included in Gron, depending on construction timing.	1-Jan-23	Required for permanent and temporary structures (including construction cranes) greater than 200 feet tall or, possibly shorter structures, within 5 miles of airport runways greater than 3,200 feet in length.	FAA notification likely dependent on requirements for crane activity during construction period.
Louisiana Department of Natural Resources (LDNR)	Ground Water Supply Well Registration	Approval	State	Low	Pre-Construction	To be determined. Could use Gron wells.	Likely Not Applicable	Likely will use Gron wells	1-Jan-23	Water wells must be installed by a licensed driller/installer; registration must be done by licensed driller/installer within 30 days of installation. A water well notification form must also be completed and submitted to LDNR 60 days prior to drilling. Groundwater wells completed in the Mississippi River Alluvial Aquifer do not require approval from LDNR or CAGWCC.	To be determined if process water strictly for CAPIO will be needed. May be likely needed to compressor station and injection well site.
U.S. Environmental Protection Agency (USEPA) and/or U.S. Coast Guard (USCG)	Spill Prevention, Control and Countermeasures Plan (SPCC) Plan	Obligation	Federal	Low	Pre-Construction	Not Applicable	Not Applicable	Covered under Gron	1-Jul-23	Plan required under 40 CFR 112 for facilities that exceed 1,320 gallons of aboveground storage capacity of oil, including animal fats and vegetable oils, and/or 42,000 gallons of underground oil storage capacity, including containers of 55 gallons and larger. Includes storage associated with construction activities as well.	Applicability will be determined based on the amount of storage required during construction and operation of CAPIO.
LDEQ - Water Permits Division	LPDES Ind. Multisector General Stormwater Permit for Industrial Activity "Water Permit"	Permit	State	High	Pre-Startup	Not Applicable	Not Applicable	Covered under Gron	1-Jan-23	Required for discharge of wastewater, sanitary and stormwater associated with industrial activities to waters of the state; individual permit provides greatest flexibility. Technically not required until startup but often sought concurrently with other pre-startup permits.	Infrastructure at injection well site will likely trigger industrial water permit. To be determined based on exact scope of project.
Department of Transportation (DOT - Pipeline and Hazardous Materials Safety Administration	HMR PHMSA DOT Approval	Approval	Federal	High	Pre-Startup	Likely Not Applicable	Applicable	Likely Not Applicable	1-Jan-23	Required to obtain an approval prior to performing a specific function under the Hazardous Materials Regulations (HMR) that requires PHMSA Associate Administrator approval. An approval is written consent to perform a function for which prior authorization by the Associate Administrator is required under the HMR or authorized international standard.	Applicants apply for an initial approval at least 120 days prior to when the approval will be needed.
LDEQ – Water Permits Division	"IT Decision Document" – Environmental Impact Questions	Obligation	State	High	Pre-Startup	To be determined	To be determined	To be determined	1-Sep-22	Responses to the "IT Questions" and Alternative Site Analysis are mandatory for new facilities and expansions. Will have to address all components of CAPIO including capture station, injection well site, compressor station, etc.	LDEQ water permits are to be finalized before project can become operational (Pre-Startup). It is typical to begin permitting process as early as possible (preferably in conjunction with the USACE permits) to avoid delays to operation start up timelines.
LDEQ - Waste Permits Division	Notice of Registration as Solid Waste and/or Hazardous Waste Generator	Approval	State	Low	Pre-Startup	Likely Applicable	Likely Applicable	Likely Applicable	1-Jan-25	Must register as solid waste or hazardous waste generator from LDEQ depending on the generation of waste materials and longevity of onsite storage of waste.	Need to confirm solid waste facilities are adequate to remove solids from facility within 30 days.
LDEQ Office of Environmental Compliance	Spill Prevention and Control (SPC) Plan	Obligation	State	Low	Pre-Startup	Not Applicable	Not Applicable	Covered under Gron	1-Jul-23	Required under LAC 33: IX – Chapter 9 where minimum aboveground storage capacity of oil is 1320 U.S. gallons for two or more individual containers in aggregate with a common storage area or 660 U.S. gallons for an individual container. May be combined with SPCC prepared under 40 CFR 112.	Applicability will be determined based on the amount of storage required during construction and operation of CAPIO.
U.S. Environmental Protection Agency (USEPA)	Risk Management Plan (RMP)	Approval	Federal	Moderate	Pre-Startup	Not anticipated	Not anticipated	Not anticipated	1-Sep-24	Risk Management plan required under section 112 (r), Part 68 of the Clean Air Act Amendments. Facilities holding more than a threshold quantity of a regulated substance in a process are required to comply with EPA's Risk Management Program regulations. Toxic chemicals (77 listed) range from 500 to 20,000 lbs. and for flammables the threshold quantity is 10,000 lbs.	To be determined based on quantities of applicable regulated chemicals stored on site.
EPA and/or U.S. Coast Guard (USCG)	Oil Pollution Act (OPA 90) Spill Response Plan	Permit	Federal	Moderate	Pre-startup	Not anticipated	Not anticipated	Not anticipated	1-Sep-24	Required if over 1 million gallons of oil stored on land or if transferring 42,000 gallons or more of oil over water. Under OPA90 Section 311(a)(1), animal fats and vegetable oils are considered "oil".	Will depend on storage requirements of CAPIO
Louisiana Public Service Commission	Intrastate Common Carrier Petroleum (Liquid) Pipeline Registration	Registration	State	Moderate	Pre-startup	Not anticipated	Likley Applicable	Not anticipated	1-Jan-25	Pursuant to LA Revised Statue 45:252 all pipelines through which petroleum is conveyed from one point to another point in the state are declared to be common carriers as defined below and are placed under the control of and subject to regulation by the Louisiana Public Service Commission. Prior to initiating service, a Carrier shall submit a registration with the Commission and tariff(s)	Will depend if carbon dioxide is considerd a common carrier.

Footnotes:
1. The CAPIO project is assumed to consist of three main components including (1) a Capture Site located at the Gron Fuels facility, (2) an approximate 35 mile pipeline (route 302), and (3) an injection well site with associated compressor station.
2. Development of the permit matrix is based on limited project specific information and data for the CAPIO project and is subject to change as new information becomes available.
3. Additional permits, approvals and obligations may be required and will be further determined once more information becomes available.
4. Permit Matrix assumes a Department of Energy NEPA process will be required. Permitting requirements and timelines are subject to change depending on the DOE NEPA process/regulations that will be determined at a later date.
5. Carbon capture/sequestration information is not readily available in Louisiana. EPA and LDEQ UIC programs may require additional information which could prolong permitting timelines for No-Migration Petitions.

Figures



Legend

- CO_2 Sequestration Well
- Area of Review
- Sherburne Lease

Change in Pressure Contours
- 20 psi
- 30 psi
- 40 psi

Notes:
- Max change in pressure illustrated - Year 5 in Sand 11.
- At no time in the model was pressure sufficient to drive brine in a hypothetical artificial penetration outside the storage complex.

FIGURE 2-1
TOPOGRAPHIC MAP
CAPIO SEQUESTRATION, LLC
POINTE COUPEE PARISH, LA

SCS ENGINEERS
Wichita, KS | January 2023

0 25,000 Feet

N

Age (Ma)	System	Series	Group	Lithostratigraphic Unit
	Quaternary	Holocene Pleistocene	-	Atchafalaya Aquifer Chicot Aquifer
2.58				
	Neogene	Pliocene	-	Evangeline Aquifer
5.3				
		Miocene	Fleming	Lagarto Formation Oakville Formation
23				
	Paleogene	Oligocene	Catahoula Vicksburg	Anahuac Frio Formation Vicksburg
34				
		Eocene	Jackson Claiborne	Jackson Cockfield Sparta Upper Wilcox
			Wilcox	
56				
		Paleocene		Middle Wilcox Lower Wilcox
			Midway	Midway
66				

Note: Ma age in millions of years.

FIGURE 2-2
GENERALIZED LITHOSTATIGRAPHIC SUBDIVISION, SEQUESTRATION AREA
CAPIO SEQUESTRATION, LLC
POINTE COUPEE PARISH, LA

SCS ENGINEERS
Wichita, KS | November 2022

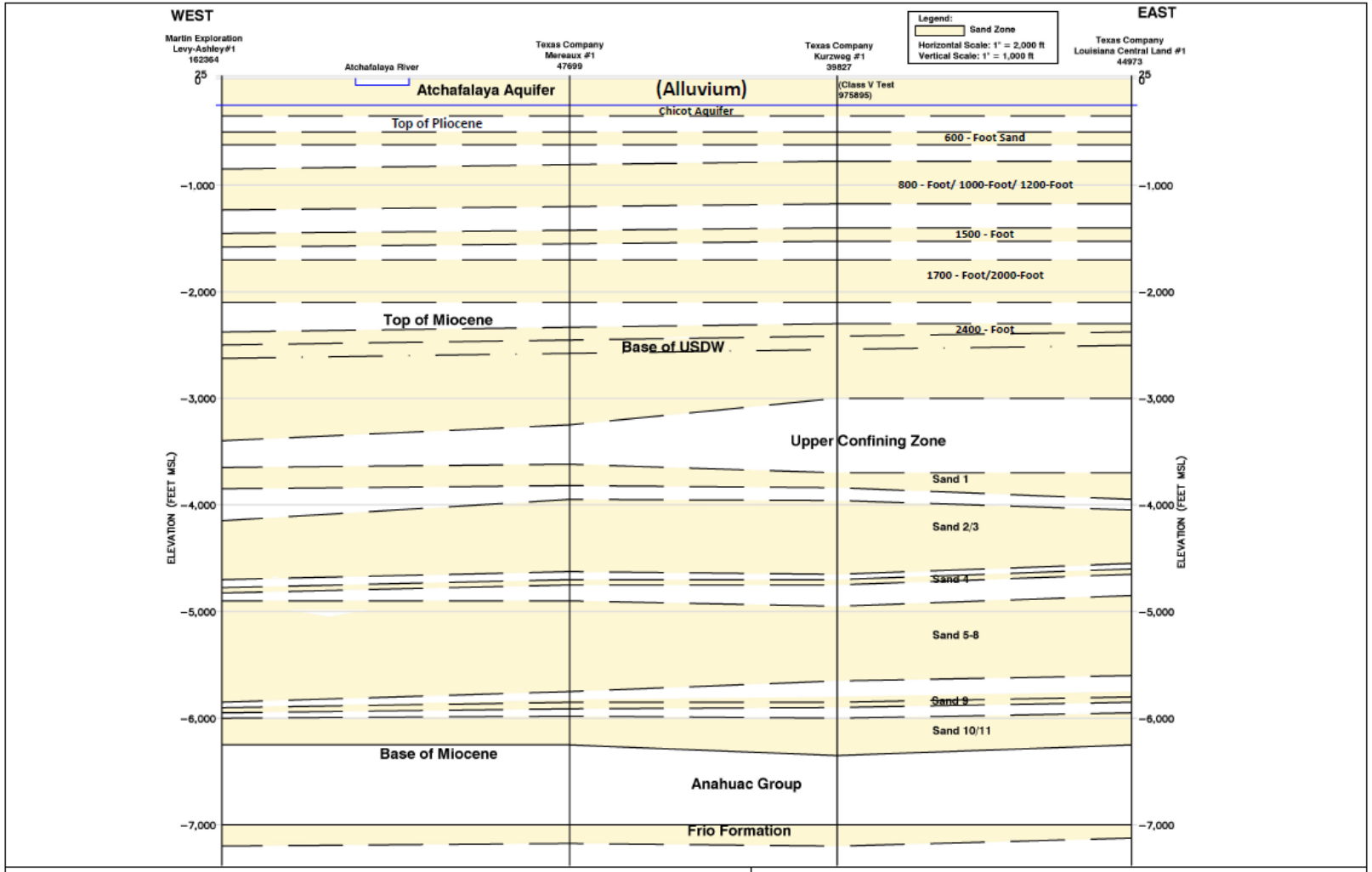
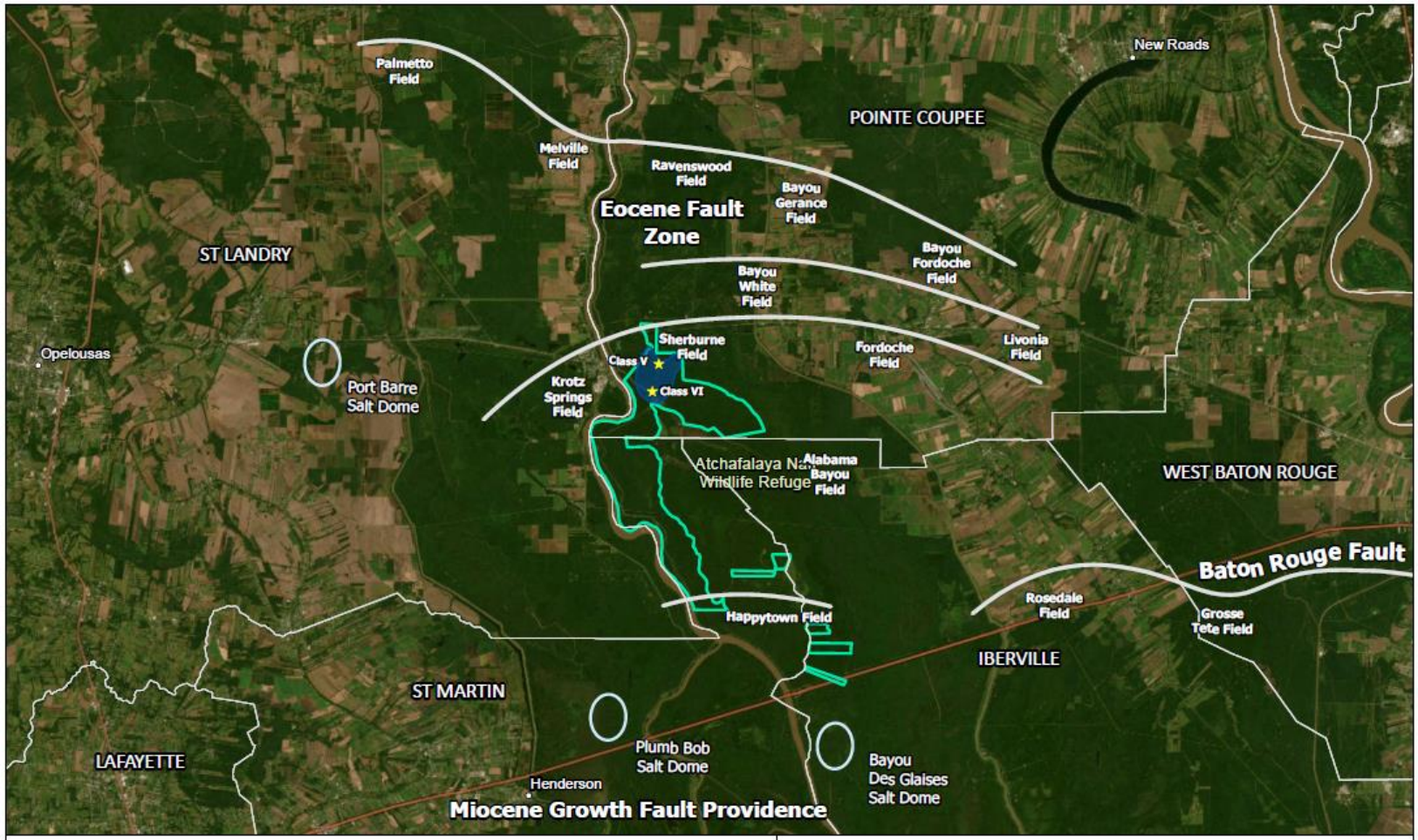


FIGURE 2-3
CROSS-SECTION EAST TO WEST
CAPIO SEQUESTRATION, LLC
POINTE COUPEE PARISH, LA

SCS ENGINEERS
Wichita, KS | November 2022

N



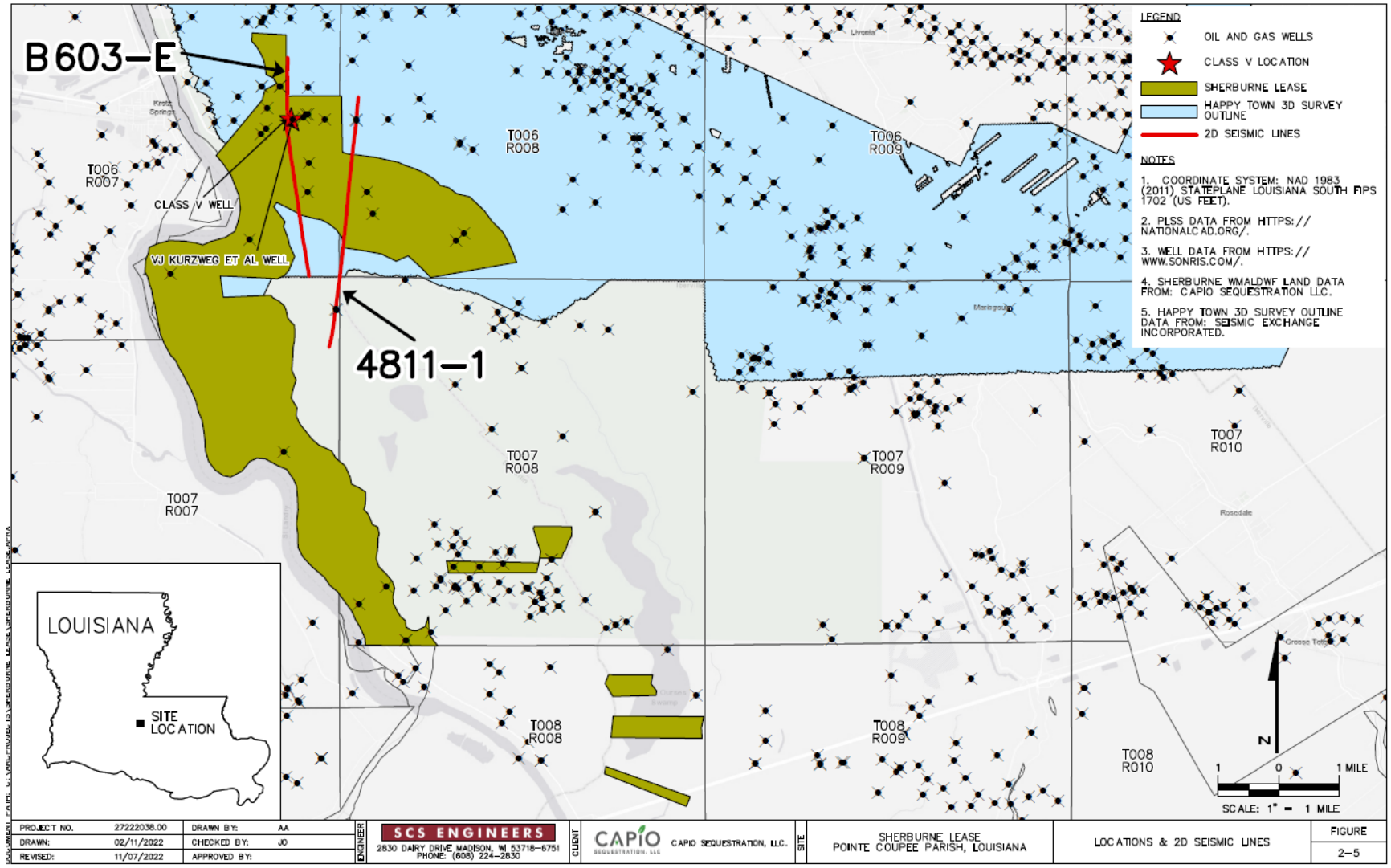
Legend

- CO_2 Sequestration Well
- Fault
- Salt Dome
- Area of Review
- Sherburne Lease

FIGURE 2-4
REGIONAL GEOLOGIC STRUCTURE FEATURES
CAPIO SEQUESTRATION, LLC
POINTE COUPEE PARISH, LA

SCS ENGINEERS
Wichita, KS | January 2023

0 25,000 Feet
N


B603-E
4811-1
CLASS V WELL
VJ KURZWEG ET AL WELL
T006 R007
T006 R008
T006 R009
T007 R007
T007 R008
T007 R009
T007 R010
T008 R008
T008 R009
T008 R010
LOUISIANA
SITE LOCATION
LEGEND
OIL AND GAS WELLS
CLASS V LOCATION
SHERBURNE LEASE
HAPPY TOWN 3D SURVEY OUTLINE
2D SEISMIC LINES
NOTES
1. COORDINATE SYSTEM: NAD 1983 (2011) STATEPLANE LOUISIANA SOUTH FIPS 1702 (US FEET).
2. PLSS DATA FROM HTTPS://NATIONALCAD.ORG/.
3. WELL DATA FROM HTTPS://WWW.SONRIS.COM/.
4. SHERBURNE WMALDWF LAND DATA FROM: CAPIO SEQUESTRATION LLC.
5. HAPPY TOWN 3D SURVEY OUTLINE DATA FROM: SEISMIC EXCHANGE INCORPORATED.
N
1 0 1 MILE
SCALE: 1" = 1 MILE
PROJECT NO. 27222038.00
DRAWN: 02/11/2022
REVISED: 11/07/2022
DRAWN BY: AA
CHECKED BY: JO
APPROVED BY:
ENGINEER
SCS ENGINEERS
2830 DAIRY DRIVE, MADISON, WI 53718-6751
PHONE: (608) 224-2830
CLIENT
CAPIO SEQUESTRATION, LLC.
SITE
SHERBURNE LEASE
POINTE COUPEE PARISH, LOUISIANA
LOCATIONS & 2D SEISMIC LINES
FIGURE
2-5

