

RESOLUTION NO. 14- 10

BOARD OF COUNTY COMMISSIONERS
HAMILTON COUNTY, FLORIDA

A RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS OF HAMILTON COUNTY, FLORIDA, A POLITICAL SUBDIVISION OF THE STATE OF FLORIDA, IDENTIFIED IN SECTION 7.24, FLORIDA STATUTES; IDENTIFYING THE SUBJECT AND EXPRESSING CONCERNS WITH REGARD TO THE PLACE OR LOCATION PROPOSED FOR THE SABAL TRAIL NATURAL GAS TRANSMISSION PIPELINE REGARDING THE WITHLACOOCHEE RIVER CROSSING IN HAMILTON COUNTY, FLORIDA; THIS RESOLUTION IS BEING ADOPTED FOLLOWING THE REGULAR MEETING OF SAID BOARD ON AUGUST 19, 2014, AT WHICH TIME THE SUBJECT WAS ON THE AGENDA FOR THAT BOARD MEETING AND THE PRINCIPAL PRESENTATION WAS MADE BY CHRIS MERICLE; AND PROVIDING FOR DISTRIBUTION OF COPIES OF THIS RESOLUTION.

Whereas, the subject as herein provided was an Agenda item, set for 6:20 P. M. on Tuesday, August 19, 2014, at a regular meeting of the Board of County Commissioners of Hamilton County, Florida (hereafter "Board"). A copy of that Agenda being attached hereto. The principal speaker at that time was Chris Mericle. Other speakers were: Wayne Crotty, Joe McClung, and Russell Tapem. In addition to those speakers, there were numerous persons present in the audience supporting the speakers.

Whereas, the speakers aforesaid stated that there was no opposition on their part to the Natural Gas pipeline, but expressed concern and opposition to the

proposed Withlacoochee River Crossing site or location in Hamilton County, Florida, based on the findings and explanation as shown in the geologist report hereafter mentioned.

Whereas, at the time of the meeting as aforesaid, the Board was presented with copies of the following items which are attached hereto:

(a) A report signed by David Brown, a professional geologist, titled “Karst Features and Hydrogeology of the Proposed Sabal Trail Natural Gas Transmission Pipeline Withlacoochee River Crossing – Hamilton County, Florida”, being a total of 21 pages, (hereafter referred to as “the Geologist Report”);

(b) A letter dated April 18, 2014 with attached Memorandum of same date, from the Suwannee River Water Management District, being a total of 5 pages (hereafter referred to as “Water Management District Report”)

(c) A letter dated July 17, 2014 from the United States Environmental Protection Agency, being 3 pages (hereafter referred to as “USEPA Report”)

NOW, THEREFORE, THE PREMISES CONSIDERED, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF HAMILTON COUNTY, FLORIDA:

1. The Board finds that the foregoing recitals (“Whereas” paragraphs) are true and correct.

2. The Withlacoochee River forms the Western boundary of Hamilton County, Florida, as shown in Section 7.24, Florida Statutes:

“The boundary lines of Hamilton County are as follows: Beginning in the thread of the Withlacoochee River where the boundary line between the states of Georgia and Florida intersects said river; thence southerly along the thread of said river to where it joins the thread of the Suwannee River; thence east and northerly following the thread of said Suwannee River where same is intersected by the boundary line between the states of Georgia and Florida; thence west along said boundary line to the place of beginning”.

3. The Conclusions and Recommendations shown at pages 13 through 15, inclusive, of the Geologist Report”), are accepted and adopted by this Board at this time and being based on the facts and study as shown in that report.

4. This Board adopts the observation and conclusions as shown in the “Special Aquatic Sites” paragraph at the top of page 3 of the USEPA Report. Like the USEPA, this Board is particularly concerned for proposed wetland and stream crossings that may impact special aquatic sites. The USEPA Report citing heightened concern to include Southwest Georgia, the ecologically significant Suwannee River and Santa Fe River, and associated freshwater springs within the north Florida region.

