National Park Service
U.S. Department of the Interior
Big Thicket National Preserve
Kountze, Texas

Proposal to improve a natural gas pipeline right-of-way for maintenance access and to lower a segment of exposed and suspended pipe in Big Sandy Creek within the Big Sandy Creek Unit of the Big Thicket National Preserve, Polk County, Texas

Environmental Assessment 2012

SUMMARY

The National Park Service (NPS) is conducting an environmental assessment (EA) to analyze Tennessee Gas Pipeline Company's (Tennessee Gas) proposed lowering of an exposed and suspended pipe in Big Sandy Creek and installation of a combination of permeable matting material (Geoweb®) and culverts along their natural gas pipeline easement within the Big Sandy Creek Unit (BSC Unit) of the Big Thicket National Preserve (Preserve) in Polk County, Texas. The purpose of the culvert/Geoweb® installations is to allow for routine maintenance activities to occur along the easement with minimal disturbance to wetlands (palustrine emergent [PEM] and riverine). The purpose of lowering the exposed and suspended pipe segment is to remove a potential safety hazard and restore flow and stream bank contours in Big Sandy Creek which has been altered by the pipe exposure.

The NPS is preparing this EA in compliance with the National Environmental Policy Act (NEPA). The purpose of an EA is to evaluate the impacts of the proposed Project on the natural environment, consider reasonable alternatives to meet the Project objectives, and identify appropriate mitigation measures to minimize potential impacts.

This EA fully evaluates three alternatives for the proposed Right-of-Way Improvement and Pipeline Lowering Project (Project). Alternative A is the no action alternative, which represents the baseline or benchmark from which to compare the impacts of the action alternatives. In this case, "no action" means the installation of the culverts/Geoweb®, as well as lowering the exposed and suspended pipe would not occur and Project objectives would not be met. Alternative B is the proposed action and would involve the installation of a combination of culverts and Geoweb® at wetland crossings to allow routine maintenance activities to occur along the pipeline easement with minimal disturbance to the streams and wetlands. This alternative also includes the lowering of an exposed and suspended 24-inch diameter pipe in Big Sandy Creek via the conventional open cut method. Alternative B would limit all impacts from the proposed Project to the existing, previously disturbed pipeline easement. Alternative C is an alternative to the proposed action which would involve the same installation of culverts and Geoweb® at wetland crossings, but would lower the exposed and suspended pipe in Big Sandy Creek via the use of a Horizontal Directional Drill (HDD). The use of a HDD would cause increased impact for three topics analyzed within this EA.

This EA has been prepared in compliance with NEPA to provide the decision-making framework that (1) analyzes a reasonable range of alternatives to meet Project objectives; (2) evaluates potential issues and impacts to the Preserve's resources and values; and (3) identifies mitigation measures to lessen the degree or extent of these impacts. Internal and external (public) scoping was conducted to assist with the development of this document. One letter of comment was received from the public in response to the NPS's request for public comment during external scoping and is discussed in the *Consultation and Coordination* section of this EA.

By installing the culverts/Geoweb® at wetland crossings, along with the application of other mitigation measures, Tennessee Gas would substantially reduce long-term

impacts to Preserve resources and values associated with routine maintenance activities. Furthermore, the lowering of the exposed and suspended pipe in Big Sandy Creek would rectify a potential safety hazard as well as restore the natural processes of the stream currently being modified by the presence of the exposed and suspended pipe. NPS dismissed several topics from detailed analysis, and this EA provides the rationale that supports their dismissal. Impacts that could potentially exceed minor levels were retained for more detailed analysis. These topics include floodplains and wetlands; geology and soils; soundscapes, water resources, fish and wildlife, and vegetation. Through the analysis, NPS concluded that the intensity of adverse impacts would range from negligible to moderate. No major adverse impacts were identified. The duration of most impacts would be short-term, lasting from several days to three years, and most effects would be localized to the Project area. Through the analysis, Alternative B was found to be the environmentally preferred and NPS preferred alternative.

Public Comment

If you wish to comment on this EA, you may do so online at the NPS website "Planning, Environment, and Public Comment" http://parkplanning.nps.gov/bith/, or you may mail comments to Douglas Neighbor, Superintendent; Big Thicket National Preserve; 6044 FM 420; Kountze, Texas 77625. This EA will be on public review for 30 days ending August 2, 2012. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment, including your personal identifying information, may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

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1.0 PURPOSE AND NEED

1.1 INTRODUCTION

The Big Thicket National Preserve (Preserve) is located in southeastern Texas, northeast of Houston. The Preserve was established by an Act of Congress on October 11, 1974 as the nation's first preserve "to assure the preservation, conservation, and protection of the natural, scenic, and recreational values of a significant portion of the Preserve in the State of Texas and to provide for the enhancement and public enjoyment thereof". The Preserve encompasses approximately 108,000 acres comprised of nine land units and six water corridors located in Jefferson, Hardin, Liberty, Polk, Tyler, Jasper and Orange Counties (Figure 1).

There are 71 oil and gas pipelines crossing the Preserve within rights-of-way totaling 101 miles and occupying approximately 589 acres. These rights-of-way existed prior to the establishment of the Preserve. No new natural gas pipelines are currently proposed to cross the Preserve, and the National Park Service (NPS) does not have the authority to grant a new right-of-way for the purpose of installing an oil and gas pipeline on federally owned, NPS administered lands. Pipelines may pose threats to the Preserve's resources if not properly managed and maintained. The NPS is the United States (U.S.) federal agency that manages the Preserve, including nonfederal oil and gas activities within.

The proposed Right-of-Way Improvements and Pipeline Lowering Project (Project) area is located in the Big Sandy Creek Unit (BSC Unit) in Polk County, Texas (Figure 1). This Unit of the Preserve is approximately 14,300 acres in size and is located north of the Lance Rosier Unit and northwest of the Hickory Creek Savannah Unit (Figure 1).

The Tennessee Gas Pipeline Company (Tennessee Gas) 100-1 pipeline segment was installed in the 1950's. The NPS defines this pipeline as a "transpark" gas pipeline because its point of origin and end point lie outside of the Preserve's boundaries and it is operated by an entity exercising rights not tied to oil and gas ownership within the Preserve's boundaries (NPS 2005). Transpark pipeline easements are routinely maintained, which consists of mowing and tree limb removal by the owners/operators for long-term access to the pipeline for routine monitoring and maintenance activities (NPS 2005). In order to prevent damage to wetland areas and small stream crossings during maintenance activities, Tennessee Gas has been placing mats over the sensitive areas along their easement. Because it takes heavier machinery, longer work hours and increased environmental impact to lay the matting, several sensitive areas have been identified for culvert and/or Geoweb® (permeable matting material) placement. Tennessee Gas proposes to install a combination of culverts and Geoweb® at nine wetland crossings (three crossings will include culverts and Geoweb® and six crossings will include Geoweb® only) within their natural gas pipeline easement in the BSC Unit of the Preserve in Polk County, Texas.

Tennessee Gas has also identified an area of exposed pipe that requires attention. Since its installation in the 1950's the 100-1 pipe has become exposed within Big Sandy Creek. They propose to lower the exposed and suspended pipe via the open cut method (method of pipe installation in which a trench is excavated to install the new pipe).