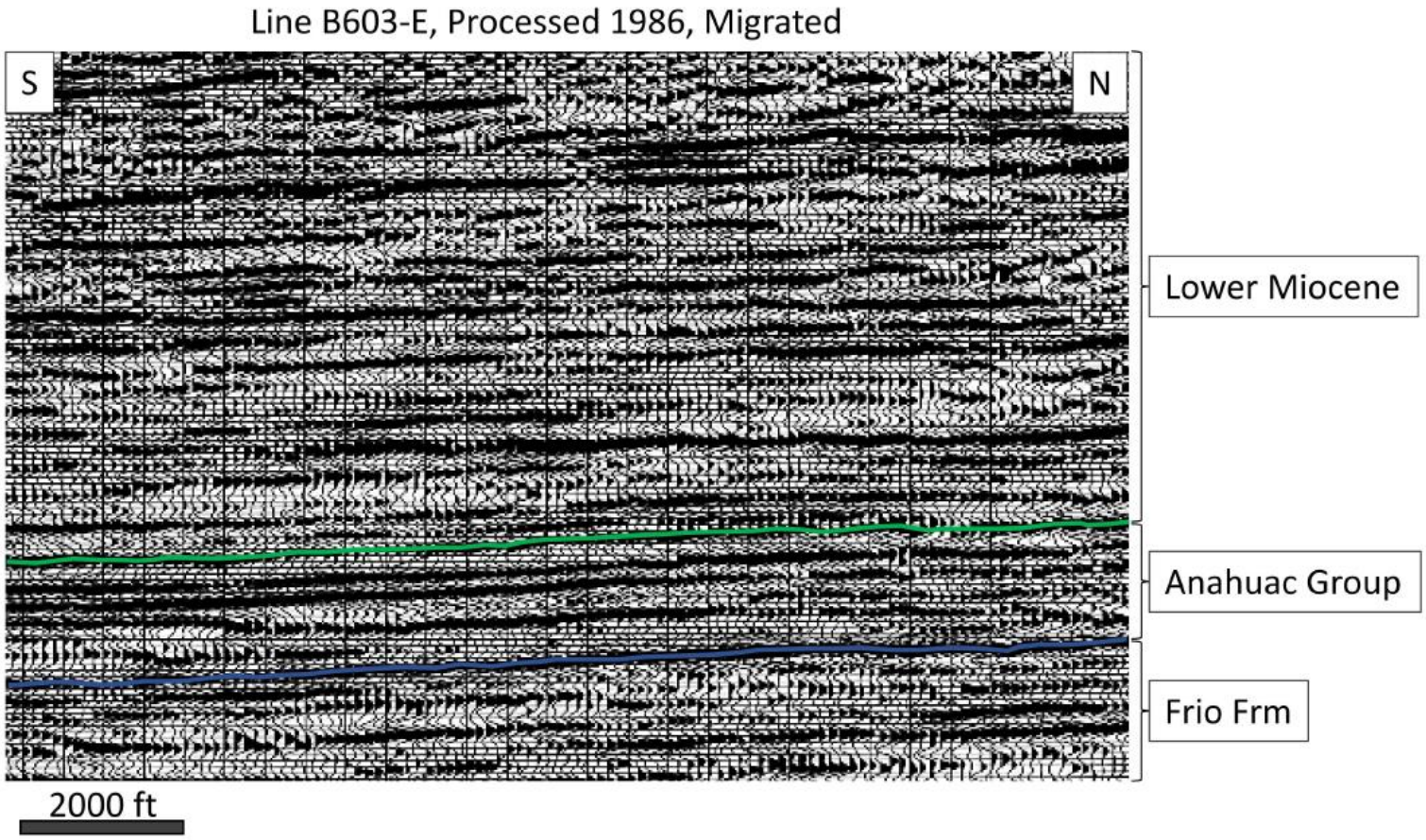
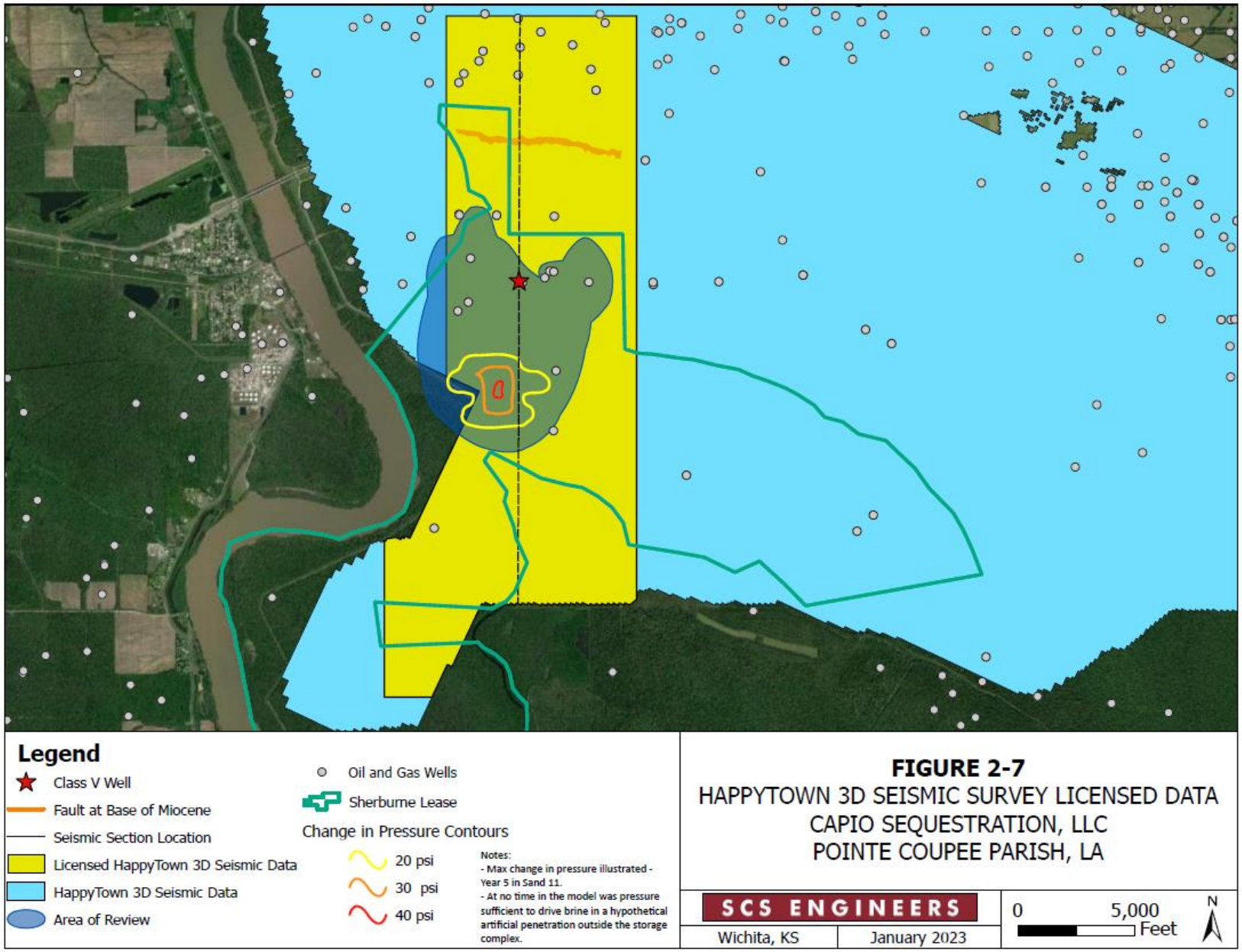


FIGURE 2-6
PORTION OF SEISMIC LINE B603-E
CAPIO SEQUESTRATION, LLC
POINTE COUPEE PARISH, LA

SCS ENGINEERS
Wichita, KS | November 2022

N


Legend
Class V Well
Fault at Base of Miocene
Seismic Section Location
Licensed HappyTown 3D Seismic Data
HappyTown 3D Seismic Data
Area of Review
Oil and Gas Wells
Sherburne Lease
Change in Pressure Contours
20 psi
30 psi
40 psi
Notes:
- Max change in pressure illustrated - Year 5 in Sand 11.
- At no time in the model was pressure sufficient to drive brine in a hypothetical artificial penetration outside the storage complex.
FIGURE 2-7
HAPPYTOWN 3D SEISMIC SURVEY LICENSED DATA
CAPIO SEQUESTRATION, LLC
POINTE COUPEE PARISH, LA
SCS ENGINEERS
Wichita, KS
January 2023
0
5,000
Feet
N

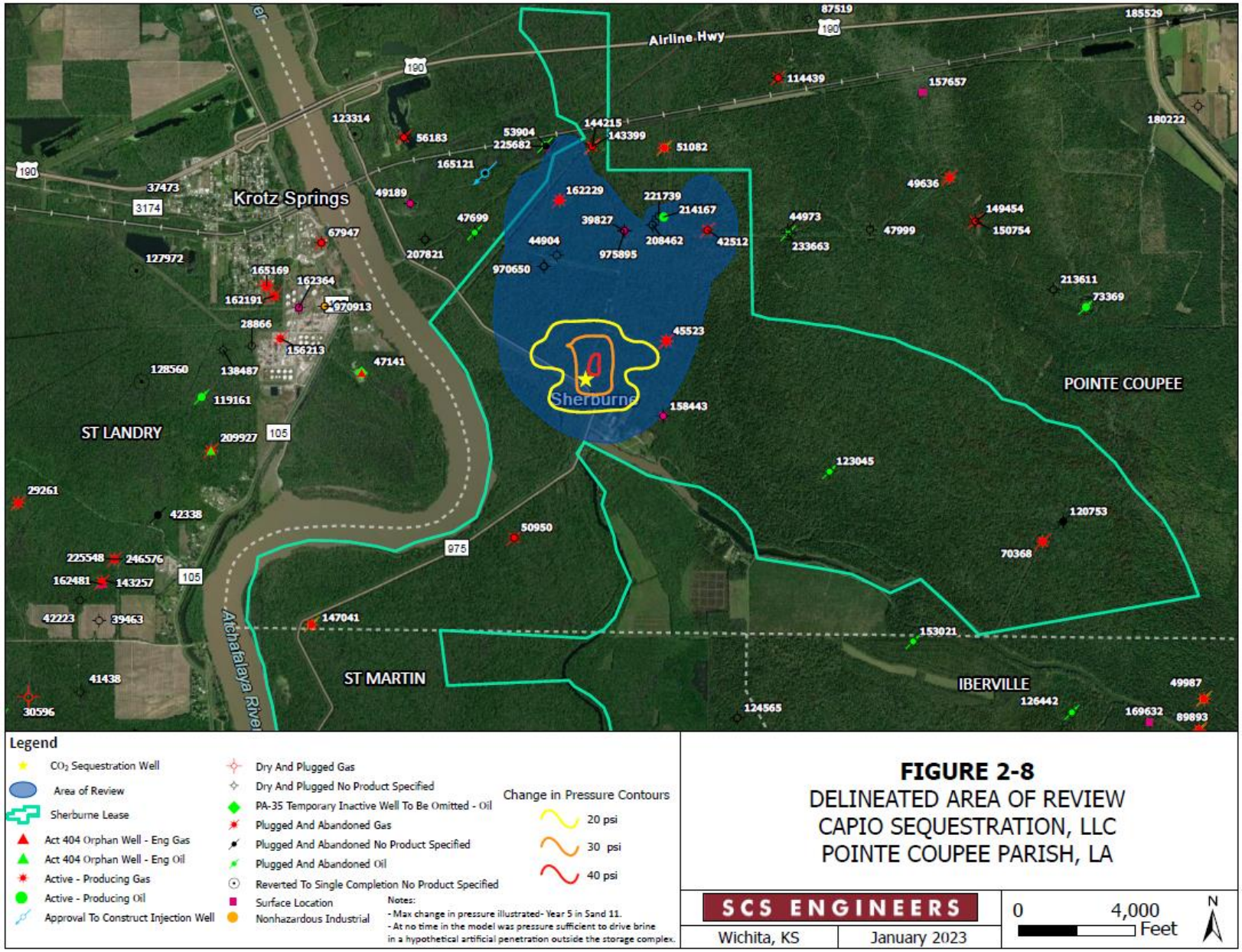
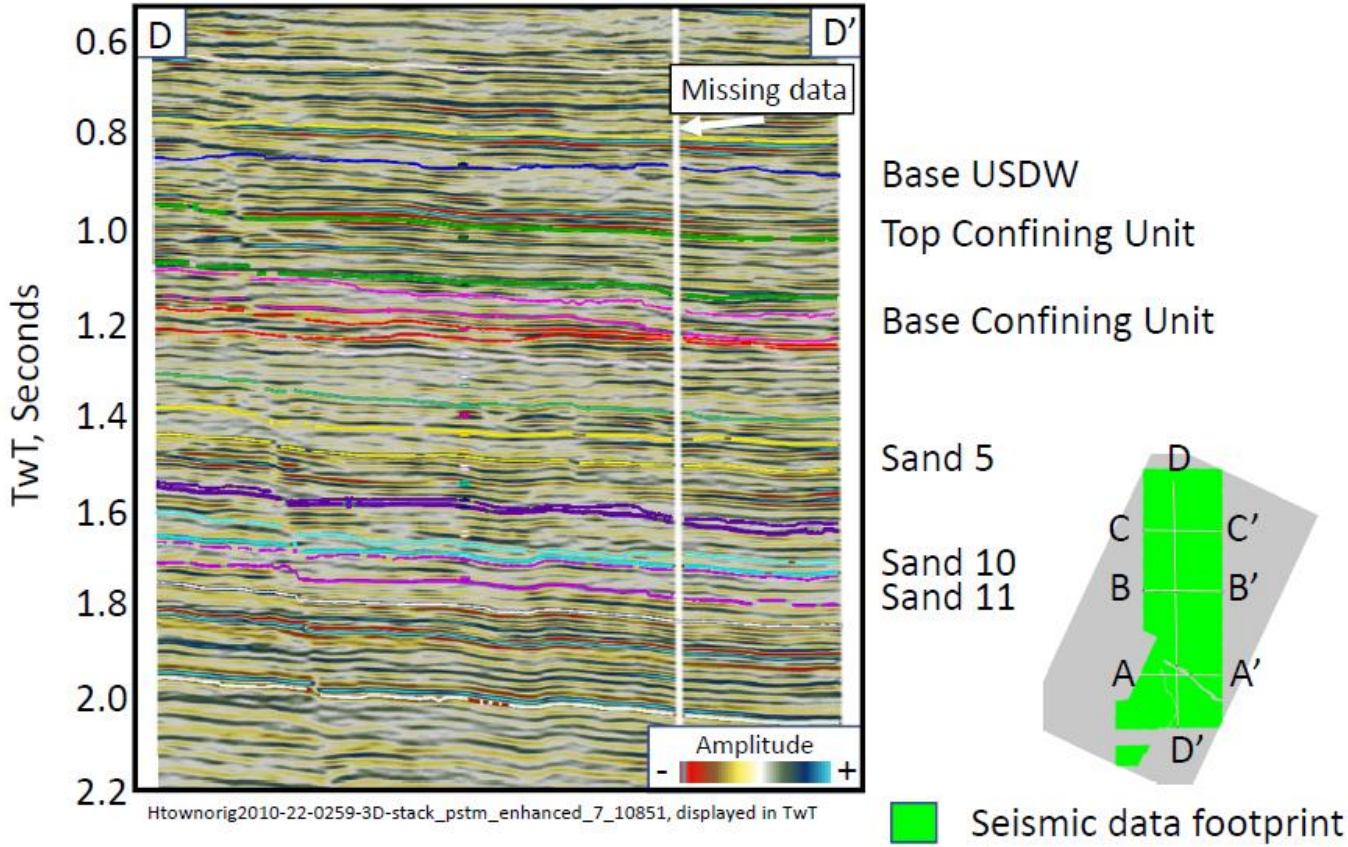
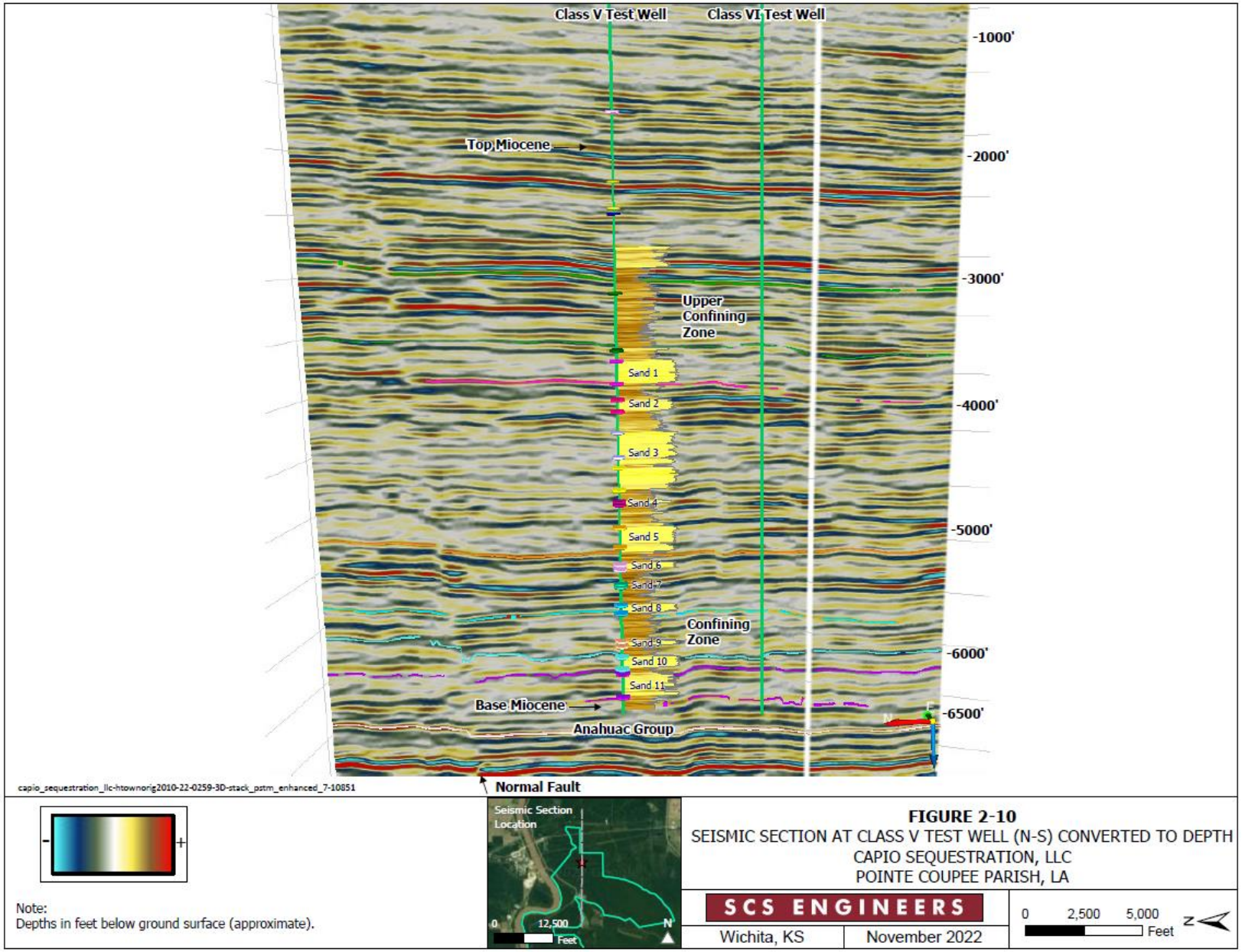


FIGURE 2-8
DELINEATED AREA OF REVIEW
CAPIO SEQUESTRATION, LLC
POINTE COUPEE PARISH, LA



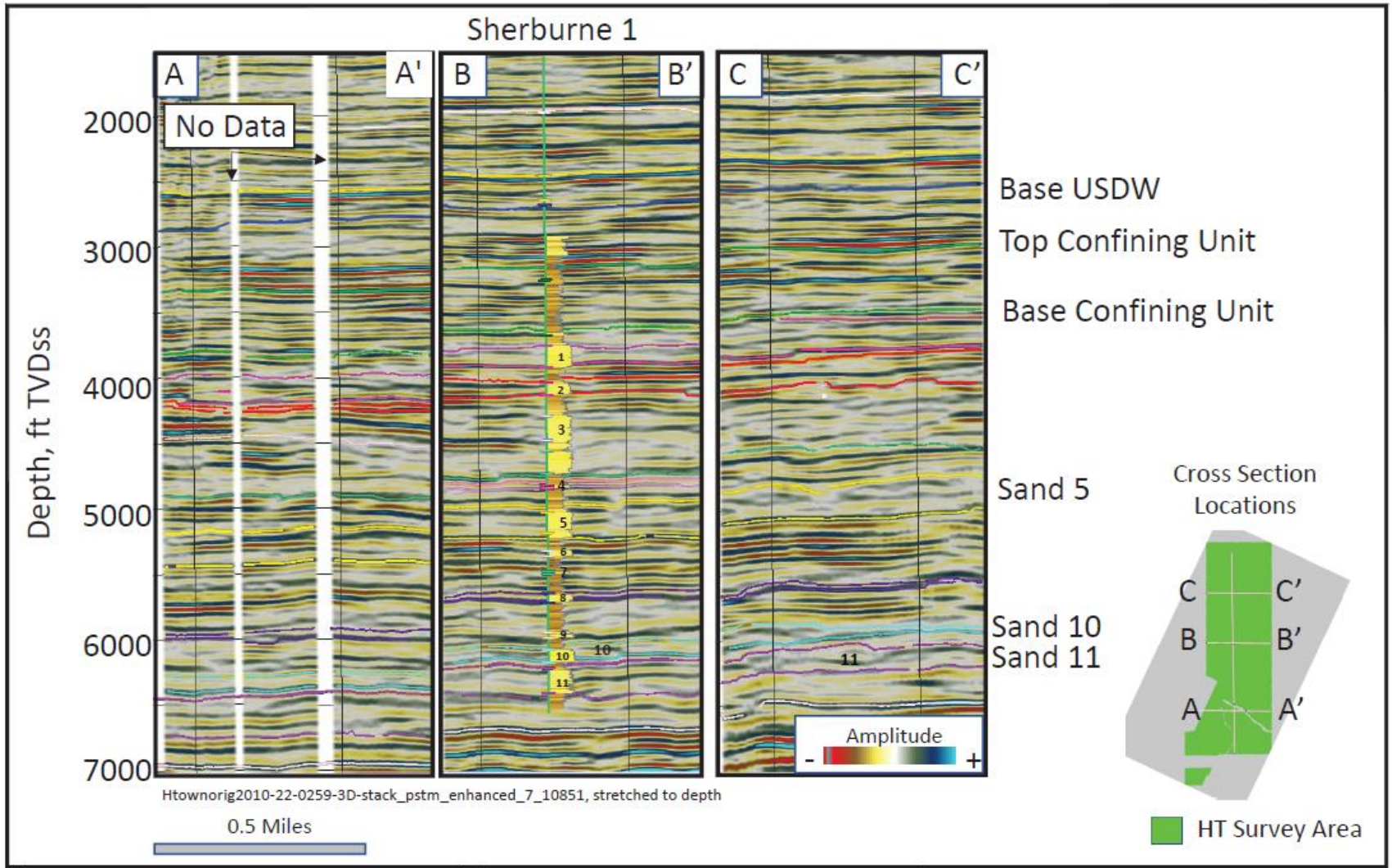
CLIENT: Capio Sequestration, LLC		SITE: Sherburne Lease, Pointe Coupee Parish, Louisiana	N-S Seismic Cross Section in Time
PROJECT NO. 27222154.00	DRAWN BY: JAO	ENGINEER: SCS ENGINEERS, 2830 DAIRY DRIVE MADISON, WI 53718-6751, PHONE: (608) 224-2830	FIGURE 2-9
DRAWN: 11/8/2022	CHECKED BY:		
REVISED: 11/8/2022	APPROVED BY:		



Note:
Depths in feet below ground surface (approximate).