5. This Board finds and concludes, as shown in the last full paragraph near the bottom of page 3 of the Water Management District Report, that there is no opposition as to the installation of pipelines that support Florida’s economy for the reasons shown in that report. This Board, based on the information provided to date, recommends that the pipeline route be reconsidered to avoid sensitive karst regions that can have a significant impact on the water resources in the area of that location, all as more specifically shown and described in the Water Management District Report.


6. As soon as reasonably possible, the Clerk of this Board shall furnish copies of this Resolution to Chris Mericle, the Congressional Delegation and the State Legislative Delegation for Hamilton County, Florida, and the Federal Energy Regulatory Commission.


DULY ADOPTED, at Jasper, in Hamilton County Florida, this 22nd day of August 2014, to be effective as of August 19, 2014.

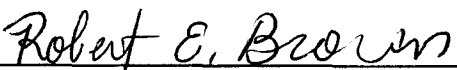
Attest: BOARD OF COUNTY COMMISSIONERS
HAMILTON COUNTY, FLORIDA


By: 
Clerk, Greg Godwin

By: _____
Chairman, Josh B. Smith


Commissioner, Randy Ogburn


Commissioner, Harry D. Oxendine


Commissioner, Robert E. Brown


Commissioner, Beth Burnam

AGENDA
BOARD OF COUNTY COMMISSIONERS, HAMILTON COUNTY, FLORIDA
Room 112 - Courthouse 207 Northeast First Street
Jasper, Florida
MEETING DATE: AUGUST 19, 2014

THE AGENDA ITEMS LISTED BY NUMBER WILL BE TAKEN IN ORDER FROM THE BEGINNING OF THE MEETING REGARDLESS OF TIME. HOWEVER, THE TIME CERTAIN ITEMS LISTED WITH SPECIFIC TIMES WILL COMMENCE AT THE SPECIFIED TIME.

LISTED ITEMS

- 1) COMMENTS FROM THE PUBLIC - UNAGENDAED APPEARANCES (*)
- 2) CONSENT AGENDA APPROVAL
- 3) OLD LIBRARY BUILDING - PAINT AND ROOF
- 4) REVISED PLANS FOR JENNINGS LIBRARY MEETING ROOM - REVIEW AND DISCUSSION
- 5) NW 23RD BLVD DEED ACCEPTANCE
- 6) MEMORANDUM OF UNDERSTANDING WITH DEPARTMENT OF AGRICULTURE REGARDING MOSQUITO CONTROL
- 7) RESOLUTION - ADOPTION OF COMPREHENSIVE EMERGENCY MANAGEMENT PLAN
- 8) DISCUSSION OF REDISTRICTING PLAN
- 9) APPROVE BILLS
- 10) CORRESPONDENCE AND ANNOUNCEMENTS
- 11) FY 2014-15 BUDGET- REVIEW AND DISCUSSION
- 12) ADJOURN

TIME CERTAIN ITEMS

- 6:00 P.M. - CALL TO ORDER - INVOCATION - PLEDGE ALLEGIANCE TO THE FLAG
6:10 P.M. - COUNTY ROAD PROJECTS - STATUS REPORTS
6:15 P.M. - SHIP/CDBG PROGRAM - STATUS REPORT
6:20 P.M. - CHRIS MERICLE - SABAL PIPELINE ROUTE DISCUSSION

An Agenda review meeting will be held, beginning at 12:00 noon, on Monday preceding the above Agenda meeting date, and will be held in Room 106, Hamilton County Courthouse, 207 NE First Street, Jasper, Florida 32052. In the event that Monday meeting date should be on the same date as a County Adopted holiday, then the Agenda review meeting will be on Friday, beginning at 12:00 noon, preceding the above Agenda meeting date at the same office as aforesaid.

Persons appearing before the Board are requested, if possible, to submit in writing the subject matter of their appearance before the Board no later than Tuesday prior to the Board Meeting the following Tuesday.

*) NOTICE: Persons appearing before the Hamilton County Board of County Commissioners, not having given notice in time to be included and shown on the Agenda, and desiring to make a presentation, will be limited to five (5) minutes, in the interest of meeting time. The Board of County Commissioners will hear and listen to persons appearing whose subject has not been shown on the agenda; however, action by the Board on any such matter can only be taken upon determination of an emergency situation. Any identifiable group of three (3) persons or more shall be limited to a total of ten (10) minutes per topic.