These actions would allow for routine maintenance activities to occur along the easement with minimal disturbance to wetlands, to reduce the potential safety hazard posed by the exposed and suspended pipe, and restore the natural processes of Big Sandy Creek that are currently inhibited by the presence of the exposed and suspended pipe.

Figure 1. Big Thicket National Preserve – Analysis Area

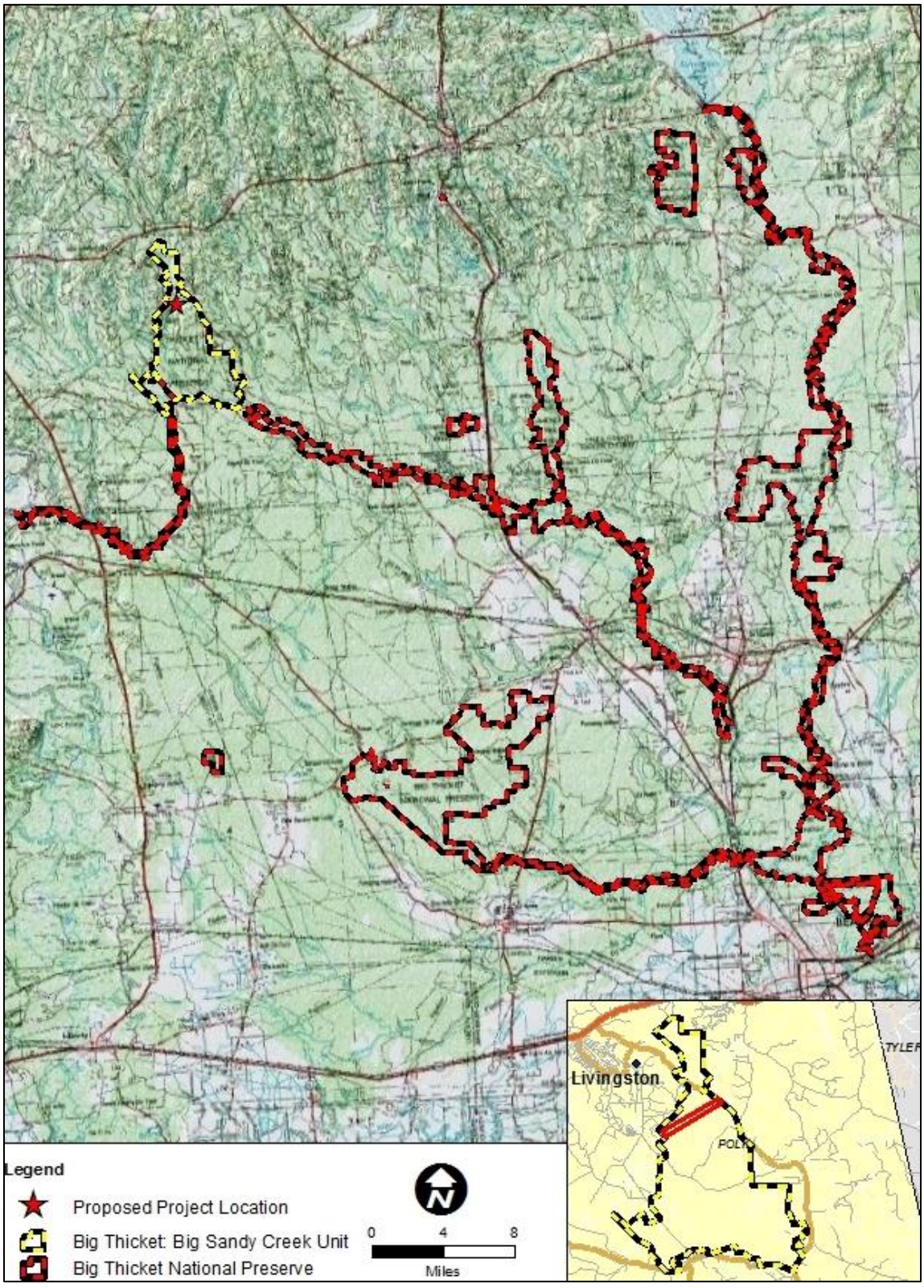
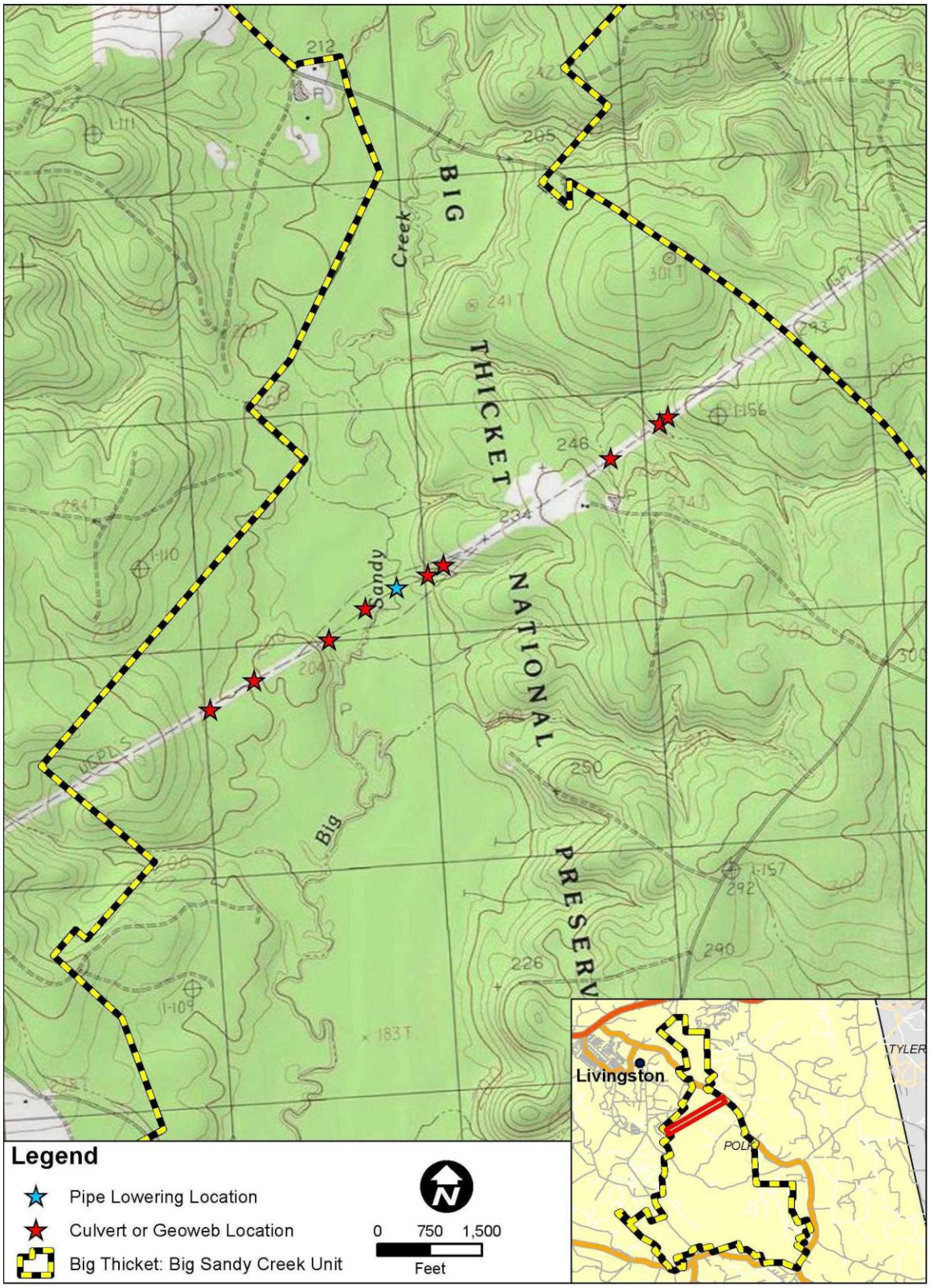