FIGURE 2-10
SEISMIC SECTION AT CLASS V TEST WELL (N-S) CONVERTED TO DEPTH
CAPIO SEQUESTRATION, LLC
POINTE COUPEE PARISH, LA

SCS ENGINEERS
Wichita, KS | November 2022



CLIENT: Capio Sequestration, LLC.	SITE: Sherburne Lease, Pointe Coupee Parish, Louisiana	West-East Seismic Cross Sections	
PROJECT NO. 27222154.00	DRAWN BY: JAO	ENGINEER: SCS ENGINEERS, 2830 DAIRY DRIVE MADISON, WI 53718-6751, PHONE: (608) 224-2830	FIGURE 2-11
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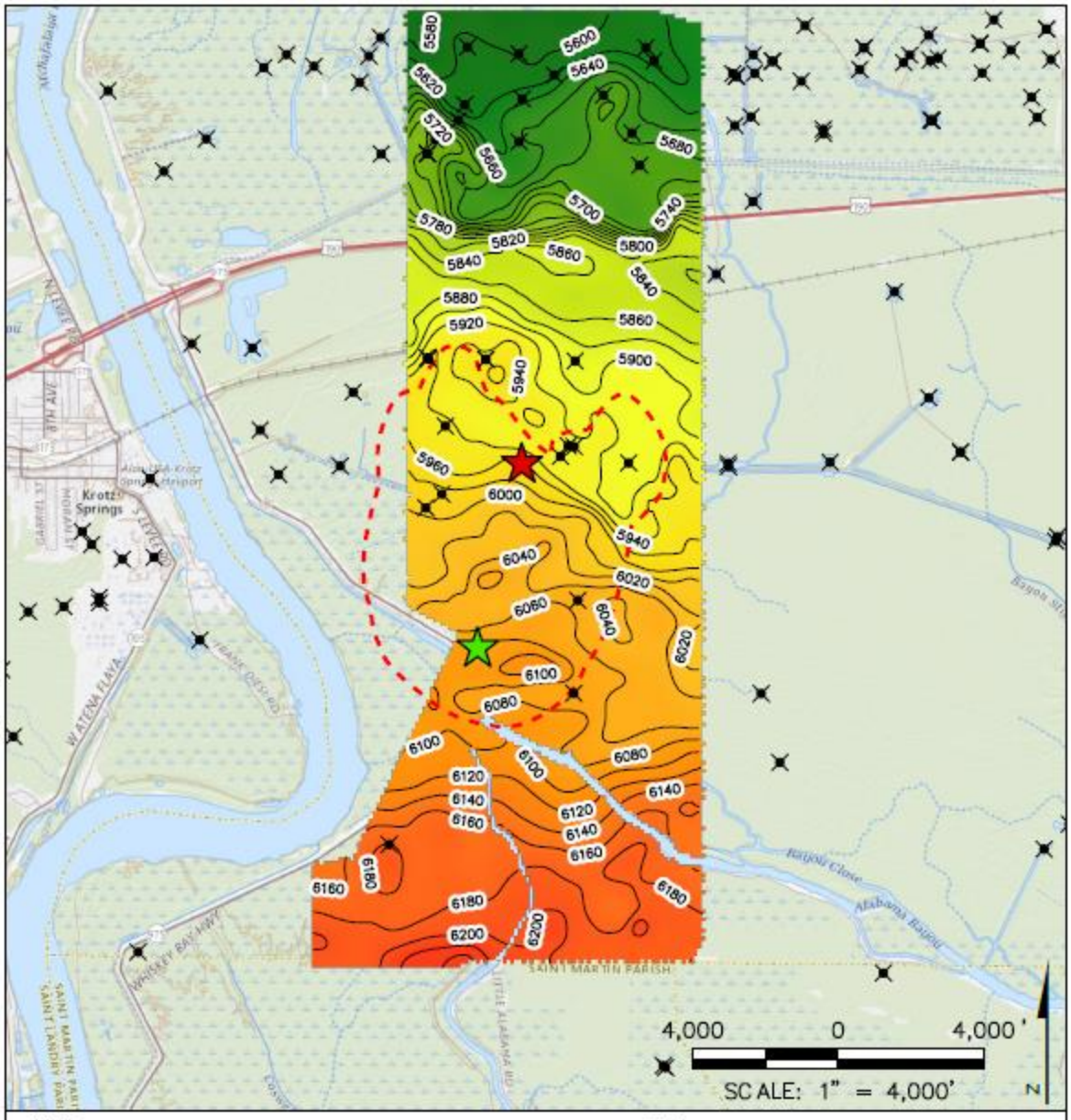
REVISED: 11/6/2022	APPROVED BY:		



LEGEND

- CLASS V PROPOSED LOCATION
- PROPOSED CLASS VI
- OIL AND GAS WELLS
- 20 FT CONTOURS
- AREA OF REVIEW

DEPTH (SUBSEA TOTAL VERTICAL DEPTH), FEET
6250.03
5573.49

NOTES

1. BASEMAP: USGS THE NATIONAL MAP. DATA REFRESHED JUNE 2022.
2. COORDINATE SYSTEM: NAD 1983 (2011) STATEPLANE LOUISIANA SOUTH FIPS 1702 (US FEET).
3. WELL DATA FROM HTTPS://WWW.SONRIS.COM/.

CLIENT: CAPIO SEQUESTRATION, LLC.	SITE: SHERBURNE LEASE POINTE COUPEE PARISH, LOUISIANA	SAND ZONE 10 STRUCTURE MAP	
PROJECT NO. 27222154.00	DRAWN BY: AA	ENGINEER: SCS ENGINEERS	FIGURE
DRAWN: 10/12/2022	CHECKED BY: JAO	2830 DAIRY DRIVE, MADISON, WI 53718-6751 PHONE: (608) 224-2830	2-12
REVISED: 01/24/2023	APPROVED BY:		

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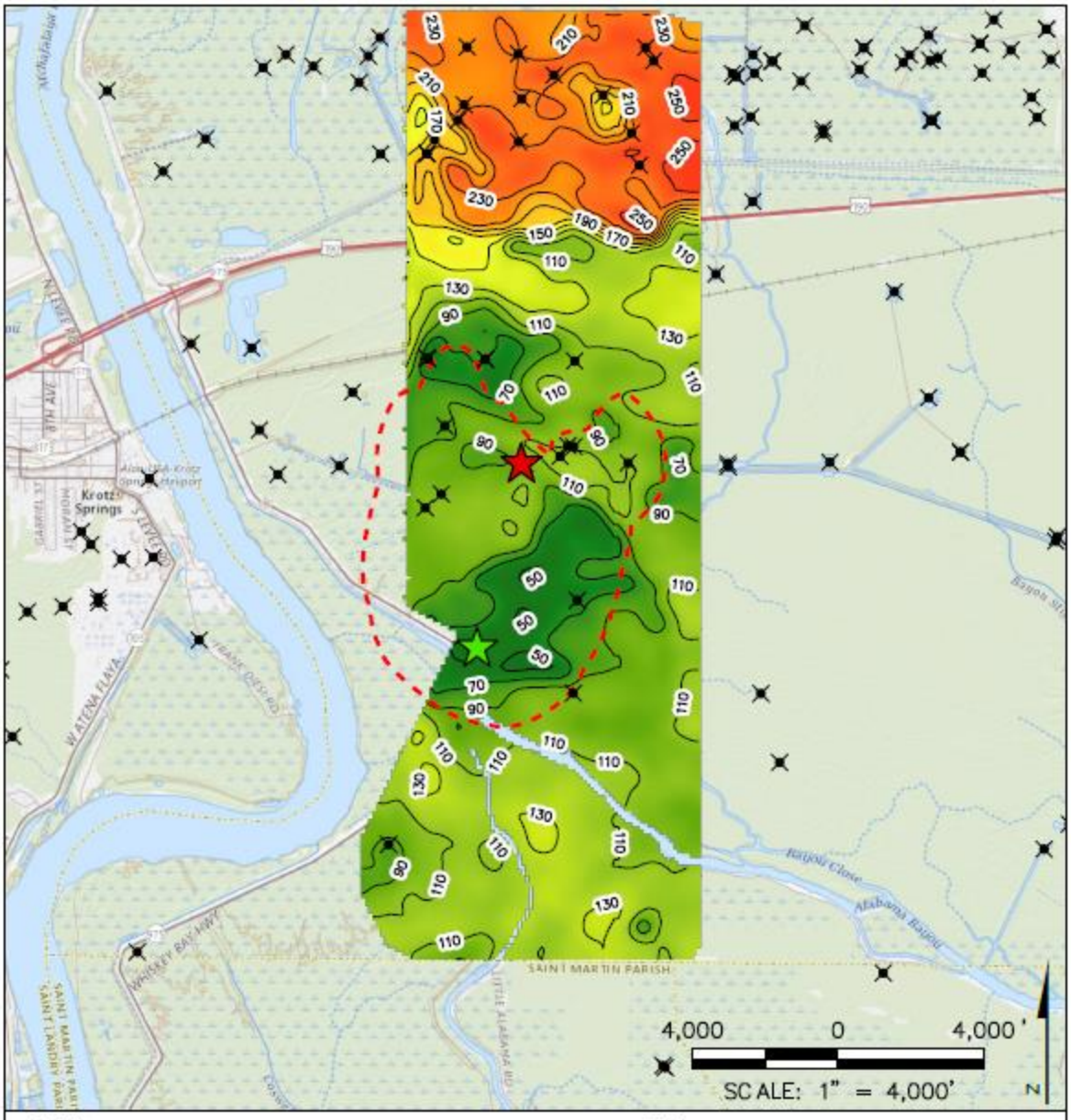

LEGEND

- CLASS V PROPOSED LOCATION
- PROPOSED CLASS VI
- OIL AND GAS WELLS
- 20 FT CONTOURS
- AREA OF REVIEW

THICKNESS (FEET)
259.283
44.3963

NOTES

1. BASEMAP: USGS THE NATIONAL MAP. DATA REFRESHED JUNE 2022.
2. COORDINATE SYSTEM: NAD 1983 (2011) STATEPLANE LOUISIANA SOUTH FIPS 1702 (US FEET).
3. WELL DATA FROM HTTPS://WWW.SONRIS.COM/.

CLIENT: CAPIO SEQUESTRATION, LLC.	SITE: SHERBURNE LEASE POINTE COUPEE PARISH, LOUISIANA	UPPER INJECTION ZONE (SAND 10) ISOPACH MAP	
PROJECT NO. 27222154.00	DRAWN BY: AA	ENGINEER: SCS ENGINEERS	FIGURE
DRAWN: 10/13/2022	CHECKED BY: JAO	2830 DAIRY DRIVE, MADISON, WI 53718-6751 PHONE: (608) 224-2830	2-13
REVISED: 01/24/2023	APPROVED BY:		

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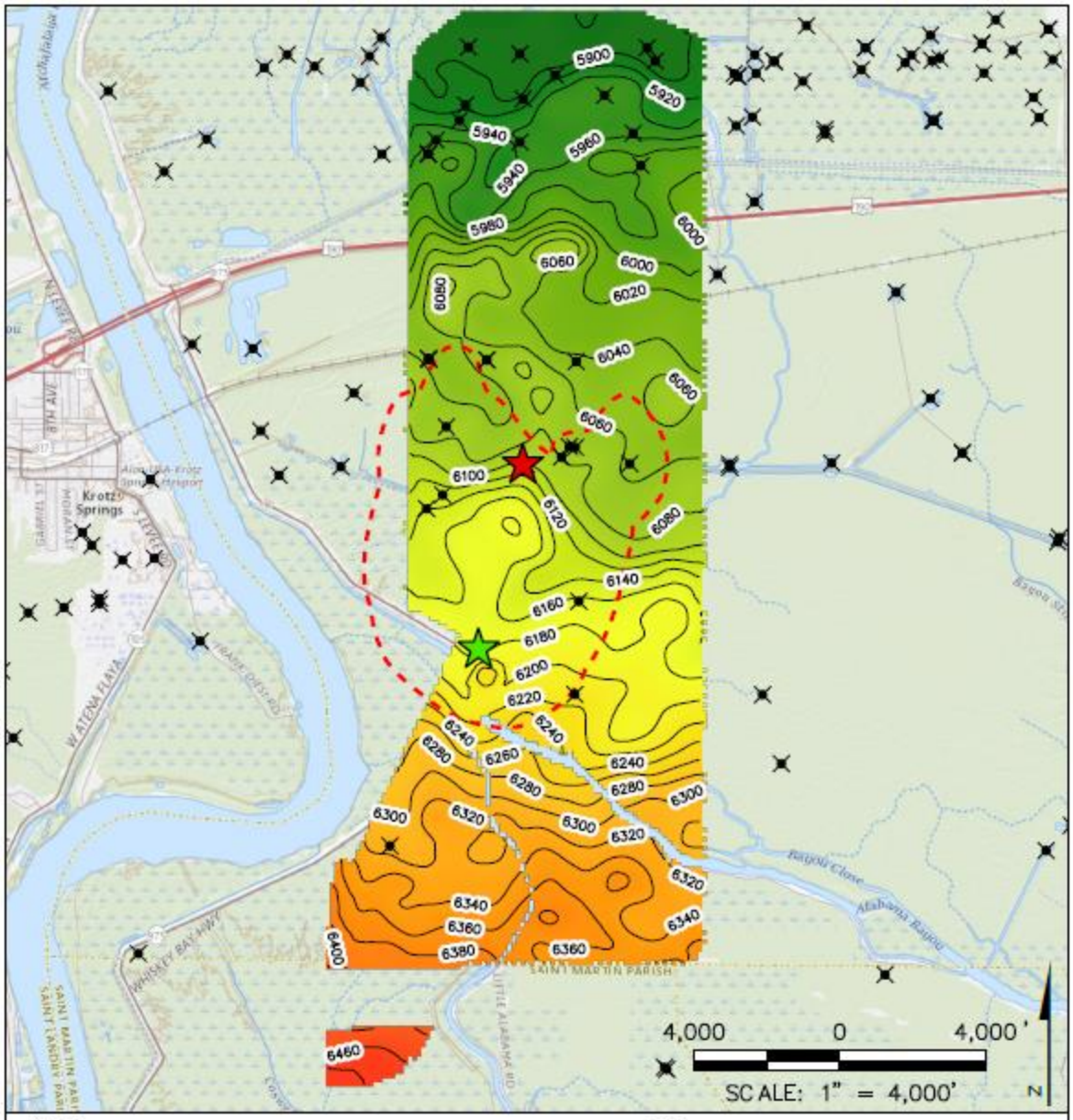

LEGEND

- CLASS V PROPOSED LOCATION
- PROPOSED CLASS VI
- OIL AND GAS WELLS
- 20 FT CONTOURS
- AREA OF REVIEW

DEPTH (SUBSEA TOTAL VERTICAL DEPTH), FEET
6489.52
5878.58

NOTES

1. BASEMAP: USGS THE NATIONAL MAP. DATA REFRESHED JUNE 2022.
2. COORDINATE SYSTEM: NAD 1983 (2011) STATEPLANE LOUISIANA SOUTH FIPS 1702 (US FEET).
3. WELL DATA FROM HTTPS://WWW.SONRIS.COM/.

CLIENT: CAPIO SEQUESTRATION, LLC.	SITE: SHERBURNE LEASE POINTE COUPEE PARISH, LOUISIANA			SAND ZONE 11 STRUCTURE MAP
PROJECT NO. 27222154.00	DRAWN BY: AA	ENGINEER: SCS ENGINEERS 2830 DAIRY DRIVE, MADISON, WI 53718-6751 PHONE: (608) 224-2830		FIGURE
DRAWN: 10/12/2022	CHECKED BY: JAO			2-14
REVISED: 01/24/2023	APPROVED BY:			

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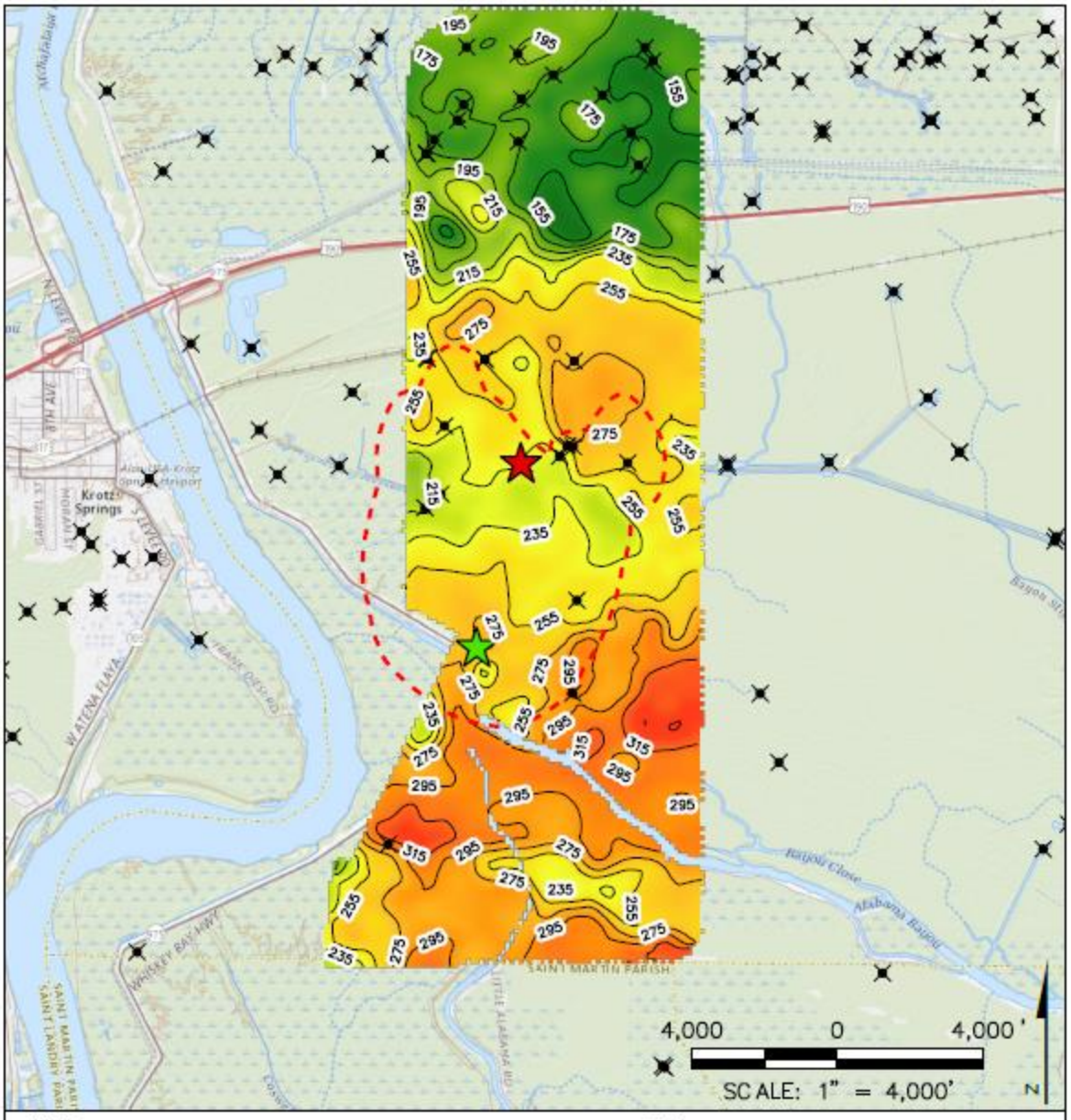

LEGEND

- CLASS V PROPOSED LOCATION
- PROPOSED CLASS VI
- OIL AND GAS WELLS
- 20 FT CONTOURS
- AREA OF REVIEW

THICKNESS (FEET)
335.85
135.42

NOTES

1. BASEMAP: USGS THE NATIONAL MAP. DATA REFRESHED JUNE 2022.
2. COORDINATE SYSTEM: NAD 1983 (2011) STATEPLANE LOUISIANA SOUTH FIPS 1702 (US FEET).
3. WELL DATA FROM HTTPS://WWW.SONRIS.COM/.