In accordance with Section 286.0105, Florida Statutes, notice is given that if any person decides to appeal any decision made by the Board, agency or commission, with respect to proceedings and that, for such purpose, he/she will need to ensure that a verbatim record of the proceedings is made, which record includes testimony and evidence upon which the appeal is based.

NOTIFICATION: IN ACCORDANCE WITH THE AMERICANS WITH DISABILITIES ACT, PERSONS WITH DISABILITIES NEEDING A SPECIAL ACCOMODATION FOR ATTENDANCE AT THIS MEETING SHOULD CONTACT THE CLERK OF CIRCUIT COURT, ROOM 106, 207 NORTHEAST FIRST STREET, JASPER, FLORIDA, TELEPHONE (386) 792-1288, NOT LATER THAN 72 HOURS PRIOR TO THE PROCEEDINGS. IF HEARING IMPAIRED, TDD (386) 792-0857.

NEXT REGULAR MEETING OF THE BOARD: TUESDAY, SEPTEMBER 2, 2014 AT 9:00 A.M.

Karst Features and Hydrogeology of the
Proposed Sabal Trail Natural Gas Transmission Pipeline
Withlacoochee River Crossing - Hamilton County, Florida



August 2014

**Karst Features and Hydrogeology of the Proposed
Sabal Trail Natural Gas Transmission Pipeline
Withlacoochee River Crossing - Hamilton County, Florida**

This report is respectfully provided to help inform the Federal Energy Regulatory Commission and other interested parties in their assessment and understanding of the potential risks to the public's health, safety and welfare; water resources; and the natural environment posed by the Sabal Trail Natural Gas Transmission Pipeline crossing of the Withlacoochee River in Hamilton County, Florida.

The findings included herein are presented on behalf of concerned landowners and are based upon sound geologic principals and hydrogeologic data available at the time the analysis was performed. The information presented is considered to be accurate and is based upon the interpretations of David J. Brown, P.G. a State of Florida Registered Professional Geologist, and is certified pursuant to Chapter 492, Florida Statutes, (FS) and Chapter 61G16, Florida Administrative Code, F.A.C.

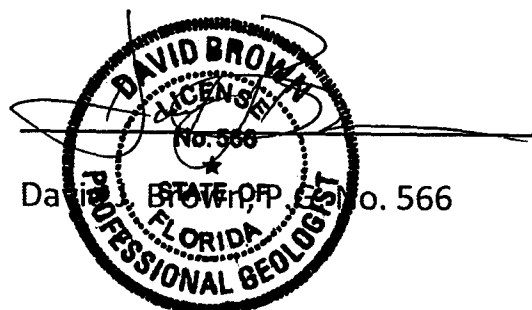


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Karst Features and Hydrogeology of the Proposed Sabal Trail Natural Gas Transmission Pipeline Withlacoochee River Crossing - Hamilton County, Florida

Abstract

The Sabal Trail Natural Gas Transmission Pipeline project proposes a crossing of the Withlacoochee River in Hamilton County, Florida (Withlacoochee River Crossing). The subject site is a unique karst hydrogeologic environment, including numerous spring vents, cave and fracture systems, which make it exceptionally susceptible to adverse impacts due to the proposed pipeline both during and after construction.

It is imperative that the pipeline owner/operator, their customer base, and adjacent and nearby property owners be assured by knowledgeable professionals that underground transmission pipelines are located, designed and constructed to the highest engineering standards possible to safeguard against adverse impacts. Given this fundamental principle, areas considered highly karstic should be avoided due to their inherent instability. Karstic terrains not only present highly problematic conditions for construction, but once in operation, sinkhole development in proximity to a highly pressurized transmission pipeline could result in potentially disastrous consequences.

The unique hydrogeology of the proposed Withlacoochee River crossing site; characterized by active sinkholes, spring vents, cave systems, siphons, swallets, estavelles, and karst valleys; presents an exceptionally high potential for collapse and sinkhole activation during Horizontal Directional Drilling and related pipeline installation activities, and also exhibits a highly significant potential for future collapse during pipeline operation due to the occurrence of extensive cave and fracture systems.