Figure 2. Big Sandy Creek Unit – Operations Area



1.2 PURPOSE

The purpose of the proposed Project is to minimize disturbance to wetlands (palustrine emergent and riverine) that are frequently crossed for routine maintenance activities along the pipeline's existing maintained easement and to rectify a potential safety hazard posed by the exposure and suspension of a segment of pipe in Big Sandy Creek. Removal of the exposed and suspended pipe would also restore the natural flow regime to the stream.

1.3 NEED

The proposed Project is necessary to reduce long-term impacts on the Preserve's resources and values resulting from routine pipeline maintenance activities and the continued exposure of pipe within Big Sandy Creek. Tennessee Gas's continued use of timber mats to cross wetlands when accessing the pipeline easement creates greater opportunity for disturbance to these ecologically important habitats.

Lowering the exposed and suspended pipe would prevent the likelihood of a major rupture or other incident from the aboveground suspension of the pipe within the Big Sandy Creek channel. Furthermore, the lowering of the exposed and suspended pipe would restore the natural flow regime and other natural processes of Big Sandy Creek that are currently impeded by the presence of the pipe in the channel.

1.4 OBJECTIVES

Consistent with the guidance and bounds set by NPS management policies, laws, and other regulations, the objectives for the Project are to:

- Avoid or minimize impacts on the Preserve's resources and values;
- Create a long-term solution to crossing streams and wetlands during pipeline maintenance activities; and
- Lower the segment of pipe currently exposed and suspended within Big Sandy Creek to decrease the potential for a pipeline incident and to return natural flow dynamics to the stream.

1.5 RELATIONSHIP TO REGULATIONS, POLICIES, PLANS, AND PERMITS

The proposed Project is required to minimize disturbances to streams and wetlands crossed by the existing easement and to eliminate a potential safety hazard caused by the exposed and suspended pipe in Big Sandy Creek. In accordance with the blanket certificate issued by the Federal Energy Regulatory Commission (FERC), Tennessee Gas would adhere to FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures), as practicable.

Within Tennessee Gas's existing transpark oil and gas pipeline easement in the Preserve, NPS has regulatory authority over the proposed activities. NPS general regulations at 36

CFR Parts 1 and 5 control a variety of activities within National Park Service units. The assessment of environmental impacts is an important and integral part of NPS's decision-making process. As such, the NPS has prepared this EA to assess the environmental impacts that would likely occur as a result of the activities of the proposed Project. If the Project is determined to be an acceptable use within the Preserve, NPS will issue Tennessee Gas a Special Use Permit to perform the proposed activities. A further explanation of applicable policies and plans is presented below.

Existing plans and policies must be examined to ensure that proposed actions are consistent with plan provisions. These include the NPS *Management Policies 2006* (NPS 2006), Big Thicket National Preserve *General Management Plan (1980)*, Big Thicket National Preserve *Oil and Gas Management Plan (2005*), and the Big Thicket National Preserve *Resource Management Plan (1996)*. The following is information pertaining to how this proposed project meets the goals and objectives of these policies and plans.

NPS Management Policies 2006 (2006)

This is the basic NPS-wide policy document, adherence to which is mandatory unless specifically waived or modified by NPS Director or certain Departmental officials, including the Secretary. Director's Order 53-1 requires a Special Use Permit be obtained from NPS before any activities commence within an existing right-of-way. Mowing and trimming vegetation, inspection or testing pipelines, and installing, shutting down or replacing pipelines, are common activities in pipeline rights-of-way requiring a Special Use Permit. Such activities are routine and provide for personal safety, leak or spill detection, and unencumbered response in the event of a spill or emergency.

General Management Plan (1980)

The Big Thicket National Preserve *General Management Plan (1980)* outlines the following objectives for natural resource management and management zoning:

- To perpetuate and protect the Preserve's unique mixture of temperate and subtropical botanical communities;
- To initiate joint planning and natural resource management programs with neighboring landowners to promote continued compatible land use;
- To proceed with research activities that provide baseline data necessary for future planning and management efforts and for the evaluation of the environmental impacts of human use on the Preserve.

Most of the Preserve is designated a "natural zone," which places management emphasis on conservation of natural resources and processes while providing for uses that do not adversely affect these resources and processes. Most of the BSC Unit is designated natural zone, but the Project area is within the special use utility subzone for pipelines. This management zone recognizes the property right interests of easement owners to operate pipelines within the Preserve. The General Management Plan states that NPS

will continually monitor oil and gas operations, including pipeline operations, in order to prevent adverse impacts on the surrounding environment, particularly on the habitat of threatened and endangered species (NPS 1980).

The proposal to install culverts and Geoweb and to lower the exposed and suspended pipe in the BSC Unit of the Preserve is consistent with the *General Management Plan (1980)* objectives and management for the following reasons: the Project area is within a special use utility subzone where pipeline maintenance operations are anticipated, and with the application of mitigation measures by Tennessee Gas and monitoring by the NPS, adverse impacts resulting from the Project would be reduced in scope and intensity to the lowest practicable level. Lowering the exposed and suspended pipe would prevent a potential catastrophic event and restore the natural flow to the stream.

Oil and Gas Management Plan (2005)

The Big Thicket National Preserve *Oil and Gas Management Plan (2005)* requires management of oil and gas operations associated with non-federal oil and gas interests underlying the Preserve in accordance with 36 CFR Part 9, Subpart B (9B). This plan also defines a transpark oil and gas pipeline as a pipeline with its point of origin and end point outside of the Preserve's boundaries; and is operated by an entity exercising rights not tied to oil and gas ownership within the Preserve's boundaries. Transpark oil and gas pipelines and their rights-of-way lie outside the scope of 9B regulations. However, pipeline operators should note that if park system resources are damaged from the operation of their pipeline in a park unit, NPS can exercise its authority under the Act of July 27, 1990, Pub. L. No. 101-337, 104 Stat. 379, codified as amended at 16 U.S.C. §§ 19jj through 19jj-4 (2000), to undertake all necessary actions to protect park system resources. Operators will be held liable to the United States for its response costs as well as for any damages to park system resources (NPS 2005).

The proposal to install culverts and Geoweb and to lower the exposed and suspended pipe in the BSC Unit of the Preserve is consistent with the *Oil and Gas Management Plan* as it pertains to transpark oil and gas pipelines, including the exemption from 9B regulations.