CLIENT: CAPIO SEQUESTRATION, LLC.	SITE: SHERBURNE LEASE POINTE COUPEE PARISH, LOUISIANA	LOWER INJECTION ZONE (SAND 11) ISOPACH MAP	
PROJECT NO. 27222154.00	DRAWN BY: AA	ENGINEER: SCS ENGINEERS, 2830 DAIRY DRIVE, MADISON, WI 53718-6751, PHONE: (608) 224-2830	FIGURE
DRAWN: 10/13/2022	CHECKED BY: JAO		2-15
REVISED: 01/24/2023	APPROVED BY:		

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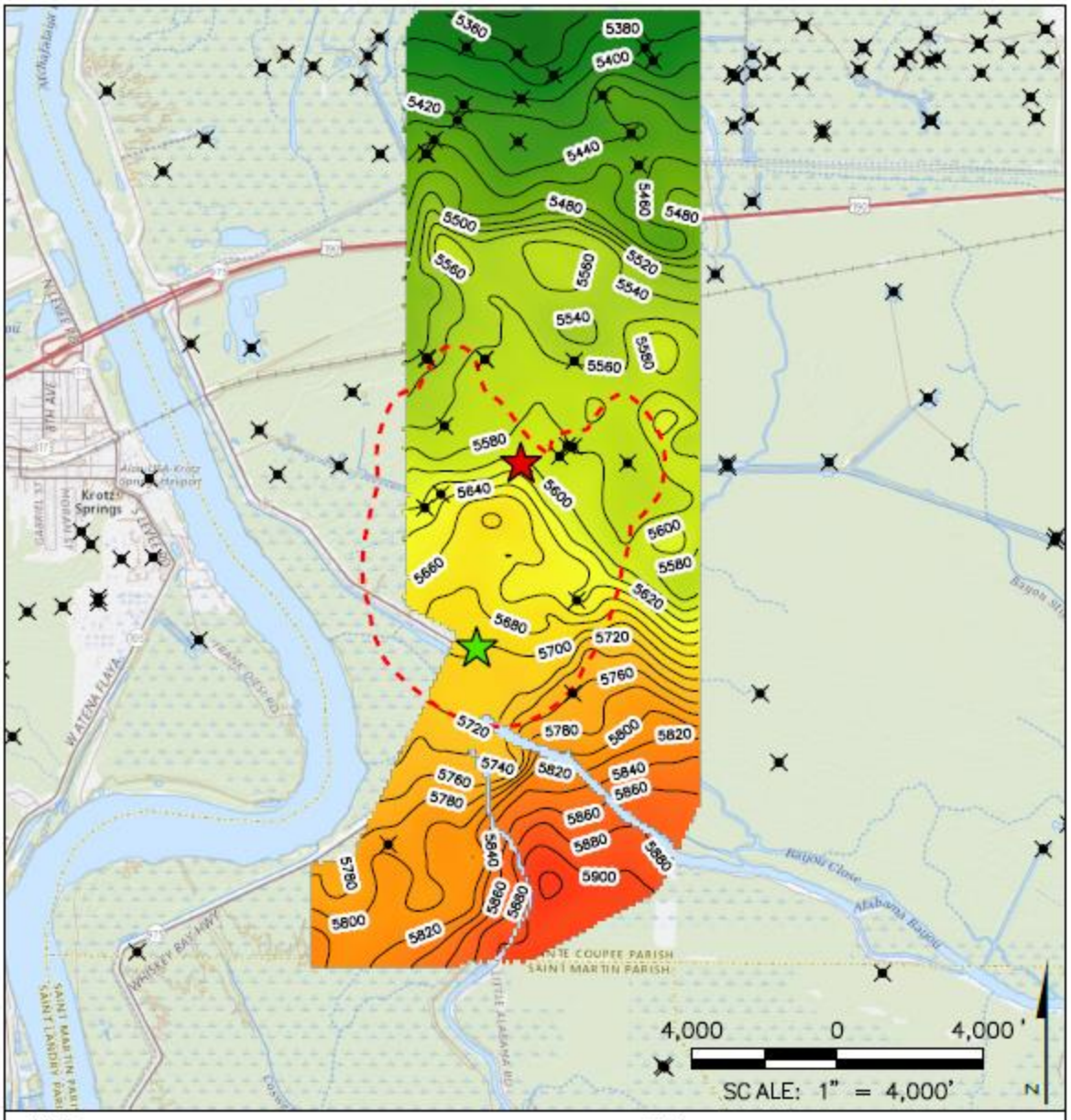


LEGEND

- CLASS V PROPOSED LOCATION
- PROPOSED CLASS VI
- OIL AND GAS WELLS
- 20 FT CONTOUR
- AREA OF REVIEW

DEPTH (SUBSEA TOTAL VERTICAL DEPTH), FEET
5925.48
5338.96

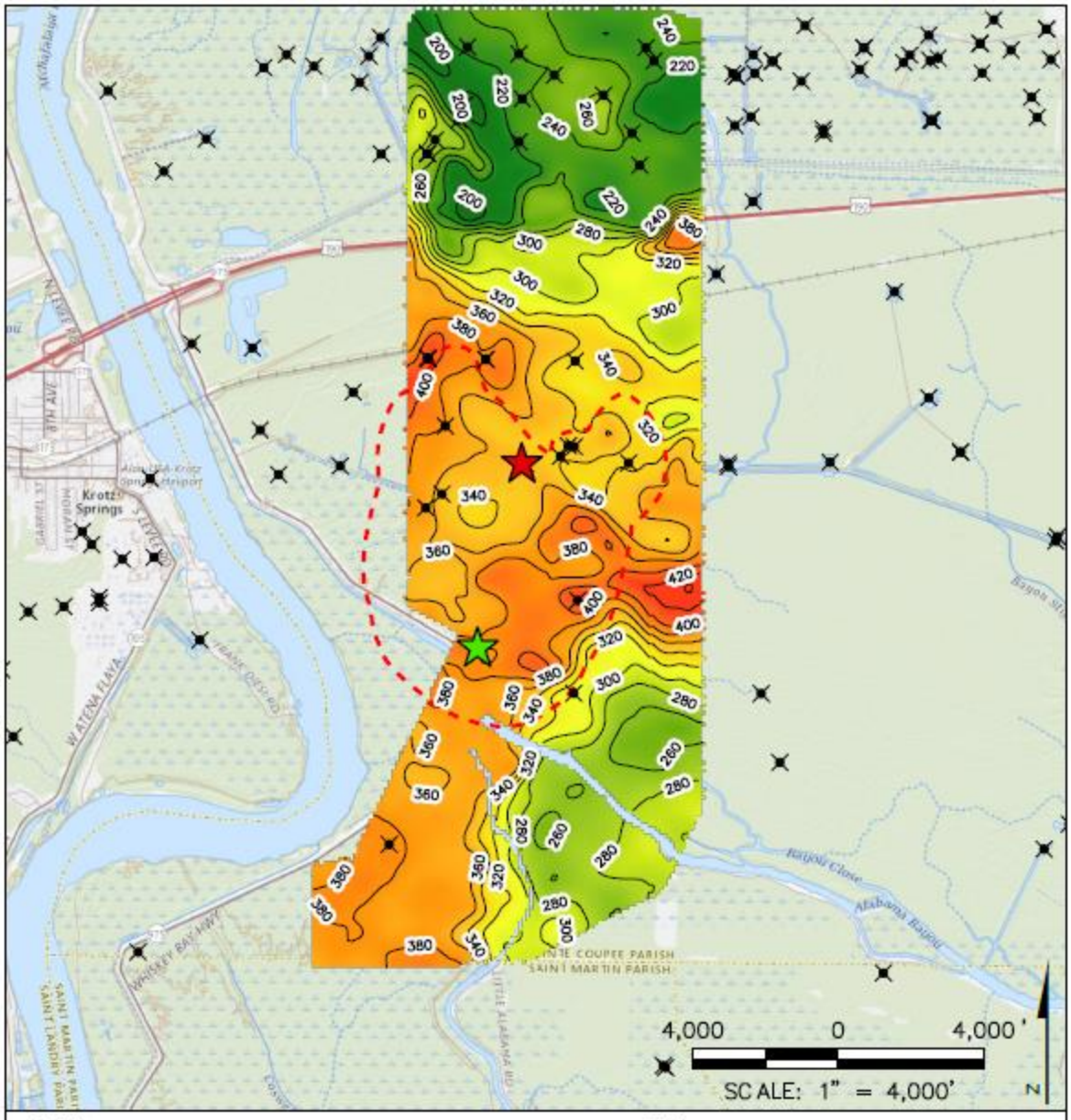
NOTES

1. BASEMAP: USGS THE NATIONAL MAP. DATA REFRESHED JUNE 2022.
2. COORDINATE SYSTEM: NAD 1983 (2011) STATEPLANE LOUISIANA SOUTH FIPS 1702 (US FEET).
3. WELL DATA FROM HTTPS://WWW.SONRIS.COM/.

CLIENT	CAPIO SEQUESTRATION, LLC.	SITE	SHERBURNE LEASE POINTE COUPEE PARISH, LOUISIANA	PRIMARY CONFINING UNIT (BASE OF SAND 8) STRUCTURE MAP

PROJECT NO.	27222154.00	DRAWN BY:	AA	ENGINEER: SCS ENGINEERS, 2830 DAIRY DRIVE, MADISON, WI 53718-6751, PHONE: (608) 224-2830	FIGURE
DRAWN:	10/12/2022	CHECKED BY:	JAO		2-16
REVISED:	01/24/2023	APPROVED BY:			

DOCUMENT PATH: I:\27222154.00\DRAWINGS\GIS\SHERBURNE LEASE\SHERBURNE LEASE.APRX



LEGEND

- CLASS V PROPOSED LOCATION
- PROPOSED CLASS VI
- OIL AND GAS WELLS
- 20 FT CONTOURS
- AREA OF REVIEW

THICKNESS (FEET)

441.763

187.95

NOTES

1. BASEMAP: USGS THE NATIONAL MAP. DATA REFRESHED JUNE 2022.
2. COORDINATE SYSTEM: NAD 1983 (2011) STATEPLANE LOUISIANA SOUTH FIPS 1702 (US FEET).
3. WELL DATA FROM HTTPS://WWW.SONRIS.COM/.

CLIENT: CAPIO SEQUESTRATION, LLC.	SITE: SHERBURNE LEASE POINTE COUPEE PARISH, LOUISIANA	PRIMARY CONFINING UNIT ISOPACH MAP	
PROJECT NO. 27222154.00	DRAWN BY: AA	ENGINEER: SCS ENGINEERS	FIGURE
DRAWN: 10/13/2022	CHECKED BY: JAO	2830 DAIRY DRIVE, MADISON, WI 53718-6751 PHONE: (608) 224-2830	2-17
REVISED: 01/24/2023	APPROVED BY:		

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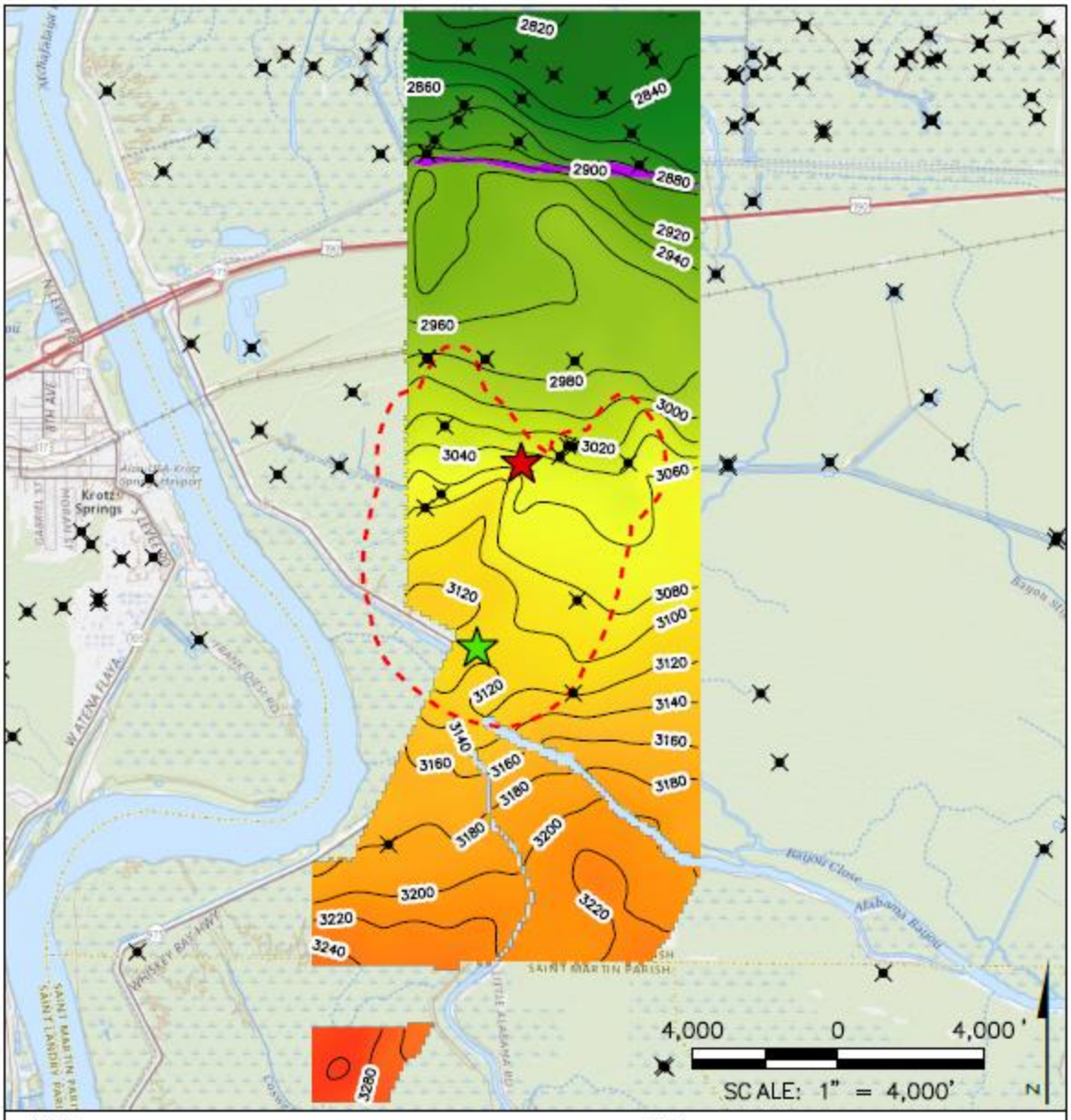

LEGEND

- CLASS V PROPOSED LOCATION
- PROPOSED CLASS VI
- OIL AND GAS WELLS
- 20 FT CONTOURS
- AREA OF REVIEW
- FAULT GAP – TOP UPPER CONFINING UNIT
- DEPTH (SUBSEA TOTAL VERTICAL DEPTH), FEET
- 3301.75
- 2815.61

NOTES

1. BASEMAP: USGS THE NATIONAL MAP. DATA REFRESHED JUNE 2022.
2. COORDINATE SYSTEM: NAD 1983 (2011) STATEPLANE LOUISIANA SOUTH FIPS 1702 (US FEET).
3. WELL DATA FROM HTTPS://WWW.SONRIS.COM/.

CLIENT: CAPIO SEQUESTRATION, LLC.	SITE: SHERBURNE LEASE POINTE COUPEE PARISH, LOUISIANA	UPPER CONFINING UNIT STRUCTURE MAP	
PROJECT NO. 27222154.00	DRAWN BY: AA	ENGINEER: SCS ENGINEERS, 2830 DAIRY DRIVE, MADISON, WI 53718-6751, PHONE: (608) 224-2830	FIGURE
DRAWN: 10/12/2022	CHECKED BY: JAO		2-18
REVISED: 01/24/2023	APPROVED BY:		

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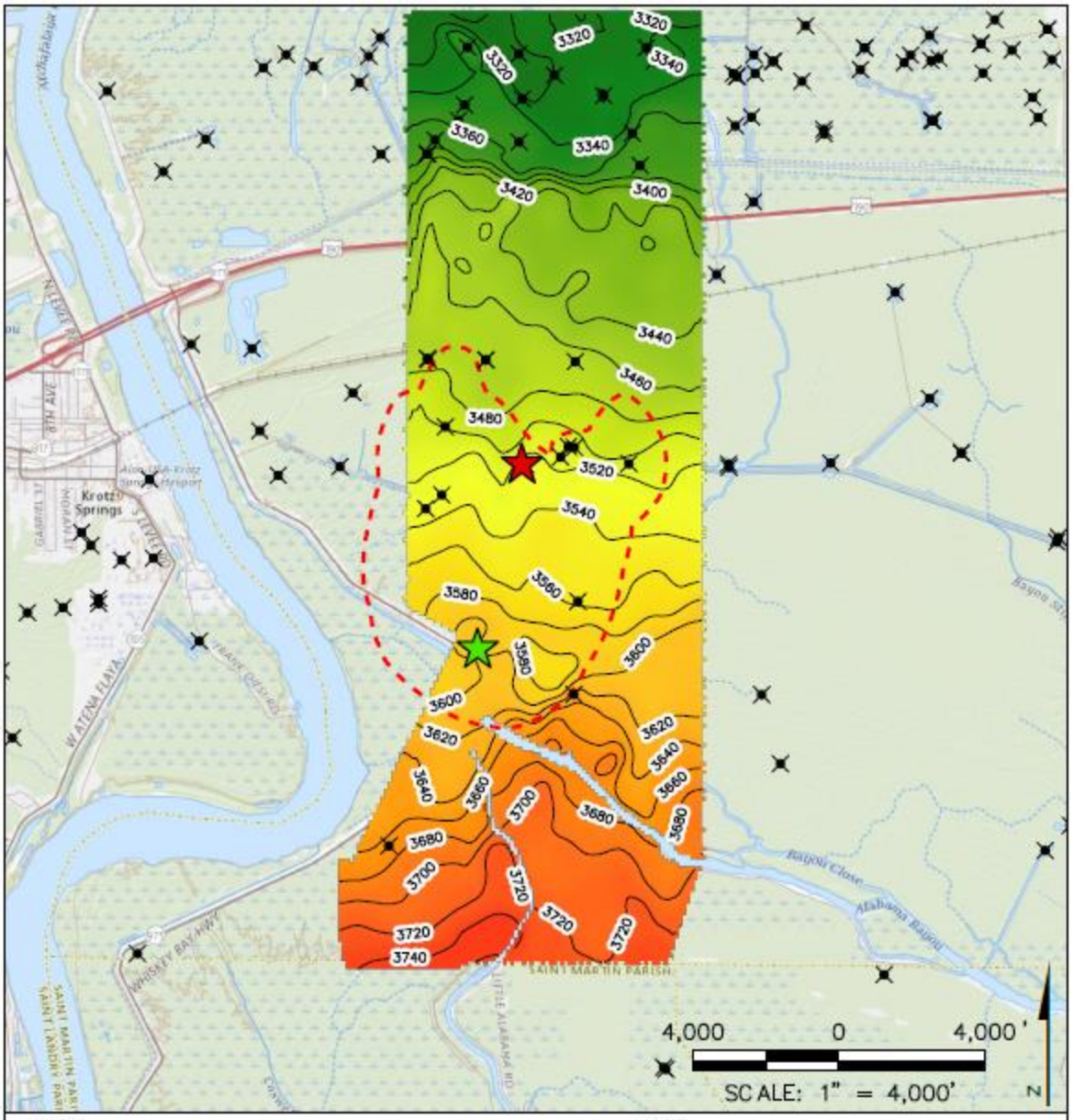

LEGEND

- CLASS V PROPOSED LOCATION
- PROPOSED CLASS VI
- OIL AND GAS WELLS
- 20 FT CONTOURS
- AREA OF REVIEW

DEPTH (SUBSEA TOTAL VERTICAL DEPTH), FEET
3751.93
3292.19

NOTES

1. BASEMAP: USGS THE NATIONAL MAP. DATA REFRESHED JUNE 2022.
2. COORDINATE SYSTEM: NAD 1983 (2011) STATEPLANE LOUISIANA SOUTH FIPS 1702 (US FEET).
3. WELL DATA FROM HTTPS://WWW.SONRIS.COM/.

CLIENT: CAPIO SEQUESTRATION, LLC.	SITE: SHERBURNE LEASE POINTE COUPEE PARISH, LOUISIANA	BASE OF UPPER CONFINING UNIT STRUCTURE MAP	
PROJECT NO. 27222154.00	DRAWN BY: AA	ENGINEER: SCS ENGINEERS, 2830 DAIRY DRIVE, MADISON, WI 53718-6751, PHONE: (608) 224-2830	FIGURE
DRAWN: 10/14/2022	CHECKED BY: JAO		2-19
REVISED: 01/24/2023	APPROVED BY:		

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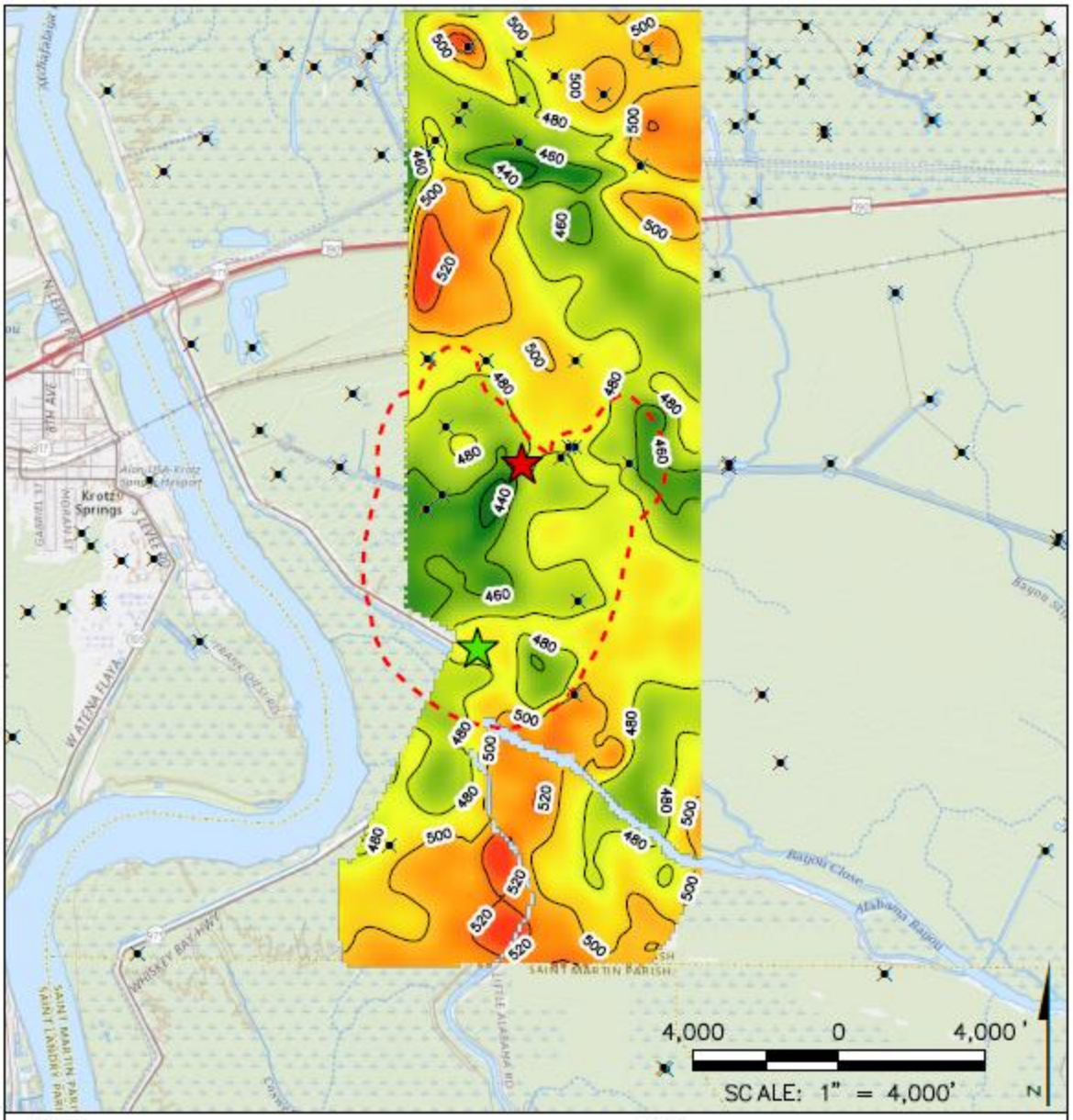


LEGEND

- CLASS V PROPOSED LOCATION
- PROPOSED CLASS VI
- OIL AND GAS WELLS
- 20 FT CONTOURS
- AREA OF REVIEW

THICKNESS (FEET)
535.002
425.735

NOTES

1. BASEMAP: USGS THE NATIONAL MAP. DATA REFRESHED JUNE 2022.
2. COORDINATE SYSTEM: NAD 1983 (2011) STATEPLANE LOUISIANA SOUTH FIPS 1702 (US FEET).
3. WELL DATA FROM HTTPS://WWW.SONRIS.COM/.