Proper due-diligence in geologically unstable areas with high potential for catastrophic pipeline failure demands that such areas be eliminated from proposed pipeline corridors. Such improved planning can serve to simultaneously achieve the benefits of supporting natural gas as an alternative energy source in the State of Florida, while avoiding unnecessary risk and potential liability.

Introduction

The unique hydrogeology of the proposed Withlacoochee River crossing site with its numerous spring vents, cave and fracture systems, siphons, swallets, estavelles, and karst valleys not only presents an exceptionally high probability for sinkhole activation during pipeline installation, but also exhibits a highly significant potential for future sinkhole development over the operational lifetime of the pipeline. The existence of such numerous karst features clearly distinguishes the crossing site as being highly unstable and therefore must preclude the location from consideration.

It is vitally important that the Federal Energy Regulatory Commission's decision regarding the proposed transmission pipeline be made in accordance with sound engineering and geological principles and the specific goals and objectives of State and Federal regulations and environmental policies in light of the field observations, published documents, and information presented herein. The Author understands that a

geologist reporting to the Federal Energy Regulatory Commission and a professional geologist employed by Sabal Trail Transmission, LLC (Sabal Trail) were made aware of local residents' concerns during an observational field trip on March 26, 2014. To date, the high level of risk and danger associated with the proposed crossing site does not appear to have been recognized as recent field activities indicate that the proposed Withlacoochee River crossing is still being considered.

The following report is therefore provided to offer a greater understanding of the complex hydrogeologic setting and highly-altered nature of the Suwannee Limestone at the proposed Sabal Trail transmission pipeline crossing of the Withlacoochee River. As of the date of this report, the proposed pipeline's primary route is oriented in a northwest-southeast direction and crosses the Withlacoochee River approximately 14 miles south of the Florida state line, approximately 1.5 miles north of U. S. Highway 90 and approximately 1.5 miles west of County Road 141 as shown in **Figure 1**.

Sabal Trail's priority route parallels the western boundary of an existing powerline easement in Section 10, Township 1 South, Range 11 East, and transects the Withlacoochee River at the county line between Hamilton and Madison Counties. The confluence of the Withlacoochee River and the Suwannee River (an Outstanding Florida Water) is approximately 3.5 miles downstream of the proposed crossing site. As shown on **Figure 1**, the report's detailed Study Area is centered on the crossing location and is approximately 0.8 square miles in area.

Karst Terms and Definitions

The karst terms used in this report are in accordance with the United States Environmental Protection Agency's (EPA) 2002 report entitled "A Lexicon of Cave and Karst Terminology with Special Reference to Environmental Karst Hydrology" and several definitions from the report are provided below.

alluvium. A general term for clay, silt, sand, gravel, or similar unconsolidated material deposited during comparatively recent geologic time by a stream or other body of running water as sorted or semisorted sediment in the bed of the stream or on its floodplain

anastomotic cave pattern. A type of maze cave consisting of tubular passages or holes in a cave or in a solution-sculptured rock. A complex of many irregular and repeatedly connected passages. Synonym: labyrinth.

artesian flow. Flow through a confined aquifer where the elevation of the overlying aquiclude is locally depressed so that the entire aquifer is saturated and the flow is under hydrostatic pressure. Some maze cave development in cavernous limestones may be due to artesian flow.

base of karstification. Level below which karstification has not occurred.

cavern porosity. A pore system having large, cavernous openings. The lower size limit, for field analysis, is practically set at approximately the smallest opening that an adult person may enter.

estavelle. An intermittent resurgence or exurgence, active only in wet seasons. May act alternatively as a swallow hole and as a rising according to ground-water conditions. Opening in karstic terrane which acts as a discharge spring during high potentiometric surface and as a swallet during low potentiometric surface.

fracture pattern. The spacial arrangement of a group of fracture surfaces.

karst. A terrane, generally underlain by limestone or dolomite, in which the topography is chiefly formed by the dissolving of rock, and which may be characterized by sinkholes, sinking streams, closed depressions, subterranean drainage, and caves.