Resource Management Plan (1996)

The Big Thicket National Preserve *Resource Management Plan (1996)* outlines the following natural resource management objectives for the Preserve:

- To perpetuate, protect, interpret, and where appropriate restore, the Preserve's unique mixture of temperate and sub-tropical botanical and biological communities.
- To establish and nurture partnerships with appropriate state and federal agencies and other entities for the purpose of managing significant scenic and natural resources of the Preserve in a manner that will assure their integrity and "health" of the greater ecosystem.
- To initiate joint planning, educational and natural resource management programs with neighboring landowners and the general public to promote

good land stewardship and to minimize conflicting uses that might be detrimental to the resources of the Preserve and region.

- To continue an aggressive research program that provides baseline data necessary to facilitate the future planning and management decision process, and for the evaluation of the environmental impacts of human use on the Preserve.

The proposal to install culverts/Geoweb® and to lower the exposed and suspended pipe in the BSC Unit of the Preserve is consistent with the Resource Management Plan objectives and management for the following reasons: it would not affect the Preserve's unique mixture of temperate and subtropical botanical and biological communities; it would establish and nurture partnerships with appropriate state and federal agencies and other entities to assure the integrity of natural resources and "health" of the ecosystem through the methods proposed; and it would minimize conflicting uses that might be detrimental to the resources of the Preserve.

1.6 IMPACT TOPIC DETERMINATIONS

Impact topics for this Project have been identified on the basis of federal laws, regulations, and orders; NPS *Management Policies 2006*; and NPS knowledge of resources at the Preserve. All impact topics were discussed and the potential degree of impact was determined. Based on project scoping concerns, and the level of potential impacts likely to occur, NPS determined which impact topics would have more than minor impacts and, therefore, would be carried forward for detailed analysis in this EA. Impact topics that were determined to have minor or less effects were dismissed from further analysis. A description and sequence of the alternatives carried forward are detailed in the *Alternatives Considered* section of this EA.

1.6.1 Impact Topics Dismissed From Further Analysis

In this section, NPS takes a "hard look" at all potential impacts by considering the direct, indirect, and cumulative effects of the proposed action on the environment, along with connected and cumulative actions. Impacts are described in terms of context and duration. The context or extent of the impact is described as localized or widespread. The duration of impacts is described as short-term, ranging from days to three years in duration, or long-term, extending up to 20 years or longer. The intensity and type of impact is described as negligible, minor, moderate, or major, and as beneficial or adverse. The NPS equates "major" effects as "significant" effects. The identification of "major" effects would trigger the need for an EIS. Where the intensity of an impact could be described quantitatively, the numerical data is presented; however, most impact analyses are qualitative and use best professional judgment in making the assessment.

The NPS defines "measurable" impacts as moderate or greater effects. It equates "no measurable effects" as minor or less effects. "No measurable effect" is used by NPS in determining if a categorical exclusion applies or if impact topics may be dismissed from further evaluation in an EA or EIS. The use of "no measurable effects" in this EA

pertains to whether NPS dismisses an impact topic from further detailed evaluation in the EA. The reason NPS uses "no measurable effects" to determine whether impact topics are dismissed from further evaluation is to concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail in accordance with CEQ regulations at 1500.1(b).

In this section of the EA, NPS provides a limited evaluation and explanation as to why some impact topics are not evaluated in more detail. Impact topics are dismissed from further evaluation in this EA if:

- they do not exist in the analysis area, or
- they would not be affected by the proposal, or the likelihood of impacts are not reasonably expected, or
- through the application of mitigation measures, there would be minor or less effects (i.e. no measurable effects) from the proposal, and there is little controversy on the subject or reasons to otherwise include the topic.

Due to there being no effect or no measurable effects, there would either be no contribution towards cumulative effects or the contribution would be low. For each issue or topic presented below, if the resource is found in the analysis area or the issue is applicable to either of the action alternative proposals, then a limited analysis of direct and indirect effects is presented. The culvert/Geoweb component of the proposed Project is the same for both action alternatives (Alternatives B and C); therefore impacts from the culvert/Geoweb installations will also be the same for both Alternatives B and C. For clarity of discussion, the action alternatives have been named according to their differences. Alternative B, which proposes pipe placement via the open-cut method, will be referred to as the "open-cut method", while Alternative C, which proposes pipe placement via Horizontal Directional Drill (HDD), will be referred to as the "HDD method".

AIR QUALITY

The Preserve is located north of the Beaumont/Port Arthur airshed and northeast of the Houston airshed. The primary pollutants transported from airsheds affecting the Preserve are volatile organic compounds (VOCs) and nitrogen oxides (NO_X). Other air pollutants that could affect the Preserve include carbon monoxide (CO), sulfur dioxide (SO_2), and particulate matter (PM) (including heavy metals and lead) (NPS 2005). Industrial activities and urbanization account for the majority of impacts to air quality in the Preserve when compared to oil and gas operations or Preserve management activities.

The Preserve is designated a Class II area under the Prevention of Significant Deterioration (PSD) provisions of the Clean Air Act (CAA). As such, the Preserve's air quality is protected by allowing limited increases (i.e., allowable increments) over baseline concentrations of pollution for the pollutants sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and particulate matter (PM). The PSD permitting program is administered by the Texas Commission on Environmental Quality (TCEQ) and applies

to defined categories of new or modified sources of air pollution with emissions greater than 100 tons per year and all other sources greater than 250 tons per year. The portion of the Preserve that the Project crosses, in Polk County, is not a designated nonattainment area (EPA 2011).

As outlined in the *Management Policies 2006* (section 4.7.1), NPS will seek to perpetuate the best possible air quality in parks to (1) preserve natural resources and systems; (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas. Furthermore, NPS will assume an aggressive role in promoting and pursuing measures to protect air quality related values from adverse impacts of air pollution. In cases of doubt as to the impacts of existing or potential air pollution on park resources, NPS "will err on the side of protecting air quality and related values for future generations".

Impacts from Project Activities

Both action alternatives would result in temporary increases of emissions associated with construction activities for both the culvert/Geoweb® installations and the pipe lowering. Air emissions associated with the construction phase of the proposed Project consist of emissions from mobile construction equipment and fugitive dust; however, these emissions would be short-term, minor adverse impacts and are not anticipated to significantly impact air quality. Typical construction equipment (e.g. bulldozers, backhoes) are sources of combustion-related emissions including NO_x, CO, VOCs, SO_2, inhalable particulate matter (i.e. particulate matter sized 10 microns and smaller [PM_{10}]), and small amounts of hazardous air pollutants (HAPs). Air pollutants from construction equipment would be limited to the immediate vicinity of the construction area and would be temporary. Following the open-cut method, emissions would be greater during the daytime hours, as all activities would be performed between 7am and 10pm. The HDD method would result in greater emissions, as drilling would be a 24-hour a day operation until completed and would last approximately seven days. Furthermore, the HDD method would involve the use of equipment that would not otherwise be necessary for the open-cut method, such as a drilling rig, drilling console, mixing tank, trailer, three frac tanks, and an additional generator. The use of more equipment with the HDD method would not only increase emissions, it would also increase overall duration of the project due to increased time for mobilization and demobilization.