CLIENT: CAPIO SEQUESTRATION, LLC.	SITE: SHERBURNE LEASE POINTE COUPEE PARISH, LOUISIANA	UPPER CONFINING UNIT ISOPACH MAP	
PROJECT NO. 27222154.00	DRAWN BY: AA	ENGINEER: SCS ENGINEERS 2830 DAIRY DRIVE, MADISON, WI 53718-6751 PHONE: (608) 224-2830	FIGURE
DRAWN: 10/12/2022	CHECKED BY: JAO		2-20
REVISED: 01/24/2023	APPROVED BY:		

DOCUMENT PATH: E:\27222154.00\DRAWINGS\GIS\SHERBURNE LEASE\SHERBURNE LEASE.APRX

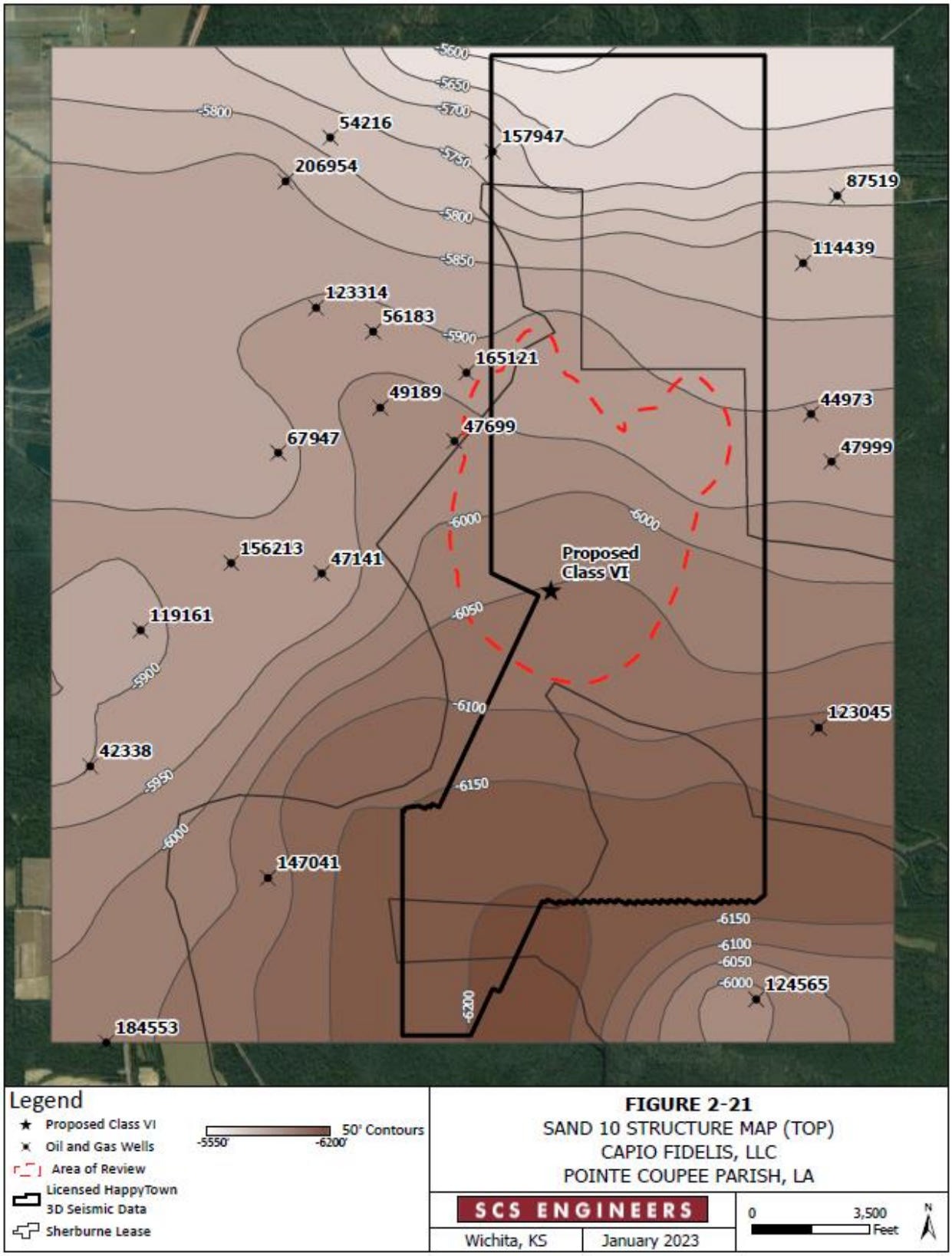


FIGURE 2-21
SAND 10 STRUCTURE MAP (TOP)
CAPIO FIDELIS, LLC
POINTE COUPEE PARISH, LA

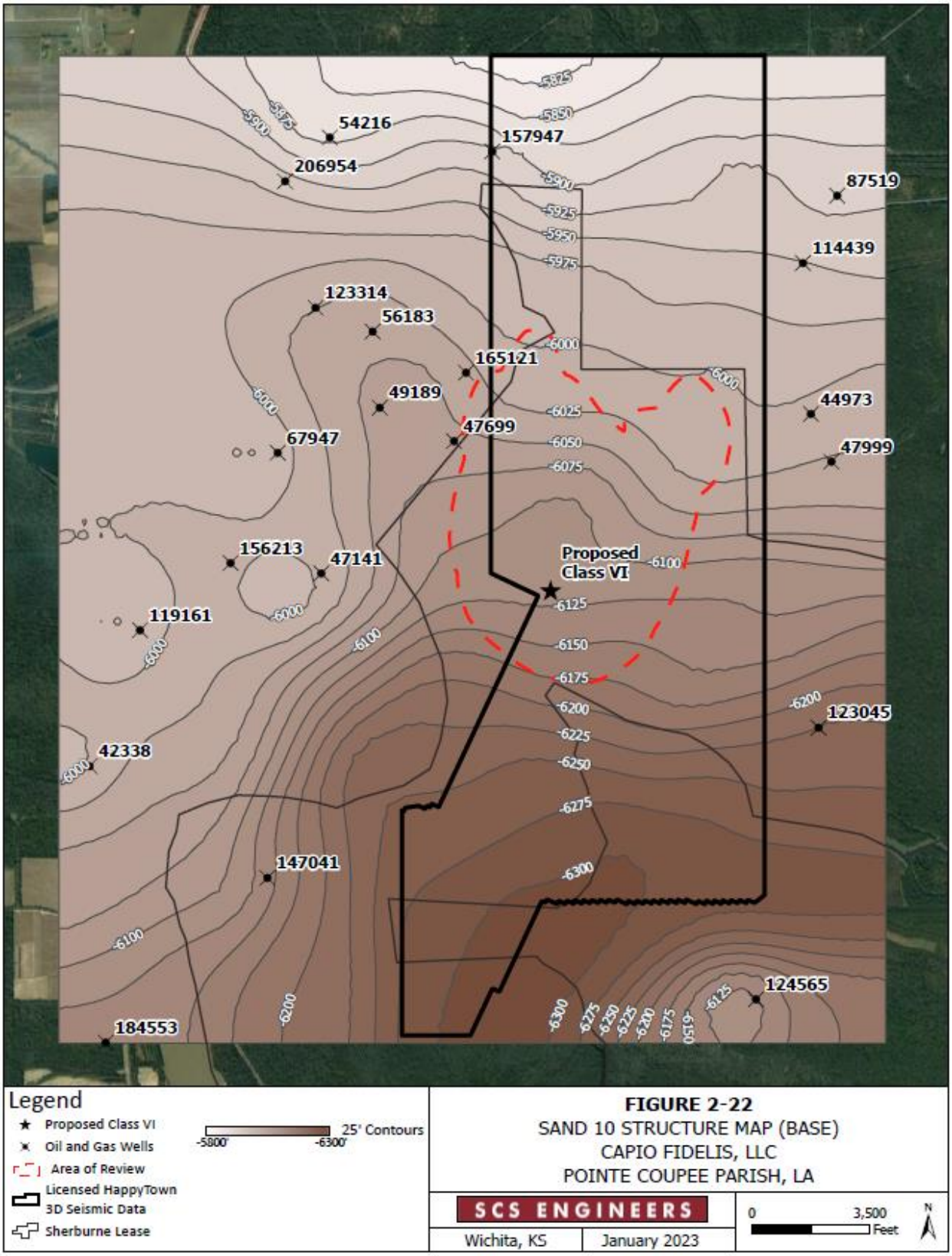
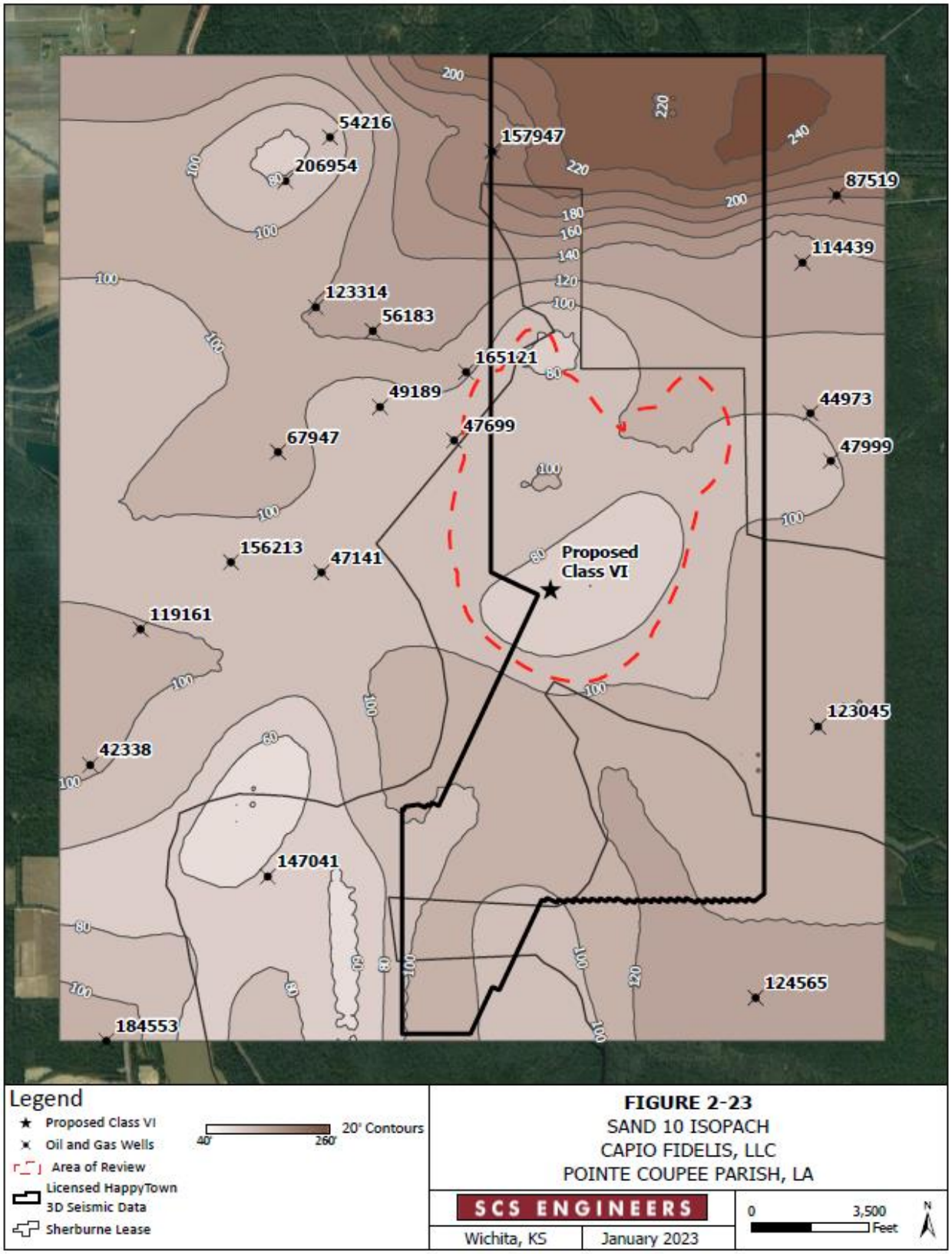


FIGURE 2-22
SAND 10 STRUCTURE MAP (BASE)
CAPIO FIDELIS, LLC
POINTE COUPEE PARISH, LA


54216
206954
157947
87519
114439
123314
56183
165121
49189
44973
47699
67947
47999
156213
47141
Proposed Class VI
119161
123045
42338
147041
124565
184553
Legend
Proposed Class VI
Oil and Gas Wells
Area of Review
Licensed HappyTown 3D Seismic Data
Sherburne Lease
20' Contours
40'
260'
FIGURE 2-23
SAND 10 ISOPACH
CAPIO FIDELIS, LLC
POINTE COUPEE PARISH, LA
SCS ENGINEERS
Wichita, KS
January 2023
0
3,500
Feet
N