karst topography. Topography dominated by features of solutional origin. Geomorphically, the dominant features usually but not always obviously present are sinkholes and caves.

karst valley. 1. Valleys in karst are normally distinctive due to the lack of integrated surface drainage. Most are either blind (due to being closed where the drainage sinks underground), headless or pocket (where a river emerges from a spring) or dry (where surface flow has been lost due to underground capture). 2. Elongated solution valley in limestone. 3. Valley produced by collapse of a cavern roof.

karst window. Depression revealing a part of a subterranean river flowing across its floor, or an unroofed part of a cave.

leaky aquifer. An aquifer overlain or underlain by semipermeable strata from or into which water will flow.

potentiometric surface. An imaginary surface representing the total static head of ground water and defined by the level to which water will rise in a piezometer or well.

secondary porosity. Porosity of some lithologic material that has developed after the rock was initially formed, such as joints and fractures, and may be capable of enlargement by dissolution processes.

siphon. Synonym for a sump, or a section of flooded cave passage, in common parlance. True siphons, where water flows first up and then down are rare in caves, as the fractures in limestone tend to disrupt the required hydraulics.

solution subsidence. 1. Any subsidence due to solution of underlying rock but particularly the subsidence of parts of a formation into hollows or pockets of an immediately underlying soluble formation. 2. A crater-like doline in rock other than karst limestone, formed by surface subsidence above solutionally enlarged fissures in a sub-surface karst limestone stratum.

spongework cave pattern. A complex maze cave pattern consisting of irregular interconnecting cavities with intricate perforation of the rock. The cavities may be large or small.

spring. Point where underground water emerges on to the surface, not exclusive to limestone, but generally larger in cavernous rocks.

swallet, swallow hole. A place where water disappears underground in a limestone region. A swallow hole generally implies water loss in a closed depression or blind valley, whereas a swallet may refer to water loss into alluvium at a streambed, even though there is no depression.

Hydrogeology of the Study Area

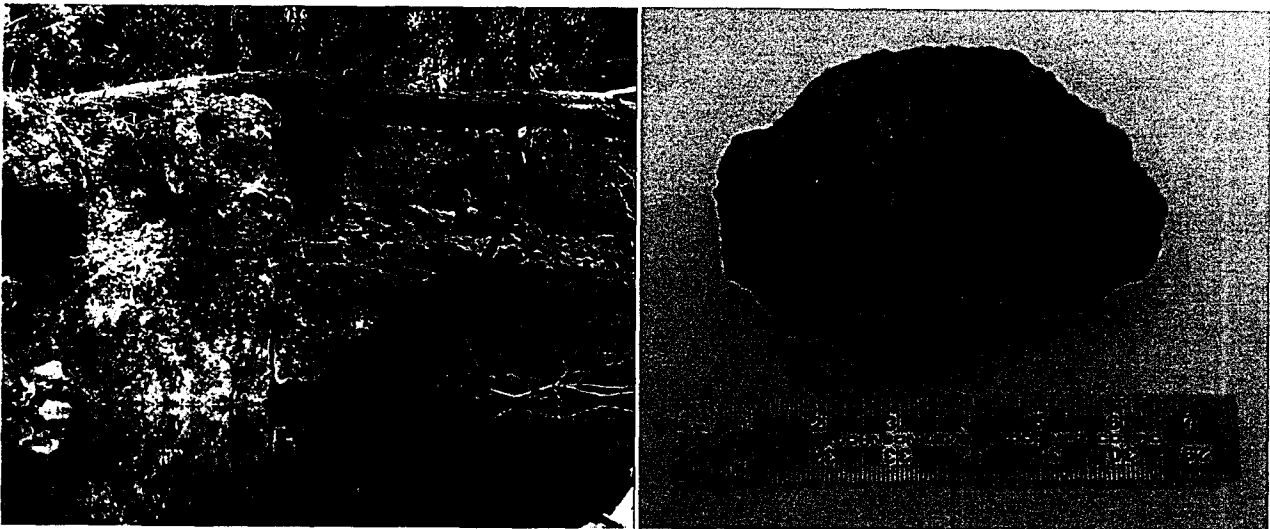
The Study Area, the southwest section of Hamilton County and parts of nearby of Madison County, is located within the Gulf Coastal Lowlands physiographic province. The Gulf Coastal Lowlands is the largest physiographic province in the State of Florida and extends along the coast of the Gulf of Mexico throughout much of the state. Elevations are generally low and range from less than 45 feet above mean sea level (msl) to approximately 100 feet msl on the landward side of the province. The tannin-stained Withlacoochee River, which originates in