Regardless of alternative, Tennessee Gas would adhere to NPS's "limited-idling" policy to further minimize the effect that the proposed Project would have on the overall air quality in the area. Tennessee Gas also intends to maintain all fossil-fueled construction equipment in accordance with the manufacturers' recommendations to minimize construction related emissions. Furthermore, normal construction practices (e.g. watering exposed soil surfaces, using soil storage piles, and restoration and revegetation activities) would avoid or minimize impacts resulting from fugitive dust.

Cumulative Impacts

The primary source of cumulative impacts to air quality in the analysis area would be contaminants from industrialization and urbanization from the Beaumont/Port

Arthur/Orange airshed, as well as from the Houston/Galveston and Lake Charles, Louisiana airsheds. Industrial facilities and general public vehicular traffic in these airsheds are major sources of emissions.

Impacts on local air quality would also occur from recreational activities, transpark oil and gas activities, private and commercial logging activities, and Preserve operations, including prescribed burning, occurring within or adjacent to the Preserve. These impacts would result from the use of motorized vehicles, watercraft, equipment, and other combustion engines that emit PM, NO_X, CO, CO_2, and SO_2. Air quality in the region is contingent on state and federal ambient air quality standards, air pollution control requirements, and air quality management programs. Therefore, while existing and future activities within the Preserve are expected to result in localized, negligible, adverse impacts on air quality inside and outside of the Preserve, contaminants from existing industrial/urban sources have resulted in moderate cumulative impacts, and with increased population growth and industrial development that level of impact is expected to continue. Tennessee Gas's Project would result in a short-term, negligible degradation of local air quality. Therefore, the Project's contribution to cumulative effects in the analysis area is not expected to change the overall intensity of those effects.

Conclusion

Neither the no action alternative nor either action alternative would notably affect the overall air quality of the region. Because the anticipated effects are minor or less in degree, air quality was dismissed from further analysis.

CULTURAL RESOURCES

Archeological Resources

Under the National Historic Preservation Act (NHPA) of 1966, as amended, NPS has a responsibility to consider the effects that undertakings may have on cultural resources that are listed, or are eligible for listing on the National Register of Historic Places. In addition to the National Historic Preservation Act, NPS's Director's Order-28A *Archeology* affirms a long-term commitment to the appropriate investigation, documentation, preservation, interpretation, and protection of archeological resources inside units of the National Park System. Archeological resources are nonrenewable and irreplaceable, so it is important that all management decisions and activities throughout the National Park System reflect a commitment to the conservation of archeological resources as elements of our national heritage.

Tennessee Gas retained Moore Archaeological Consulting, Inc. (MAC) to conduct cultural resources investigations of the general area, including the proposed Project area. This survey was conducted on January 23-27, March 21, and April 2-6, 2012 to comply with Section 106 of the National Historic Preservation Act (NHPA) and as required by NPS. Results of the cultural resources investigation concluded that no cultural resources are located within the proposed Project footprint and that *No Properties are Adversely Affected.* During surveys, five cultural sites were identified and delineated within the existing ROW; however, none of these sites occurred within the Project footprint. A report of the archaeological and cultural resources investigation

was prepared and submitted to the Texas Historical Commission (THC) on July 2, 2012. A response from THC is anticipated within 30 days of submittal.

The open cut method would involve a moderate amount of deep excavation associated with the pipe lowering, and minor excavations associated with the culvert/Geoweb® installations that could potentially unearth cultural resources. The likelihood of unearthing unanticipated cultural remains would be less using the HDD method, as there would be less excavation associated with the use of an HDD. However, extensive archaeological surveys were conducted within the Project footprint, with the exception of the 400-foot proposed trench area, and no cultural resources were identified within the proposed workspace. The section of the Project footprint that was not surveyed would result in disturbances only within the existing pipeline easement. Tennessee Gas has entered into a Memorandum of Understanding with the THC that allows for this type of maintenance construction within previously disturbed areas. In the unlikely event that cultural resources are encountered during Project activities, Tennessee Gas would adhere to their *Unanticipated Discovery Plan* in which they would stop work immediately in the area of the find and contact THC. To further ensure that no cultural resources are impacted by the Project, a third-party monitor will be on site at all times during construction and will ensure that no excavation occurs in areas identified as containing potentially culturally significant remains.

Cultural Landscapes

According to NPS's Director's Order-28 *Cultural Resource Management Guideline*, a cultural landscape is a reflection of human adaptation and use of natural resources, and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. Although a cultural landscape inventory has not been conducted for the Preserve, there are no features within the general project area that are likely to contribute to a significant cultural landscape.

Historic Structures

In addition to the National Historic Preservation Act, National Park Service's 2006 *Management Policies* and Director's Order-28 *Cultural Resource Management* require that management decisions and activities throughout the National Park System reflect awareness of the irreplaceable nature of cultural resources (NPS 2006). The term "historic structures" refers to both historic and prehistoric structures, which are defined as constructions that shelter any form of human habitation or activity. No known historical structures exist in the project area, and no new historic structures were found during the cultural resource survey referenced in "Archeological Resources" above.

Museum Collections

According to Director's Order-24 *Museum Collections,* NPS requires the consideration of impacts on museum collections (historic artifacts, natural specimens, and archival and manuscript material), and provides further policy guidance, standards, and requirements for preserving, protecting, documenting, and providing access to, and use

of, National Park Service museum collections. No specimens are currently housed in the project area.

Ethnographic Resources

National Park Service's Director's Order-28 *Cultural Resource Management* defines ethnographic resources as any site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it. According to DO-28 and Executive Order 13007 on sacred sites, NPS should try to preserve and protect ethnographic resources.

The NPS requested the presence of the Alabama-Coushatta Tribe of Texas Tribal Historical Preservation Officer (THPO) at an internal scoping site visit on October 20, 2011. No ethnographic resources were identified at that time. The THPO requested a shovel test be performed prior to any ground disturbance. A copy of the cultural resources survey described above was sent in a letter to the THPO on 07/19/2012.

Cumulative Impacts

Existing and future transpark pipelines and logging activities could impact cultural resources in the analysis area; however, compliance with the NHPA is anticipated to eliminate adverse effects from projects within the Preserve. Over time, cultural resources outside the Preserve could be incrementally lost, with up to moderate cumulative adverse impacts on cultural resources and traditional cultural practices in the region. The effects of the Project alternatives would not contribute more than negligible adverse impacts to the overall cumulative impacts of these actions.

Conclusion

While cultural resources were identified during the cultural resources survey, no sites occurred within the Project footprint. A report of these findings was submitted to the Texas Historical Commission (THC) on July 2, 2012 and Tribal Historic Preservation Office (THPO) on July 19, 2012 requesting concurrence with the *No Historical Properties Impacted* assessment. Should any artifacts be encountered during construction, Tennessee Gas would implement the measures in its *Unanticipated Discovery Plan.* This plan is discussed under Mitigation Measures in the Alternatives Considered section of this EA. For these reasons, the cultural resource topic was dismissed from further analysis.

SOCIOECONOMICS

Socioeconomic issues, including impacts to the local economy, minority or low-income populations, or recreation resources, encompass the affects of the Project alternatives on visitation to the Preserve, which in turn affects the local economies. The description presented below of past, present, and reasonably foreseeable oil and gas development in and adjacent to the Preserve provides supporting data on which to base the cumulative impact analyses in this section.