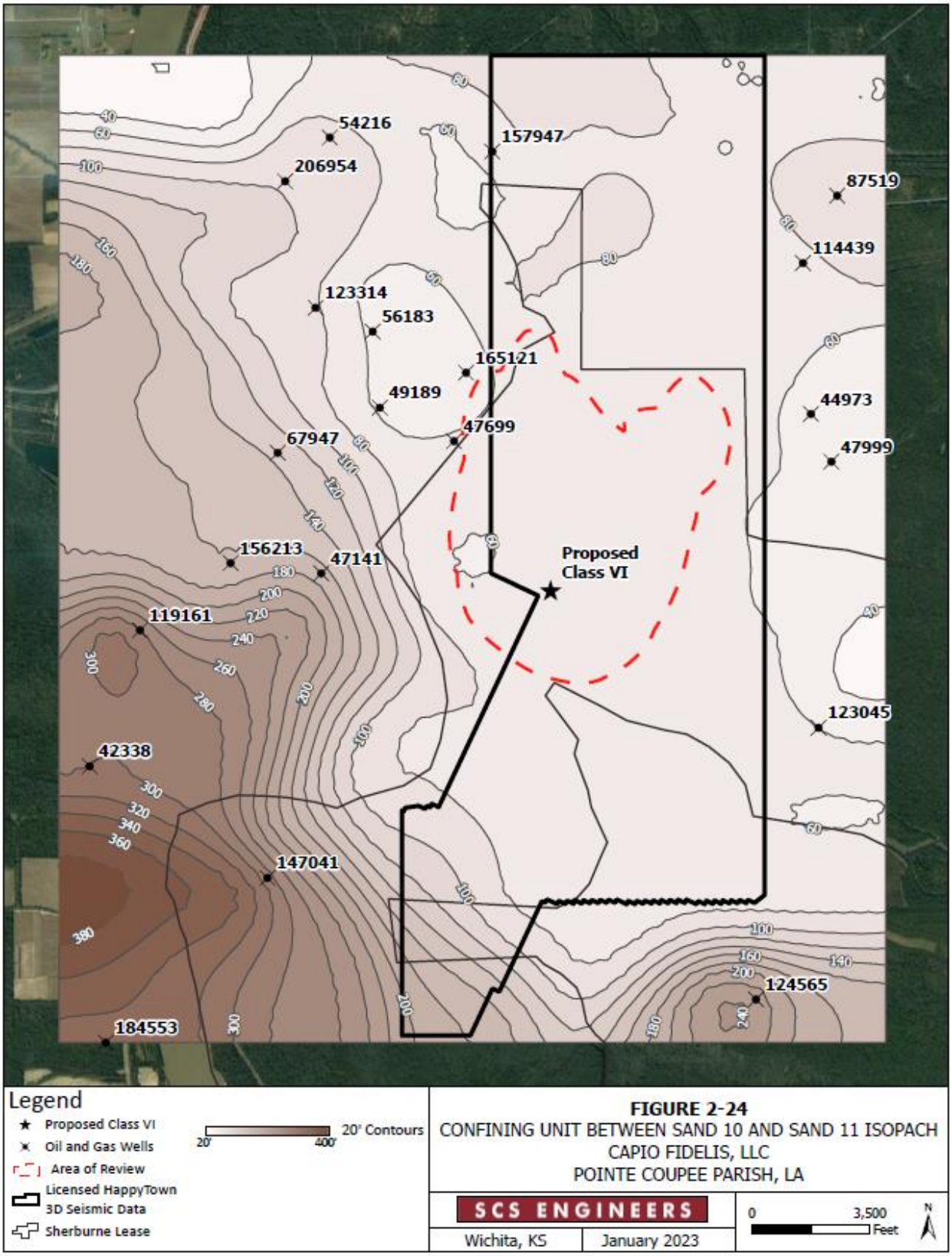


FIGURE 2-24
CONFINING UNIT BETWEEN SAND 10 AND SAND 11 ISOPACH
CAPIO FIDELIS, LLC
POINTE COUPEE PARISH, LA

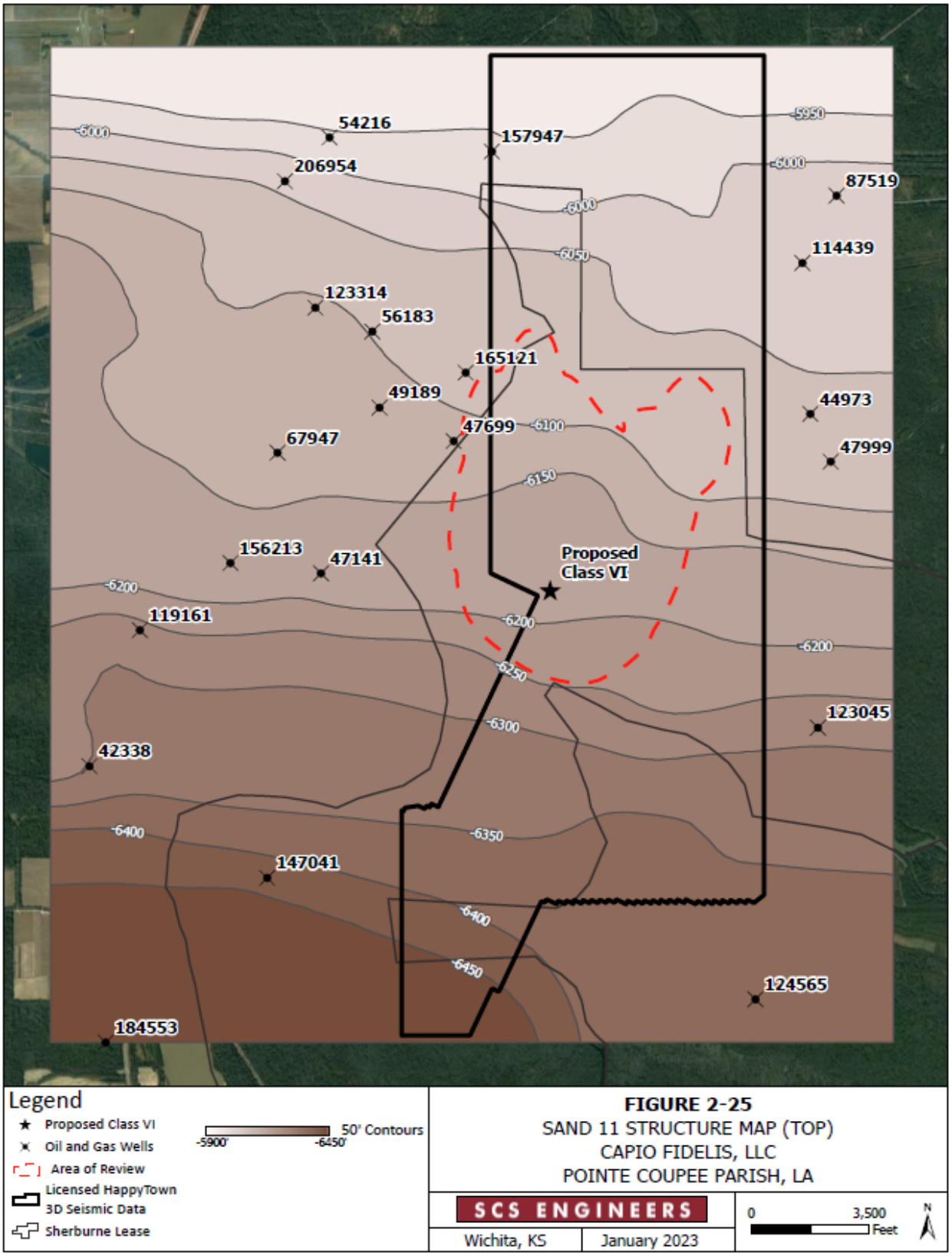


FIGURE 2-25
SAND 11 STRUCTURE MAP (TOP)
CAPIO FIDELIS, LLC
POINTE COUPEE PARISH, LA

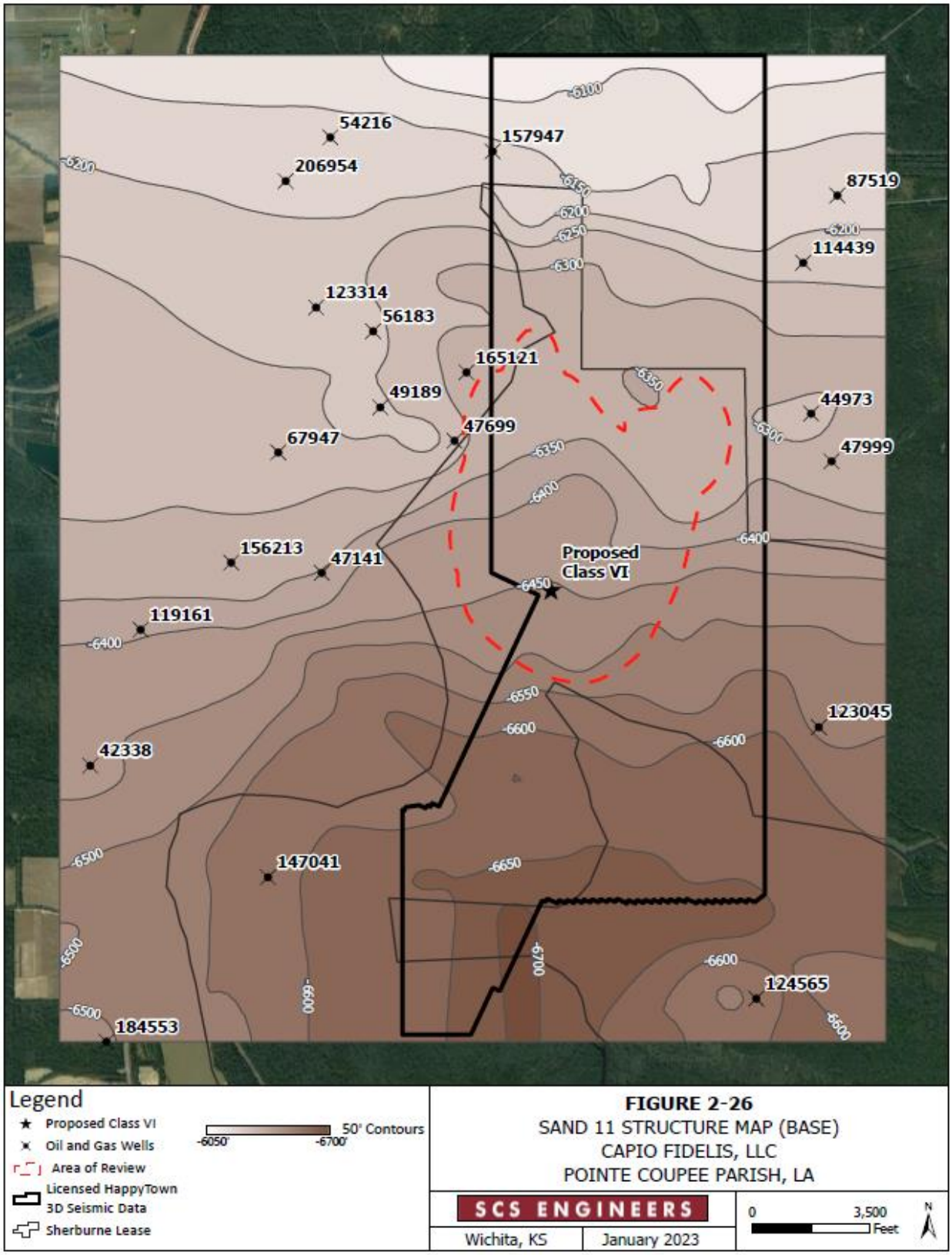
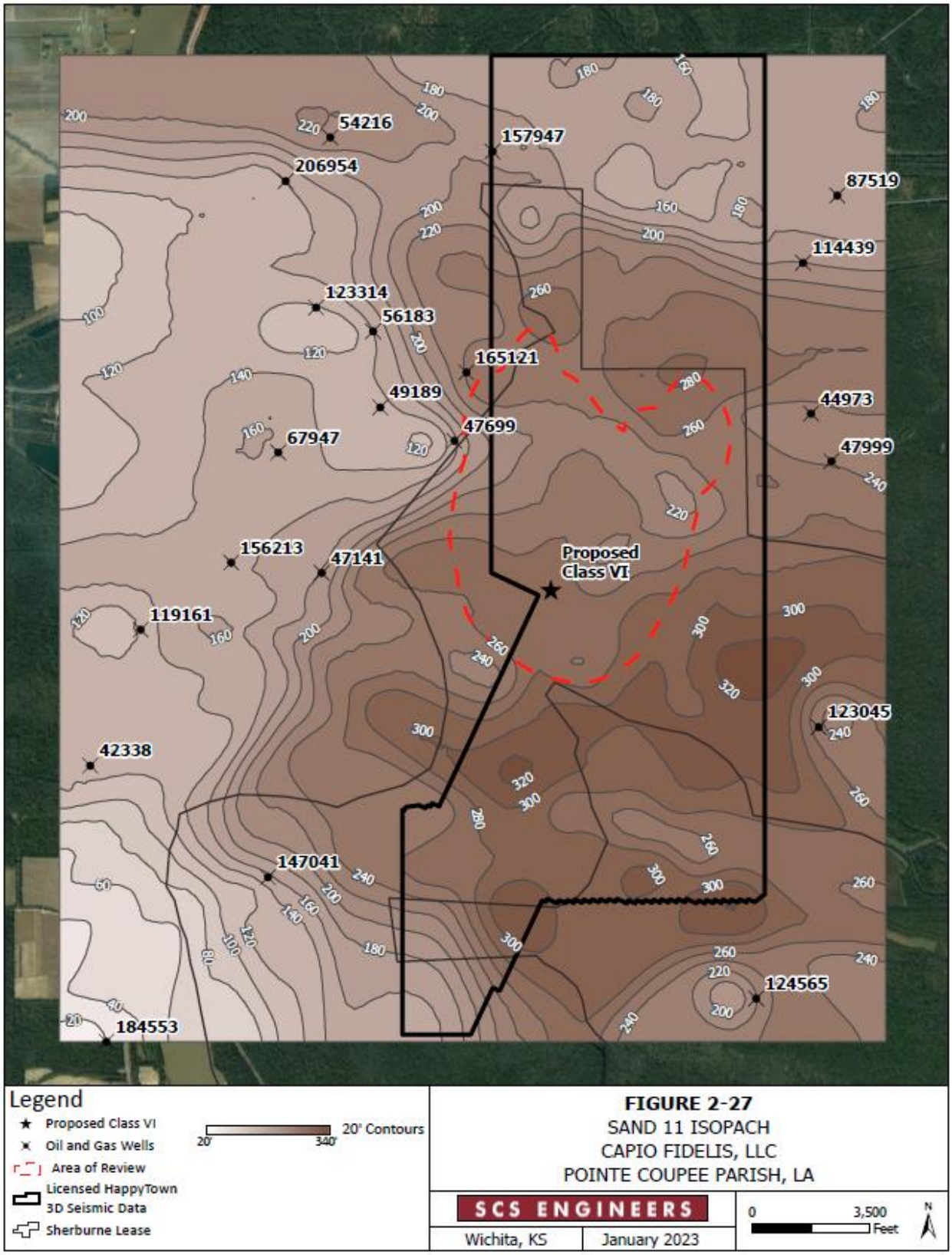


FIGURE 2-26
SAND 11 STRUCTURE MAP (BASE)
CAPIO FIDELIS, LLC
POINTE COUPEE PARISH, LA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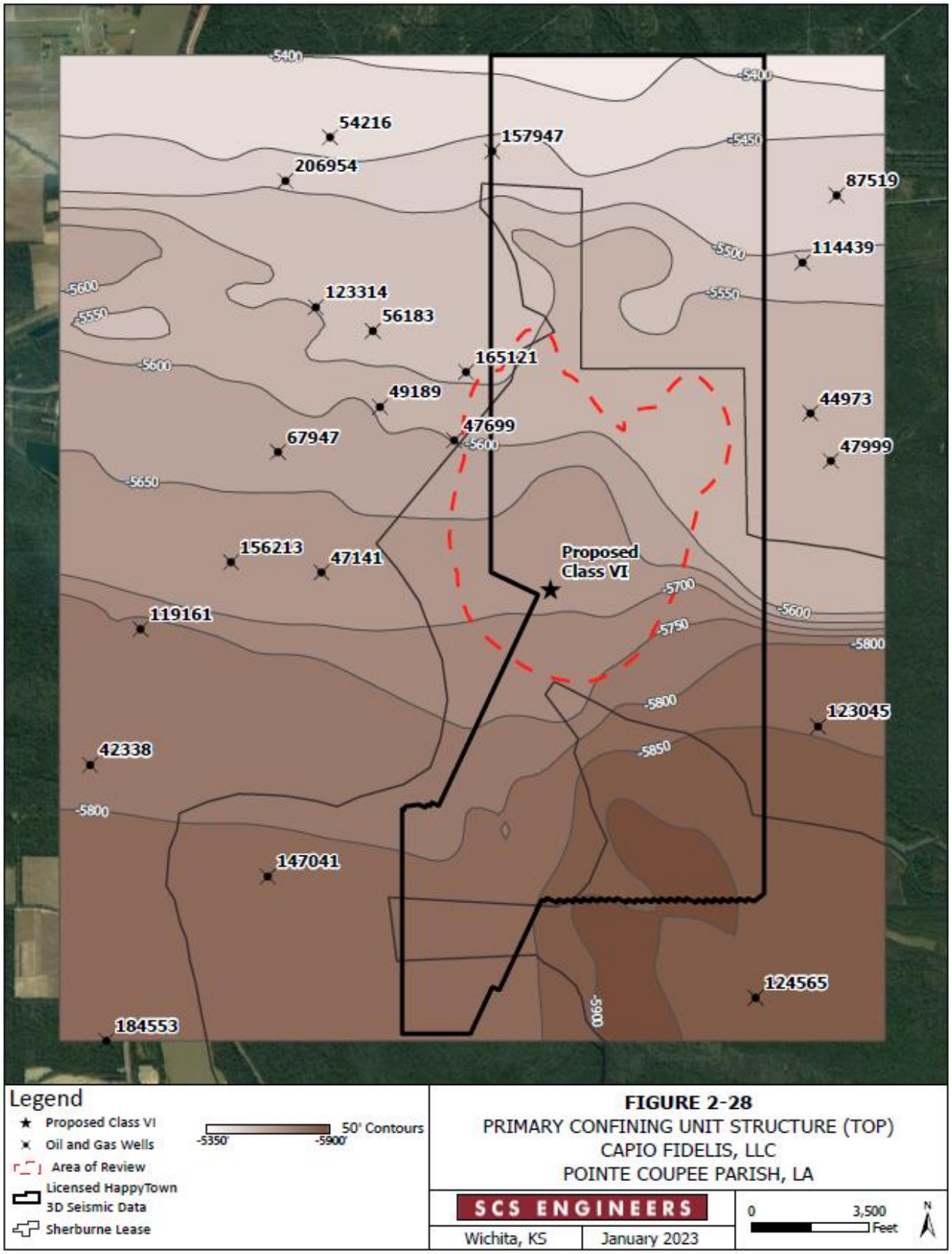
157947
206954
87519
114439
123314
56183
165121
49189
44973
67947
47699
47999
156213
47141
Proposed Class VI
119161
123045
42338
147041
124565
184553
Legend
Proposed Class VI
Oil and Gas Wells
Area of Review
Licensed HappyTown 3D Seismic Data
Sherburne Lease
20' Contours
20'
340'
FIGURE 2-27
SAND 11 ISOPACH
CAPIO FIDELIS, LLC
POINTE COUPEE PARISH, LA
SCS ENGINEERS
Wichita, KS
January 2023
0
3,500
Feet
N


-5400
-5450
-5500
-5550
-5600
-5650
-5700
-5750
-5800
-5850
-5900
54216
157947
206954
87519
114439
123314
56183
165121
49189
44973
47699
67947
47999
156213
47141
Proposed Class VI
119161
123045
42338
147041
124565
184553
Legend
Proposed Class VI
Oil and Gas Wells
Area of Review
Licensed HappyTown 3D Seismic Data
Sherburne Lease
50' Contours
-5350'
-5900'
FIGURE 2-28
PRIMARY CONFINING UNIT STRUCTURE (TOP)
CAPIO FIDELIS, LLC
POINTE COUPEE PARISH, LA
SCS ENGINEERS
Wichita, KS
January 2023
0
3,500
Feet
N

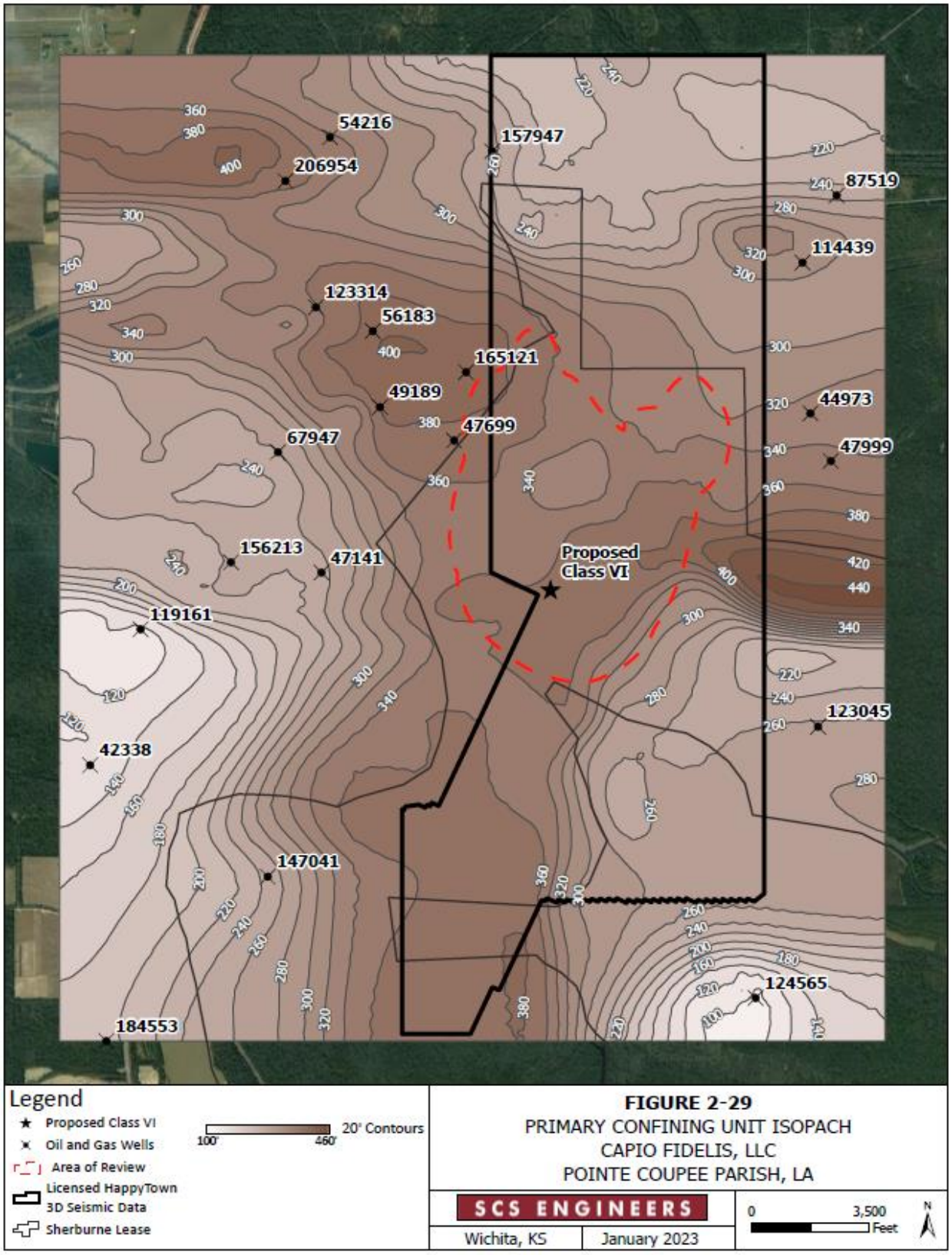
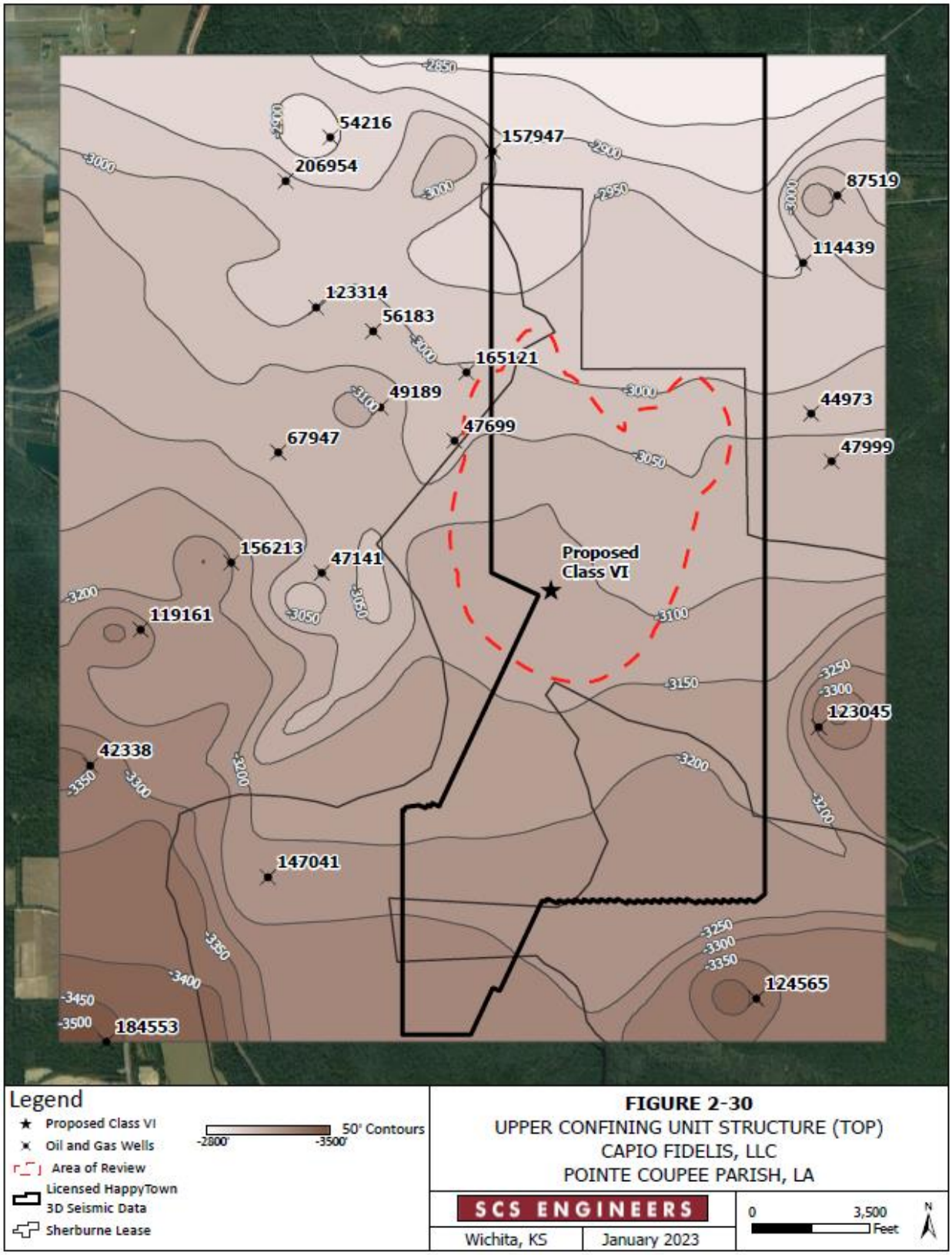