Georgia, flows southerly across the Cody Scarp and intersects the Suwannee River to the south. Limestone in Hamilton County south of the Cody Scarp is thinly covered and generally not confined.

In the Study Area, the Withlacoochee River meanders in an easterly direction through an incised valley of Oligocene Age Suwannee Limestone, which is readily observed along river bank exposures. The Suwannee Limestone represents the top of the upper Floridan Aquifer, which is reported to be one of the most productive aquifers in the world (USGS) and is the primary aquifer utilized for groundwater withdrawals in the area. The potentiometric surface of the upper Floridan Aquifer varies seasonally, with elevations exceeding land surface in and around the river's incised channel resulting in numerous springs that contribute significantly to its baseflow (see report cover). Along the river banks, the Suwannee Limestone is nearly completely exposed. However, outside of the floodplain, the Suwannee Limestone is generally overlain by a thin veneer of unconsolidated siliciclastic sediments, typically less than 15 to 20 feet in thickness, composed of variable percentages of undifferentiated clays and sands. Locally, the thickness of the overlying sediments can vary due to irregularities in the upper surface of the limestone.

These unconsolidated sediments do not comprise a viable confining unit and the upper Floridan is considered a leaky aquifer within the Study Area. In the flood plain it is common to observe eroded limestone boulders and rubble (alluvium) above the limestone unit's upper contact as a result of active weathering through continuous dissolution and erosion. The upper Suwannee Limestone is highly altered and exhibits pronounced secondary porosity and in many areas cavernous porosity. The unit is extremely fractured and preferential weathering and erosion of these features most likely influences the channel's alignment and migration.

As shown below, the Suwannee Limestone outcrops nearly at land surface in the Study Area and is reported to reach thicknesses in excess of 150 feet in Hamilton County (Rupert, 1989). It is typically off-white to pale yellow-orange in color and can be highly fossiliferous with foraminifera, mollusk and echinoid fossils common. The Suwannee Limestone is also variably hard, with silicified interbeds of chert and dolomite which can have great impact on the proposed drilling operations.



(Left) Exposed upper contact of the Suwannee Limestone (Floridan Aquifer) 300 feet west of the proposed Sabal Trail Pipeline crossing. A spongework cave pattern is clearly evident. (Right) A sample of the Suwannee Limestone obtained from the Study Area with a dense, hard, silicified (dark gray) section exposed. Scale is in inches.

To better understand the methods used in this study, several structural geology terms must also be defined. A "Fracture Trace" is a line drawn on a map to denote the presence of an underlying fracture or zones of fractures

and indicates the feature's azimuth, i.e., direction or angle of bearing. Fracture traces also reflect zones of increased weathering and permeability (Diodato, 1999). In the Study Area there appears to be a strong correlation between the presence and number of adjacent karst features, whose shape and orientation denote a preferred direction, and the occurrence of enhanced permeability via fractures. Several of the karst features investigated were found to be structurally related and are excellent examples of fracture traces. Larger, more extensive fracture systems composed of multiple fracture traces or prominent karst features, i.e., karst valleys, can also be drawn on maps. Such features are often called "Lineaments" and they can extend for miles, depending on the rock type(s) and geologic history of an area. Based on the work performed as part of this study, two lineaments composed of fracture traces, fracture systems, cavern systems and springs are located in proximity to, and intersect the location of, the proposed pipeline crossing, greatly increasing the potential for adverse impacts.