The Preserve contributes to the local and regional economies by adding sales, taxes, and employment related to the acquisition of services, supplies, and materials needed for

administration. In addition, tourism-related expenditures contribute to the economy and also create jobs to support tourism. NPS has estimated there were 140,489 visitors to the Preserve in 2010 (NPS 2011a). Specific data detailing how many visits to the BSC Unit is unavailable. Visitors primarily use the BSC Unit for overnight camping, canoeing, hiking, bird watching, hunting, and fishing.

In the event of a serious oil and gas accident involving serious personal injury or death, the public could perceive that the Preserve is not a desirable place to visit. Tourism could fall, resulting in reduced revenues to the local and regional economies. Both the petroleum industries, as well as the regulatory community are aware of the potential for pipeline failures from outside forces, corrosion, operator error, failed pipe, equipment malfunction, failed weld, and other causes. Despite these problems, industry and federal safety officials believe that underground pipelines are the safest mode of transportation for this medium (NPS 2005).

Impacts from Project Activities

The action alternatives would generate revenue for the local economy; as a result local businesses would receive revenue from purchases of food, fuel, lodging, and other incidental purchases by construction crews and managers.

The proposed Project, regardless of alternative, would not impact local businesses or other agencies. It is also not expected to impact minority or low-income populations, or recreation resources. Implementation of the action alternatives could provide a short-term, negligible, beneficial impact to the economies of local communities due to slight increases in services required for and used by the construction crew for the duration of the Project.

Cumulative Impacts

Cumulative impacts on socioeconomics continue to occur because of routine Preserve operations and visitor uses, transpark oil and gas operations, commercial and private logging demands for goods and services, along with other sources of economic development. Residential or commercial developments add to the tax base of the area. The divestiture of timberlands surrounding the Preserve by timber companies could also affect socioeconomics of the area. All three of the major landholding neighbors to the Preserve, International Paper, Louisiana Pacific, and, most recently, Temple-Inland have sold their timberlands. The sale of these lands has been primarily to institutional investors. This represents a shift in land management strategy towards maximizing returns on timberland assets for shareholders. Implementation of the proposed Project, regardless of the action alternative, is not expected to have more than a negligible impact on the local or regional economy nor is it expected to contribute to the cumulative impacts to socioeconomic values.

Conclusion

Any effect on the local economy from either of the action alternatives would be short-term, localized and negligible, lasting only as long as Project activities. Because the impacts to the socioeconomic environment would be temporary and negligible, and

there would be no impact to minority or low income populations or recreation resources, these topics were dismissed from further review.

CATASTROPHIC PIPELINE INCIDENTS

The transportation of natural gas by pipeline involves some risk in the event of an accident and subsequent release of gas. The greatest hazard is a fire or explosion following a major pipeline rupture. Methane, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. If inhaled in high concentration, it can result in oxygen deficiency leading to serious injury or death. Methane has an ignition temperature of 1,000 degrees Fahrenheit and is flammable at concentrations between 5.0 and 15.0 percent in air. Unconfined mixtures of methane in air are not explosive. However, a flammable concentration within an enclosed space in the presence of an ignition source can explode. It is buoyant at atmospheric temperatures and disperses rapidly in air.

The pipeline associated with the proposed Project must be designed, constructed, operated, and maintained in accordance with the Department of Transportation (DOT) Minimum Federal Safety Standards in 49 CFR Part 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. Part 192 specifies material selection and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

Since February 9, 1970, 49 CFR 191 has required all operators of transmission and gathering systems to notify the DOT of specific types of incidents that occur during the operation of the natural gas transmission and gathering systems nationwide. The DOT changed reporting requirements after June 1984 to reduce the amount of data collected. However, because the 14.5-year period from 1970 through June 1984 provides a larger database and more basic report information than subsequent years, it has been subject to detailed analysis, as discussed below (FERC 2008).

From February 1970 through June 1984, the dominant incident cause was outside forces, constituting 53.8 percent of all service incidents (Jones 1986). Outside forces incidents result from the encroachment of mechanical equipment such as bulldozers and backhoes; earth movements due to soil settlement, washouts, or geologic hazards; weather effects such as winds, storms, and thermal strains; and willful damage. An analysis of the outside forces incidents shows that human error in equipment usage was responsible for approximately 75 percent of outside forces incidents (Jones 1986). Since April 1982, operators have been required to participate in "One Call" public utility programs in populated areas to minimize unauthorized excavation activities in the vicinity of pipelines. The "One Call" program is a service used by public utilities and some private sector companies (e.g., oil pipelines and cable television) to provide preconstruction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts. The 1986 through 2007 data show that the portion of incidents caused by outside forces has decreased to 36 percent.

The frequency of service incidents is strongly dependent on pipeline age. While pipelines installed since 1950 exhibit a fairly constant frequency of service incidents, pipelines installed before that time have a significantly higher rate, partially due to corrosion. Older pipelines have a higher frequency of corrosion incidents, since corrosion is a time-dependent process. Furthermore, new pipe generally uses more advanced coatings and cathodic protection to reduce corrosion potential. The use of both an external protective coating and a cathodic protection system, required on all pipelines installed after July 1971, significantly reduces the rate of failure compared to unprotected or partially protected pipe. Older pipelines also have a higher frequency of outside forces incidents partly because their location may be less well known and less well marked than newer lines. In addition, older pipelines contain a disproportionate number of smaller diameter pipelines, which are more easily crushed or broken by mechanical equipment or earth movements (FERC 2008). Based on approximately 320,000 miles in service, the rate of public fatalities for the nationwide mix of transmission and gathering lines is 0.01 per year per 1,000 miles of pipeline. Using this rate and the 2.3-mile long segment across the Preserve and the entire 80-mile long 100-1 line, the pipeline might result in a public fatality every 43,478 years or 20,000 years, respectively.

Impacts from Project Activities

The no action alternative for the proposed Project would result in the continued and increased exposure and suspension of the pipe in Big Sandy Creek. As the pipe becomes more exposed and suspended, the integrity of the pipe can become compromised, creating the potential for a catastrophic pipeline incident. In the event of a catastrophic incident, Preserve resources, including vegetation, air resources, fish and wildlife, wetlands, and water resources may be impacted. Impacts could include those associated with explosions, fire, and emergency clean-up operations. The likelihood of these impacts, however, is extremely low. The action alternatives would safely rebury the pipe to a depth in which the risk of future exposure or suspension is minimized, thereby further reducing the potential for a catastrophic incident to occur.

Cumulative Impacts

There are currently 28 active transpark natural gas pipelines crossing the Preserve (NPS 2005). These pipelines vary in length but together equal less than 75 miles of pipeline within the Preserve. Using the rate above, 75 miles of transpark natural gas pipelines across the Preserve might result in a public fatality every 1,330 years. Comparing this data with the data provided by FERC, cumulative transpark natural gas pipelines, including the Tennessee Gas 100-1 line within the Preserve, represent an extremely slight increase of risk to the public.

Conclusion

The available data shows that natural gas pipelines continue to be a safe, reliable means of energy transportation. This Project would result in negligible, long-term, beneficial impacts by increasing the accessibility to the pipe, should a catastrophic event occur.