FIGURE 2-29
PRIMARY CONFINING UNIT ISOPACH
CAPIO FIDELIS, LLC
POINTE COUPEE PARISH, LA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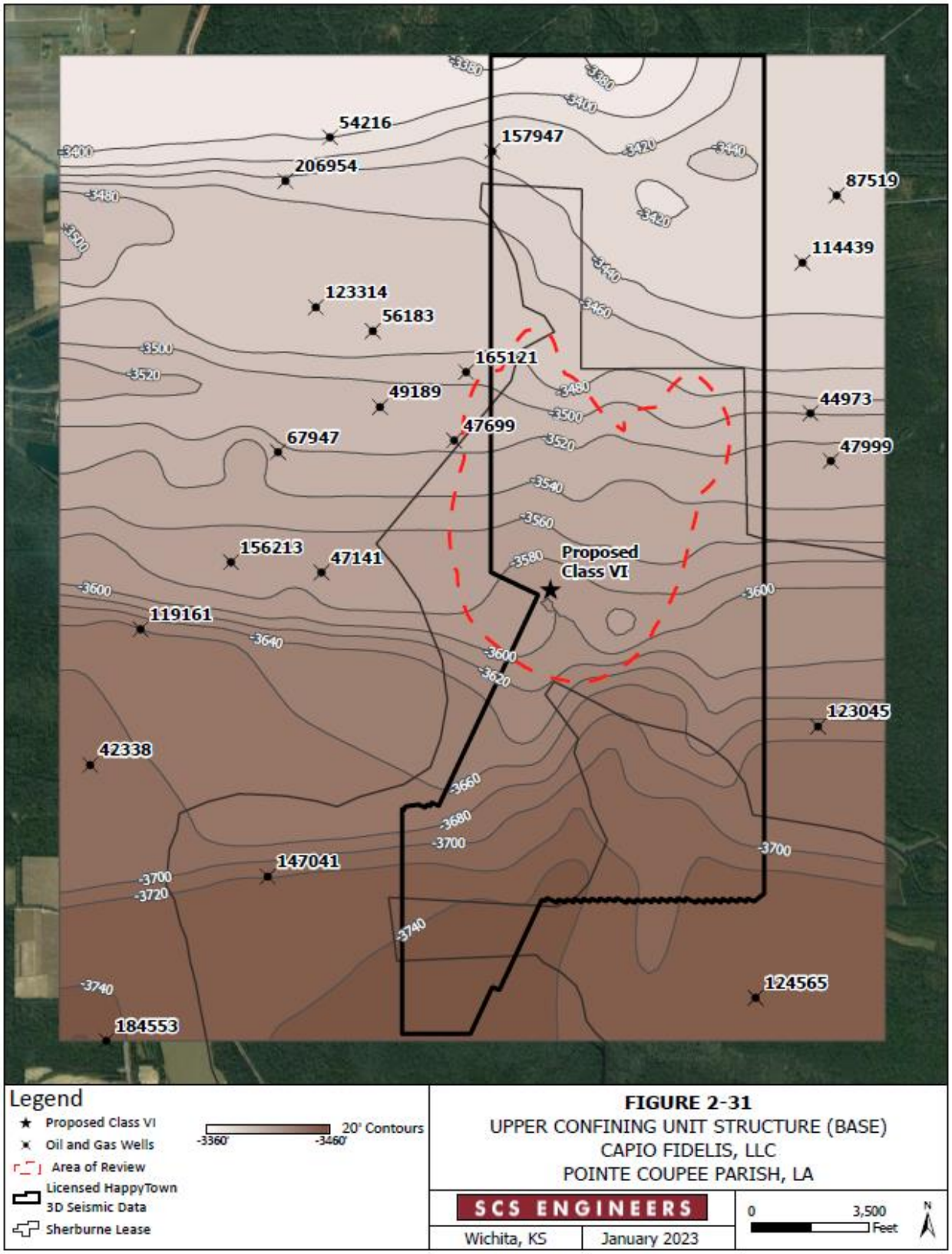
87519
114439
123314
56183
165121
49189
44973
47699
67947
47999
156213
47141
Proposed Class VI
119161
123045
42338
147041
124565
184553
-2850
-2900
-2950
-3000
-3050
-3100
-3150
-3200
-3250
-3300
-3350
-3400
-3450
-3500
Legend
Proposed Class VI
Oil and Gas Wells
Area of Review
Licensed HappyTown 3D Seismic Data
Sherburne Lease
50' Contours
-2800'
-3500'
FIGURE 2-30
UPPER CONFINING UNIT STRUCTURE (TOP)
CAPIO FIDELIS, LLC
POINTE COUPEE PARISH, LA
SCS ENGINEERS
Wichita, KS
January 2023
0
3,500
Feet
N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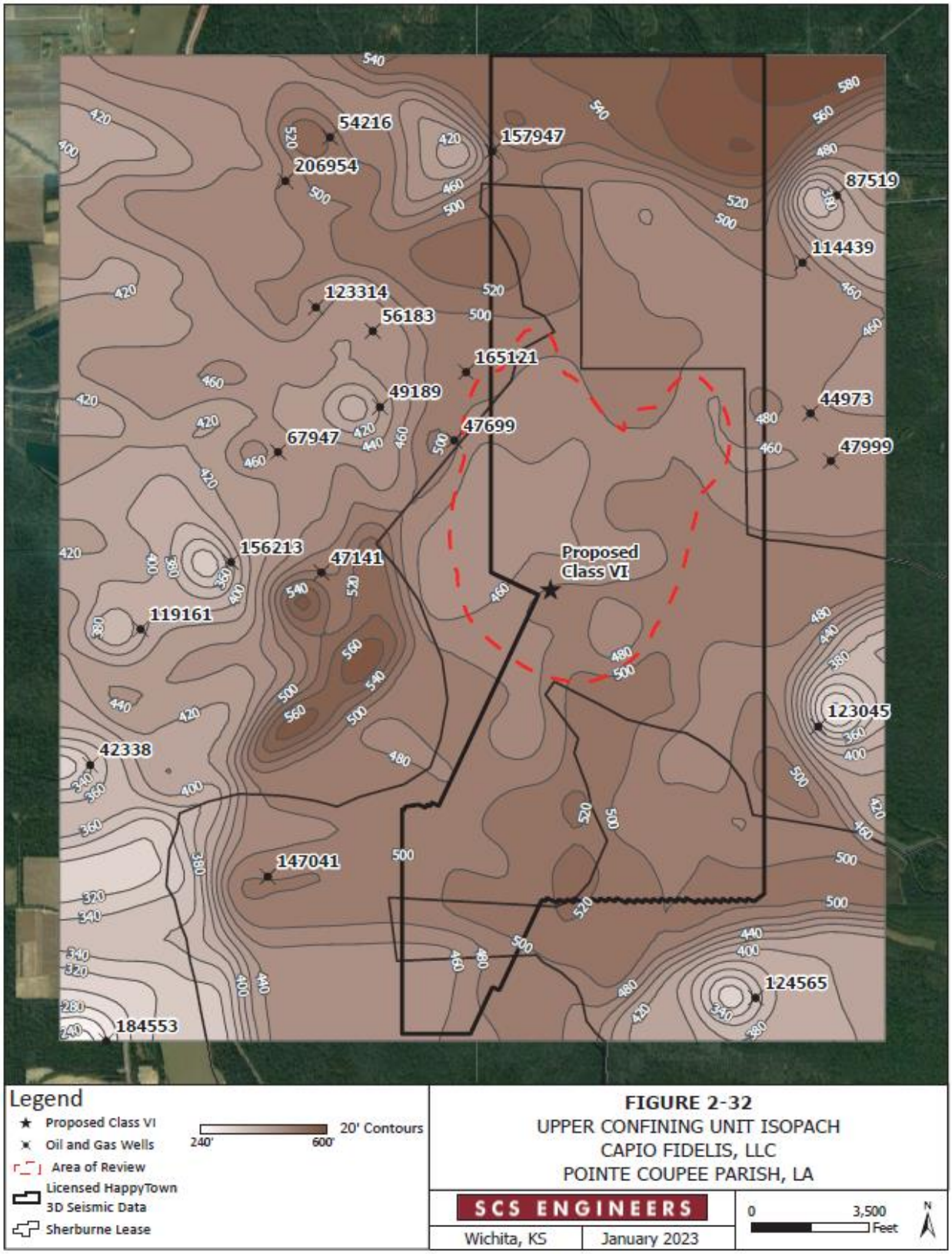
206954
87519
114439
123314
56183
165121
49189
44973
47699
67947
47999
156213
47141
Proposed Class VI
119161
123045
42338
147041
124565
184553
Legend
Proposed Class VI
Oil and Gas Wells
Area of Review
Licensed HappyTown 3D Seismic Data
Sherburne Lease
20' Contours
-3360'
-3460'
FIGURE 2-31
UPPER CONFINING UNIT STRUCTURE (BASE)
CAPIO FIDELIS, LLC
POINTE COUPEE PARISH, LA
SCS ENGINEERS
Wichita, KS
January 2023
0
3,500
Feet
N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114439
123314
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165121
49189
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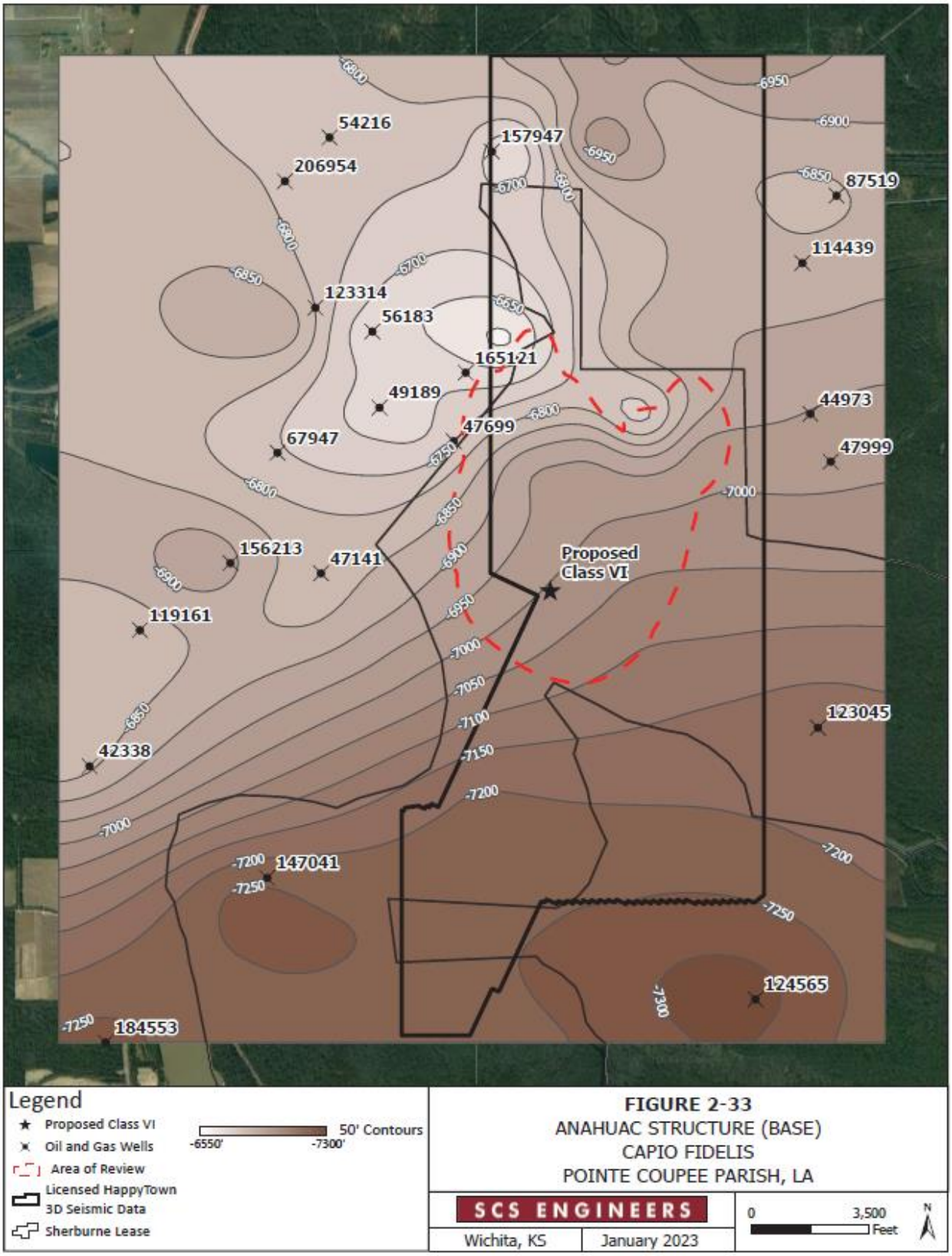
156213
47141
Proposed Class VI
119161
123045
42338
147041
124565
184553
Legend
Proposed Class VI
Oil and Gas Wells
Area of Review
Licensed HappyTown 3D Seismic Data
Sherburne Lease
20' Contours
240'
600'
FIGURE 2-32
UPPER CONFINING UNIT ISOPACH
CAPIO FIDELIS, LLC
POINTE COUPEE PARISH, LA
SCS ENGINEERS
Wichita, KS
January 2023
0
3,500
Feet
N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206954
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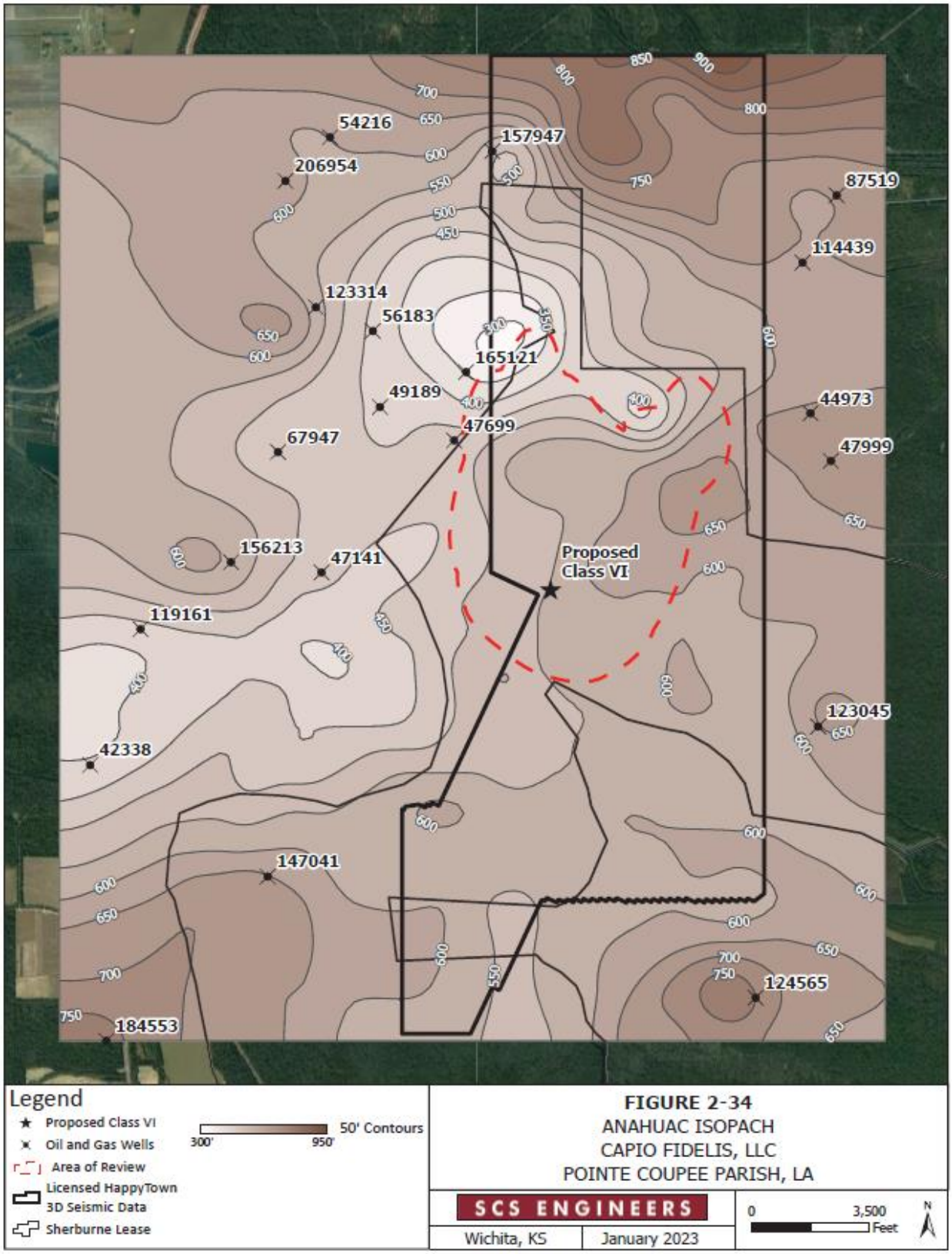
87519
114439
123314
56183
165121
49189
44973
47699
67947
47999
156213
47141
Proposed Class VI
119161
123045
42338
147041
124565
184553
-6800
-6850
-6900
-6950
-7000
-7050
-7100
-7150
-7200
-7250
-7300
Legend
Proposed Class VI
Oil and Gas Wells
Area of Review
Licensed HappyTown 3D Seismic Data
Sherburne Lease
50' Contours
-6550'
-7300'
FIGURE 2-33
ANAHUAC STRUCTURE (BASE)
CAPIO FIDELIS
POINTE COUPEE PARISH, LA
SCS ENGINEERS
Wichita, KS
January 2023
0
3,500
Feet
N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87519
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123314
56183
165121
49189
44973
47699
67947
47999
156213
47141
Proposed Class VI
119161
123045
42338
147041
124565
184553
Legend
Proposed Class VI
Oil and Gas Wells
Area of Review
Licensed HappyTown 3D Seismic Data
Sherburne Lease
50' Contours
300'
950'
FIGURE 2-34
ANAHUAC ISOPACH
CAPIO FIDELIS, LLC
POINTE COUPEE PARISH, LA
SCS ENGINEERS
Wichita, KS
January 2023
0
3,500
Feet
N

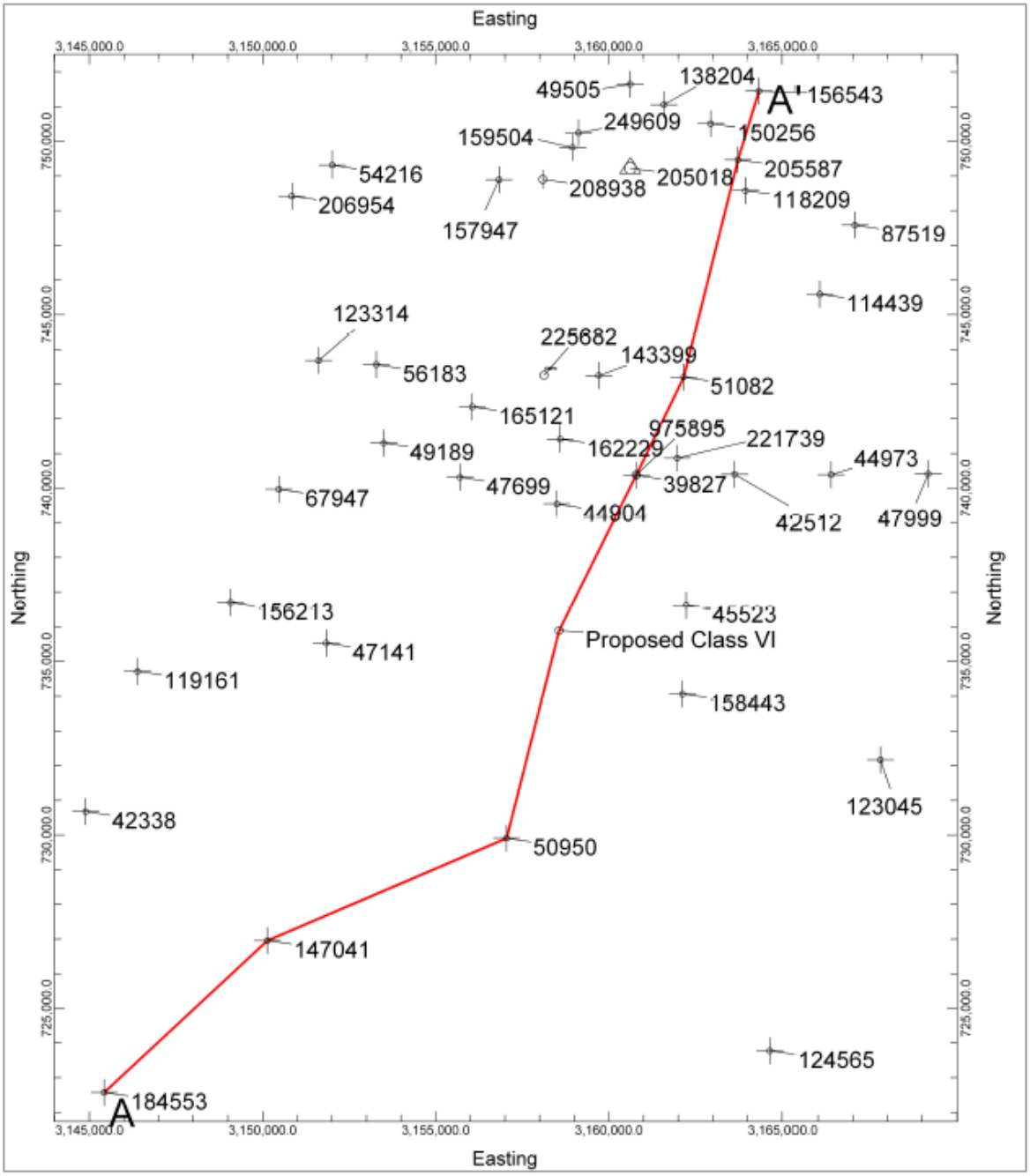


FIGURE 2-35
CROSS-SECTION TRACE A-A' (SW-NE)
CAPIO SEQUESTRATION, LLC
POINTE COUPEE PARISH, LA

SCS ENGINEERS
Wichita, KS | November 2022

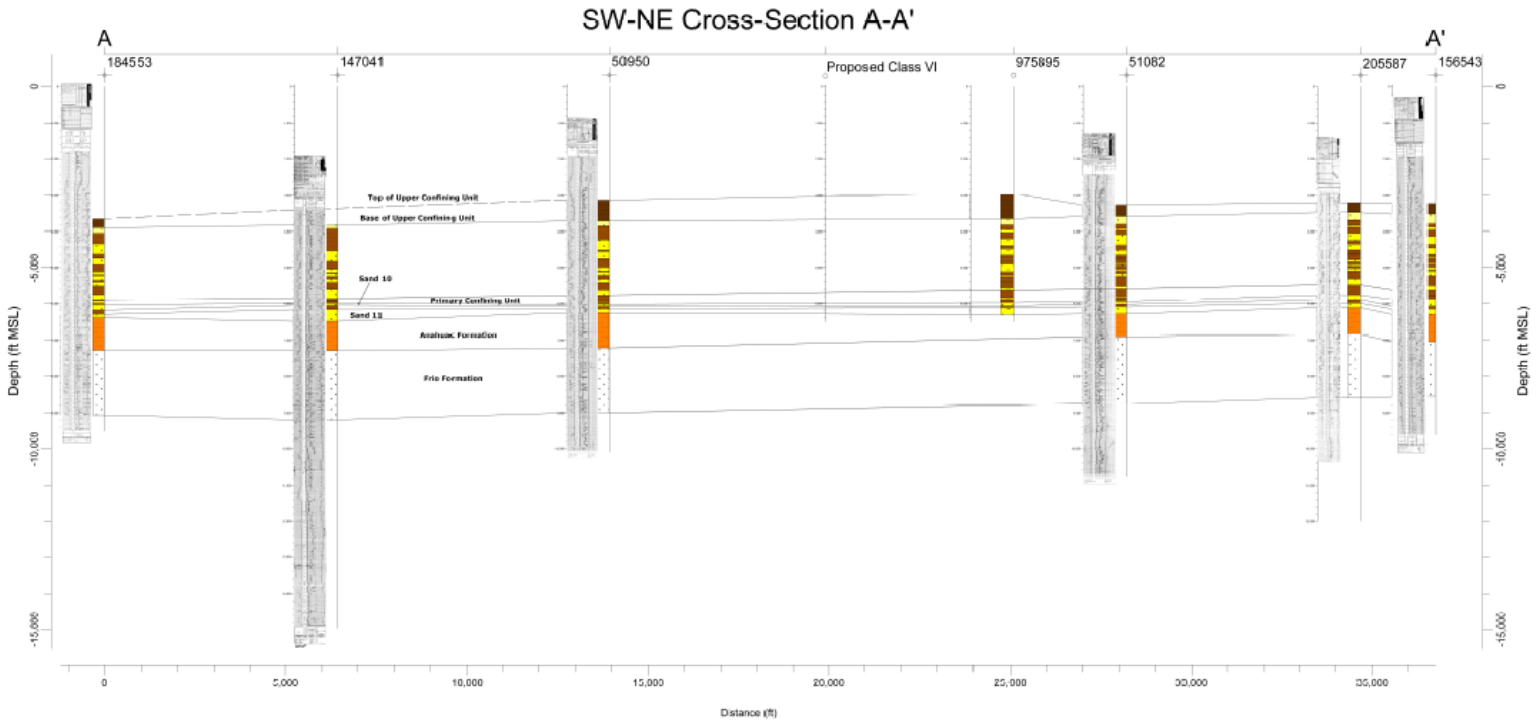


FIGURE 2-36
Cross-Section A-A' (SW-NE)
Capio Sequestration, LLC
Pointe Coupee Parish, LA