"Subsidence Sinkholes" or solution subsidence features were also identified in the Study Area and are common to regions where limestone is thinly covered. Subsidence sinkholes are formed by the process of dissolution of the underlying limestone, where cavities develop below land surface resulting in a sag or collapse of overlying sediments. Cavities in underlying rock are responsible for virtually all sinkholes in Florida (USGS). Karst Windows are somewhat different than Subsidence Sinkholes and represent depressional openings that reveal subterranean groundwater flow, or the exposed portion of a cave or vertical window (FGS 2003). Based on the Author's work in the Study Area, it is possible that karst windows begin as subsidence sinkholes and developed over time through continued erosion and subsidence along preferential groundwater flowpaths.

Collectively, alignments of exposed fractures, sinkholes and karst windows can be used to infer "Fracture Traces", and since these features can often be associated with several fractures or groups of fractures, they can sometimes also be described as "Fracture Systems". Larger, more extensive Fracture Systems composed of multiple fracture traces and other prominent karst features, i.e., karst valleys, can also be drawn on maps as lineaments. Such features play an important role in groundwater flowpaths and the occurrence of springs.

Karst Features Identified in the Study Area

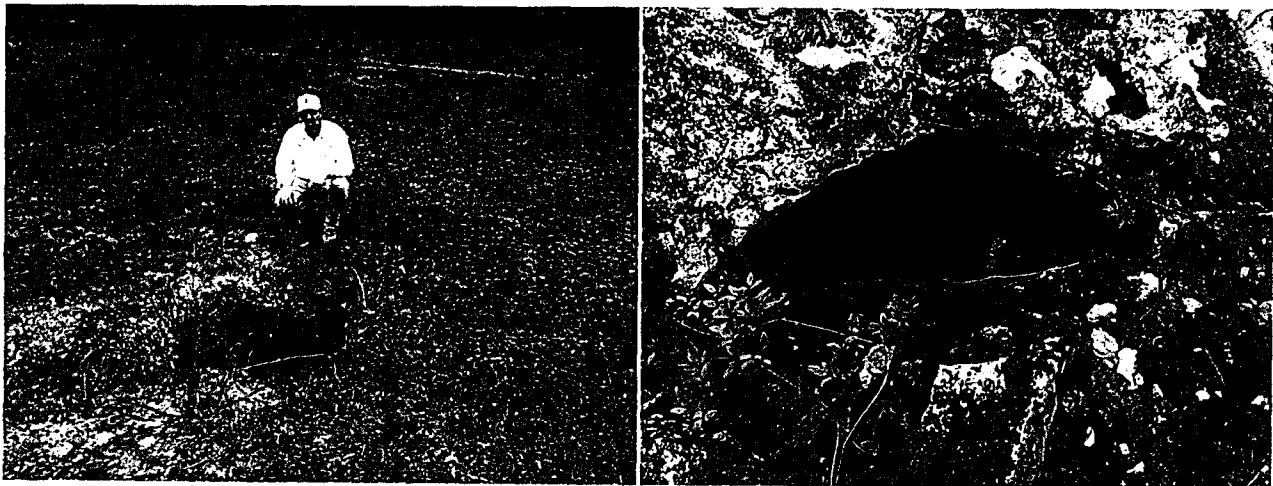
In the Study Area, the Suwannee Limestone is typically soft with a highly irregular upper surface, pockmarked with fissures, vugs (rock cavities), and solution features created by the excavating effects of water on the soluble rock. Close inspection of the exposed limestone surface reveals numerous small fractures and cracks interconnecting larger voids and cavities, resulting in cavernous porosity in many areas. Due to the minor thickness of overlying unconsolidated sediments, subsidence sinkholes dominate the Study Area. Several subsidence sinkholes were found to be active, with recently fallen trees, exposed roots and loose, raveled soils. The active subsidence observed is most likely triggered or accelerated by fluctuating river stage, whereby surface water intrudes into depressional areas and flushes loose unconsolidated sediments from cavities and solution features in the Suwannee Limestone, further weakening the feature and promoting collapse.