Furthermore, by lowering the exposed and suspended pipe the potential for a catastrophic event is reduced. Thus, this topic was dismissed from further analysis.

CLIMATE CHANGE

On-going scientific research has identified the potential impacts of climate changing pollutants on global climate. These pollutants are commonly called "greenhouse gases" and include carbon dioxide, methane, nitrous oxide, water vapor, and several trace gas emissions. Through complex interactions on a regional and global scale, these emissions cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the Earth back into space. Although climate changing pollutant levels have varied for millennia (along with corresponding variations in climatic conditions), recent industrialization and burning of fossil carbon sources have caused CO_2 concentrations to increase dramatically and are likely to contribute to overall climatic changes, typically referred to as global warming.

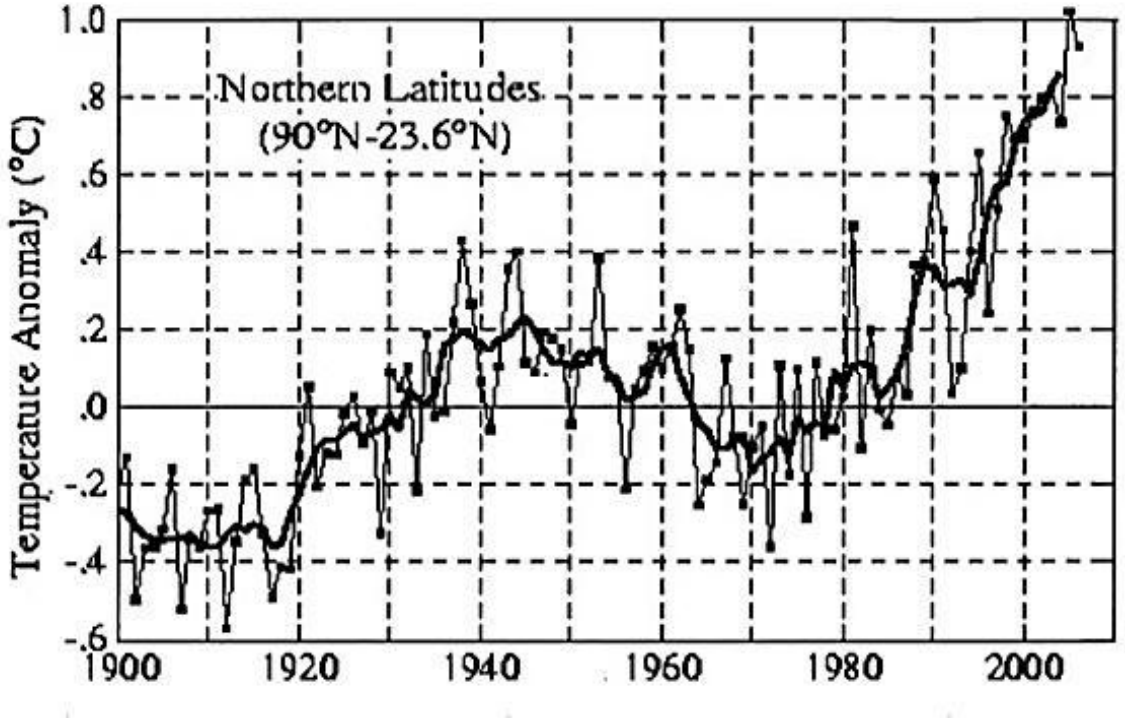
Increasing CO_2 concentrations also lead to preferential fertilization and growth of specific plant species.

Global mean surface temperatures have increased nearly 1.0°C (degrees Celsius) (1.8°F [degrees Fahrenheit]) from 1890 to 2006 (Goddard Institute for Space Studies 2007). However, observations and predictive models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Figure 2 demonstrates that northern latitudes (above 24° N) have exhibited temperature increases of nearly 1.2°C (2.1°F) since 1900, with nearly a 1.0°C (1.8°F) increase since 1970. Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of these "greenhouse gases" are likely to accelerate the rate of climate change.

The Intergovernmental Panel on Climate Change (IPCC 2007) has recently completed a comprehensive report assessing the current state of knowledge on climate change, its potential impacts, and options for adaptation and mitigation. At printing of this EA, this assessment is available on the IPCC web site at http://www.ipcc.ch/. According to this report, global climate change may ultimately contribute to a rise in sea level, destruction of estuaries and coastal wetlands, and changes in regional temperature and rainfall patterns, with major implications to agricultural and coastal communities.

The IPCC has suggested that the average global surface temperature could rise 1 to 4.5°F in the next 50 years, with significant regional variation. The National Academy of Sciences (2006) has confirmed these findings, but also indicated that there are uncertainties regarding how climate change may affect different regions. Computer models indicate that such increases in temperature will not be equally distributed globally, but are likely to be accentuated at higher latitudes, such as in the Arctic, where the temperature increase may be more than double the global average. Also, warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures is more likely than increases in daily maximum temperatures. Vulnerabilities to climate change depend considerably on specific geographic and social contexts.

Figure 3. Annual Mean Temperature Change for Northern Latitudes (24 - 90°N)



Source: Goddard Institute for Space Studies (2007)

Potential impacts to air quality due to climate change are likely to be varied. For example, if global climate change results in a warmer and drier climate, increased particulate matter impacts could occur due to increased windblown dust from drier and less stable soils. Cool season plant species' spatial ranges are predicted to move north and to higher elevations, and extinction of endemic threatened/endangered plants may be accelerated. Due to loss of habitat, or due to competition from other species whose ranges may shift northward, the population of some animal species may be reduced. Less snow at lower elevations would be likely to impact the timing and quantity of snowmelt, which, in turn, could impact aquatic species.

NPS has created *a Climate Change Response Strategy* to further address growing concern over effects of climate change. This strategy "describes goals and objectives to guide our actions to protect the natural and cultural resources under our care through four integrated components: science, adaptation, mitigation, and communication" (NPS 2011b). However, it is still difficult to accurately predict the effect of resources management-level decisions from this planning effort on global climate change. In the future, as tools for predicting climate changes in a management area improve and/or changes in climate affect resources and necessitate changes in how resources are managed, NPS may be able to re-evaluate decisions made as part of this planning process and adjust management accordingly.

Impacts from Project Activities

The proposed Project is anticipated to have a negligible effect on global climate change due to the relatively low emissions and short duration of use of the equipment.

Cumulative Impacts

The assessment of climate changing pollutant emissions and climate change is in its formative phase; therefore, it is not yet possible to know with confidence the net impact to climate. However, the Intergovernmental Panel on Climate Change (IPCC 2007) concluded that "warming of the climate system is unequivocal" and "most of the observed increase in globally average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic [man-made] greenhouse gas concentrations."

Conclusion

Because of the low emissions anticipated from either action alternative for the Project, it is reasonably expected that the effect on climate change would not be more than negligible; therefore, this topic was dismissed from further analysis in this EA.

BIOSPHERE RESERVE DESIGNATION

The Preserve is often referred to as a "biological crossroads" and is a transition zone where southeastern swamps, eastern deciduous forest, central plains, pine savannas, and xeric (dry) sandhills intersect. The area provides habitat for rare species and favors unusual combinations of plants and animals.