SCS ENGINEERS
Wichita, KS | November 2022

N

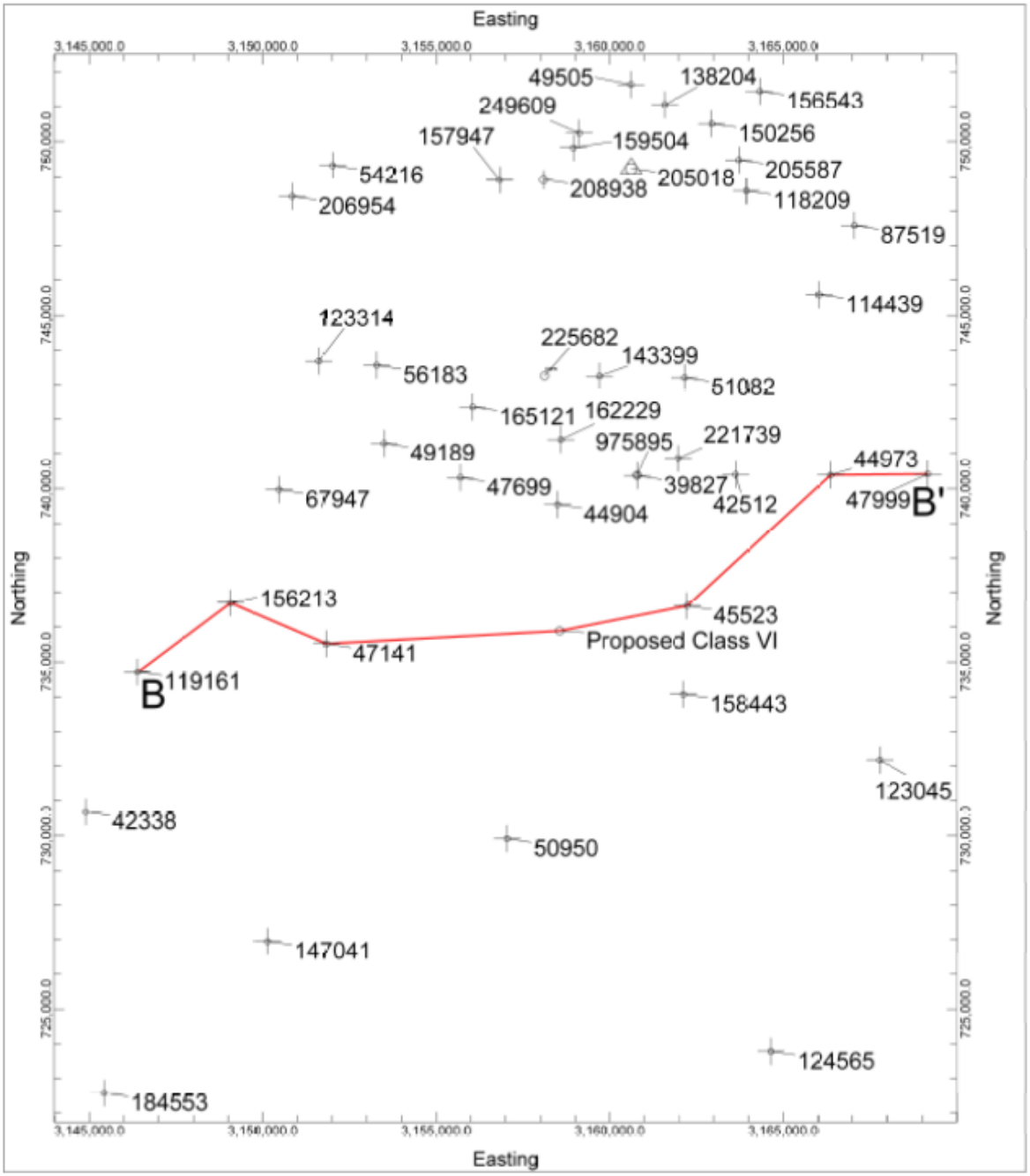


FIGURE 2-37
CROSS-SECTION TRACE B-B' (W-E)
CAPIO SEQUESTRATION, LLC
POINTE COUPEE PARISH, LA

SCS ENGINEERS

Wichita, KS | November 2022

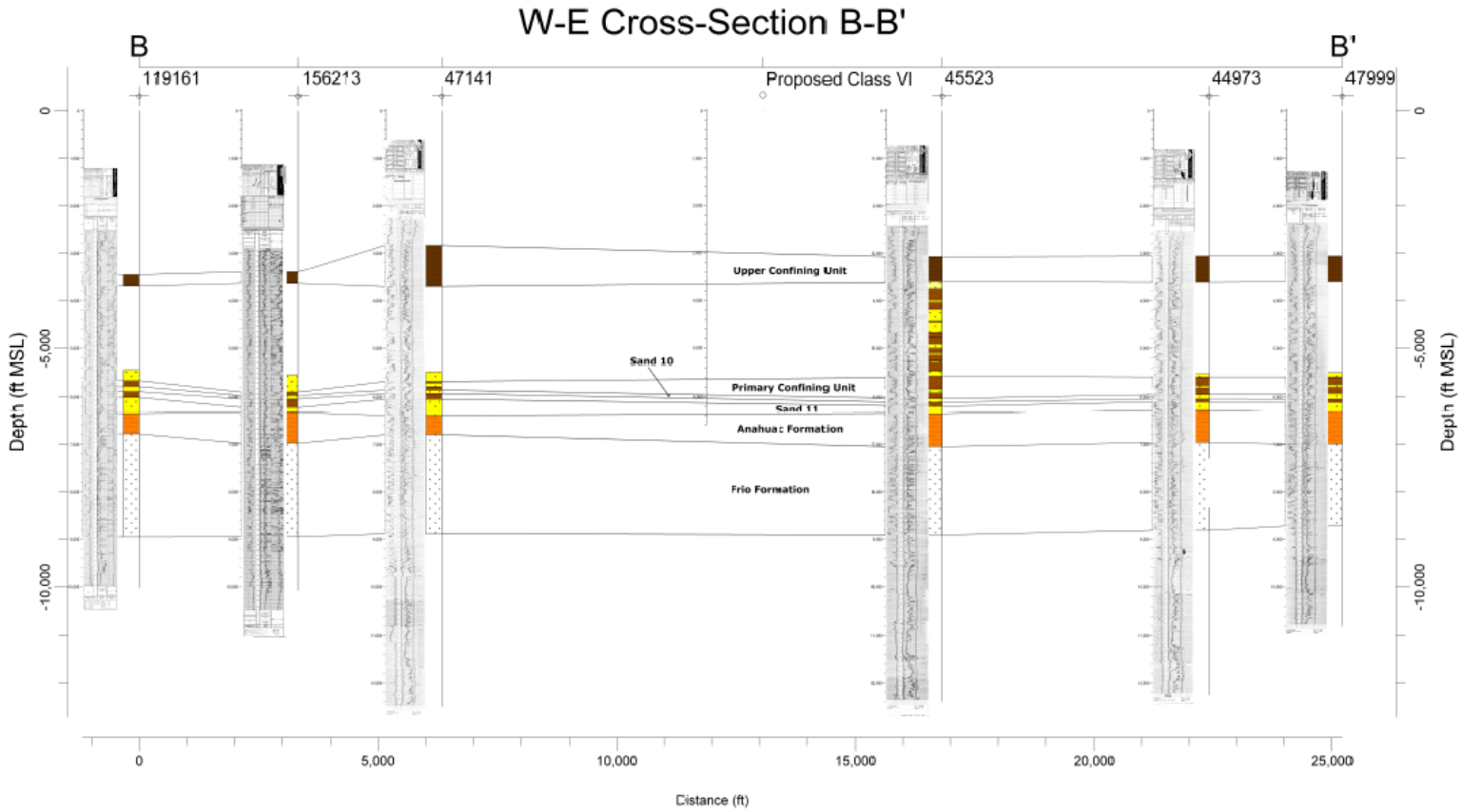
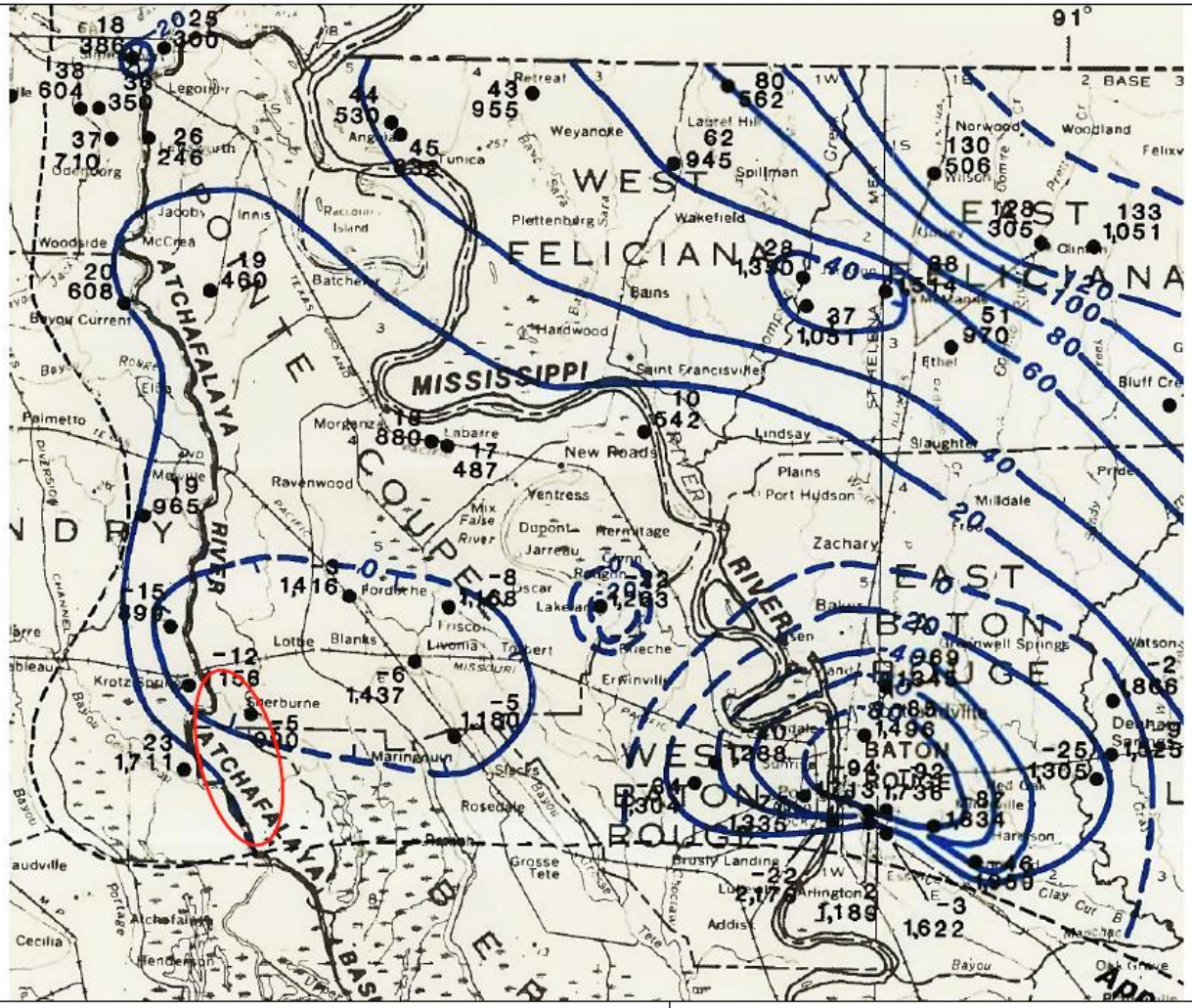


FIGURE 2-38
Cross-Section B-B' (W-E)
Capio Sequestration, LLC
Pointe Coupee Parish, LA

SCS ENGINEERS
Wichita, KS | November 2022

N



Legend

- Potentiometric Contours (20' intervals - Datum is sea level)
- Control Point — Altitude of potentiometric surface (feet) / Depth of Well (feet)
- Approximate Location of Sherburn Lease

Source:
Martin, A. and Whiteman C.D. (1985). "Generalized Potentiometric Surface of the Evangeline and Equivalent Aquifers in Louisiana, 1980". Water-Resource Investigation Report 84-4359. USGS. DOI: 10.3133/wri844359.

FIGURE 2-39
POTENTIOMETRIC SURFACE OF THE EVANGELINE AND EQUIVALENT AQUIFERS
CAPIO SEQUESTRATION, LLC
POINTE COUPEE PARISH, LA

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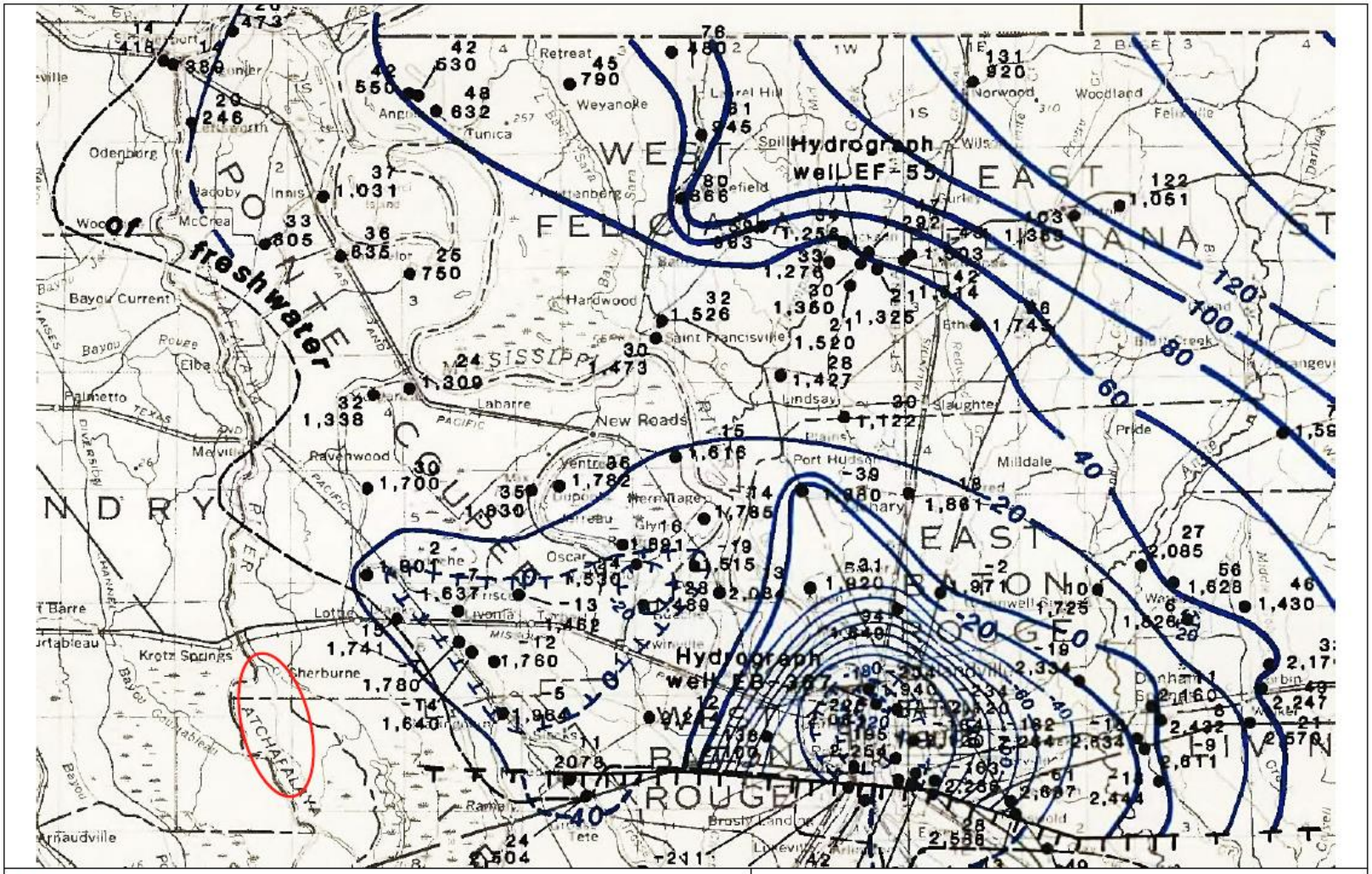

Legend

- Potentiometric Contours (20' intervals - Datum is sea level)
- Control Point — Altitude of potentiometric surface (feet) / Depth of Well (feet)
- Baton Rouge Fault (Approximate Location)
- Approximate Location of Sherburne Lease

Source:
Martin, A.,Whiteman C.D., and Becnel M.J. (1988). "Generalized Potentiometric Surfaces of the Upper and Lower Jasper and Equivalent Aquifers in Louisiana, 1984". Water-Resource Investigation Report 87-4139 Plate 1. USGS. DOI: 10.3133/wri874139.

FIGURE 2-40
POTENTIOMETRIC SURFACE OF THE UPPER JASPER AND EQUIVALENT AQUIFERS
CAPIO SEQUESTRATION, LLC
POINTE COUPEE PARISH, LA

SCS ENGINEERS
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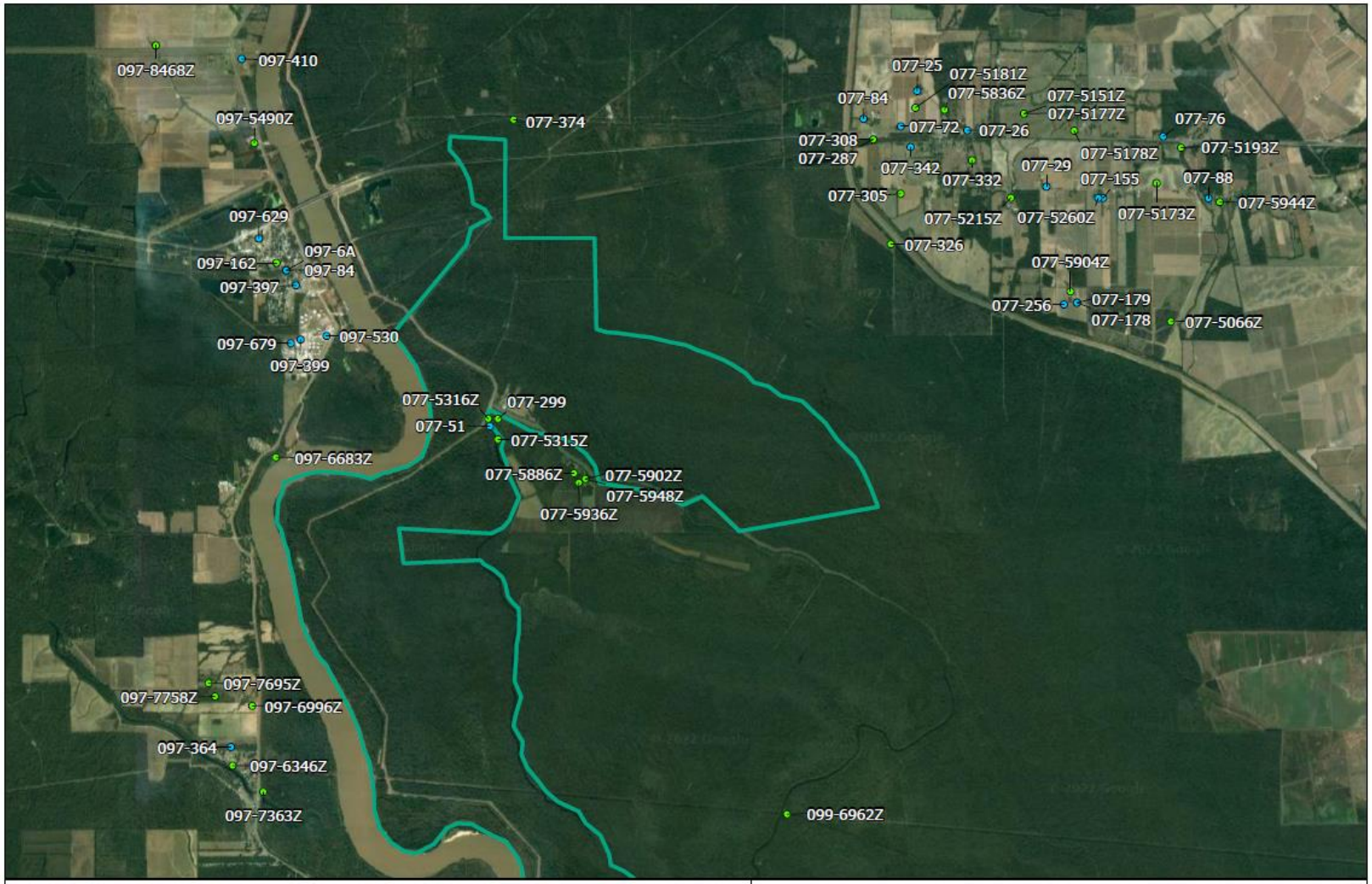
N



Legend

- Sherburne Lease
- Well (Evangeline and Equivalent Aquifers)
- Well (Mississippi River Valley Alluvium (MRVA) and Atchafalaya Alluvium Aquifers)

FIGURE 2-41
AREA WATER WELLS
CAPIO SEQUESTRATION, LLC
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0 9,000 Feet
N

Appendices

Appendix 1-A

Appendix 1-B.1

Appendix 1-B.2

Appendix 1-B.3