Karst topography, resulting from the dissolution of the Suwannee Limestone, dominates the Study Area and numerous subsidence sinkholes and dozens of depressions were identified in field inspections. Based on reports from cave divers at Morgan Spring, the base of karstification may extend throughout the thickness of the Suwannee Limestone to depths in excess of 200 feet below land surface (ft bls). This depth is most likely well below the depth for Horizontal Directional Drilling (HDD) proposed for the subterranean pipeline crossing of the

.Withlacoochee River. Based on topographic information and Sabal Trail's recently drilled exploratory boreholes, the HDD will extend for approximately 2,500 lineal feet (approximately ½ mile) underneath the Withlacoochee River and will be performed at depths of shallower than 110 ft bls. If correct, this indicates, that the pipeline will be located above the base of karstification and well within the vertical range of solution features and fractures.

Two prominent elongated depressional features were identified in the Study Area and appear to be karst valleys, one of which lies directly underneath the proposed pipeline's alignment and within the section proposed for the HDD river crossing. The parallel nature of both karst valleys, that trend in a virtually identical northwest to southeast azimuth direction, may be indicative of parallel fracture systems and extensive solution activity in the underlying limestone. For the purposes of identification in this report, these features have been identified as the Thunderhole Karst Valley and the Power Line Karst Valley.

Both features are associated with and located in proximity to numerous karst features, including spring vents, estavelles, karst windows and subsidence sinkholes. Karst valleys should be considered as highly unstable and prone to collapse and sinkhole development. Due to its complex structural character there is an extremely high potential for collapse and sinkhole activation at the Powerline Karst Valley during HDD and related pipeline installation activities, but also this particular site exhibits a highly significant potential for future collapse due to the depth of karstification and occurrence of extensive cave and fracture systems in close proximity to the pipeline alignment. Thunderhole Karst Valley and Power Line Karst Valley are easily identified on **Figure 2**.



(Left) Cavernous solution features evident in the exposed Suwannee Limestone at land surface. This solution feature is one of several located along the power line easement, within the floodplain north of the river, and is approximately 100 feet west of the proposed HDD alignment. **(Right)** This cavernous feature is located to the west of the power line easement, near the Withlacoochee River. Such features can transmit large quantities of surface water into underlying fractures and cavern systems during higher river stages and can easily enlarge and contribute to future sinkhole development.



(Left) Active subsidence sinkhole in the Study Area, with fallen trees, exposed roots and loose, raveled soils. (Right) Another active subsidence sinkhole within the Study Area showing recent raveling of soils into the exposed cavity. Both features were observed in close proximity to the proposed Sabal Trail gas pipeline alignment and are considered extremely unstable.

The unique karstic terrain of the proposed Withlacoochee River crossing site presents an extremely high potential for collapse and sinkhole activation during HDD and related pipeline installation activities and should be abandoned. Conversely recent exploratory drilling activities appear to indicate a desire by Sabal Trail to move forward with this location as a means to cross the Withlacoochee River. Implementation of the proposed project at this location could provide disastrous.

Springs Identified in the Study Area

The number of springs identified in the Study Area clearly identifies the site as hydrologically unique. As shown on **Figure 2**, there are at least 11 springs in close proximity to the proposed pipeline crossing. Some of these features flow only during a rising or falling river stage which indicates a dynamic relationship between surface water and groundwater. At times some of these features apparently act as estavelles, whereby they discharge during high potentiometric surface events and become swallets when the potentiometric surface is low. Artesian flow from the springs is facilitated by preferential flowpaths created by subsurface solution features, caves and fracture systems and based on discussions with a local cave diver; several of the springs may be interconnected by a complex series of passages over hundreds of feet in length. This interconnectivity increases susceptibility for adverse impacts from the proposed HDD drilling operation and there appears a very high probability that the interconnected cave systems would facilitate uncontrolled HDD fluid (drilling mud) discharges into the Withlacoochee River.

In an effort to increase awareness of the spring features in the Study Area, representatives from the SRWMD were notified to verify that that all features identified as part of this study were accounted for in their springs database. The Author understands that three (3) new springs were added to the database for the Study Area based on these recently-identified springs. The increased awareness and protective measures concerning safeguarding springs in Florida mandate that these features be protected from adverse impacts, especially those related to HDD.