The United Nations Educational, Scientific, and Cultural Organization's (UNESCO) 1968 Conference on the Conservation and Rational Use of the Biosphere launched the Man and the Biosphere (MAB) Program. The Biosphere Reserve concept was a key element for achieving the MAB's objective to create a balance between the conflicting goals of conserving biodiversity, promoting economic and social development, and maintaining associated cultural values. Biosphere reserves innovate and demonstrate approaches to conservation and sustainable development. They are under national sovereign jurisdiction, yet share their experience and ideas nationally, regionally, and internationally within the World Network of Biosphere Reserves. There are 580 sites worldwide in 114 countries. Of these, 47 units are in the United States, of which 29 are managed by NPS. UNESCO designated the Preserve as a biosphere reserve in 1981 to protect the Preserve's vegetation and physiographic features (UNESCO 2012).

Impacts from Project Activities

Neither action alternative would cause impacts to the Preserve's biosphere designation.

Cumulative Impacts

NPS has implemented conservation and mitigation measures since 1981 for all actions within the Preserve; therefore, current and future actions should have no more than negligible impacts on the Preserve's biosphere designation. The Project would not contribute to impacts of future cumulative actions.

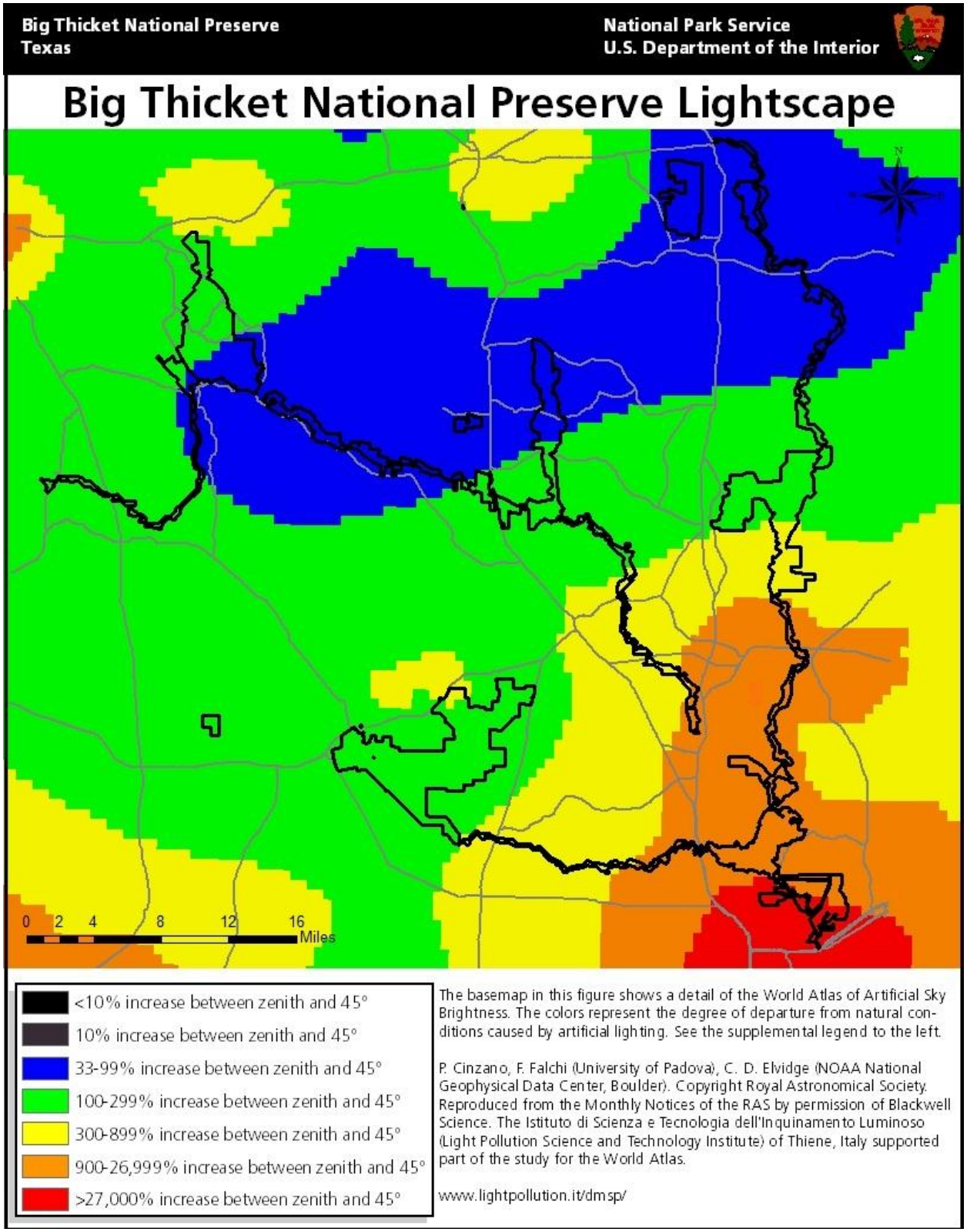
Conclusion

Neither Project action alternative would impact or change the Preserve's biosphere designation, therefore this topic was dismissed.

NATURAL LIGHTSCAPES

NPS *Management Policies* 2006 (§ 4.10) emphasize the protection of natural lightscapes not only for the enjoyment and experience of visitors, but also for protection of ecological integrity (Figure 4). Mitigation strategies are identified, including restricting the use of artificial lighting only where necessary, utilizing minimum impact techniques, and shielding lights to prevent unwanted light scatter. Light, visible electromagnetic radiation streaming through the atmosphere, has a tremendous amount of natural variation. The spectrum of the brightest day to the darkest night spans over eight orders of magnitude (NRPC 2003). Disruption of this cycle can have significant ecological effects. Darkness is an important habitat component, providing cover, security, navigation, or predatory advantage to both nocturnal and diurnal species. Light pollution, defined as stray, unwanted light outside the range and timing of natural variation, is not only an ecological disrupter, but also adversely affects the natural scenery of the night. The NPS mission to "conserve scenery" extends to night and the sky above. The ability to view a pristine night sky where thousands of stars are visible has diminished with increasing development. The loss of this resource represents a direct reduction in enjoyment for park visitors who regularly stargaze. It would also reduce the integrity of other resources by a loss in context.

Figure 4. Map of Lightscapes in Big Thicket National Preserve



Impacts from Project Activities

All Project activities associated with the culvert/Geoweb® installation would be conducted during daylight hours and thus would have no effect on the natural lightscapes. Activities associated with the open-cut method would primarily be conducted during daylight hours; however, during construction within the stream when water is being diverted, there would be biological monitors on site 24 hours. During this time there would be some negligible impacts on the lightscapes from headlights and safety lights. The use of a HDD would require 24-hour drilling until the desired depth is reached. This process is anticipated to last approximately six to seven days. During this time, the extensive use of work lights would be necessary to safely and efficiently conduct project activities from dusk until dawn. Tennessee Gas would minimize the impacts to the lightscapes by utilizing hooded work lights to decrease light pollution. This would result in short-term, minor adverse impacts to lightscapes.

Cumulative Impacts

Cumulative impacts to lightscapes would result from a variety of light sources in the area of analysis for cumulative impacts, including new developments, logging operations activities, vehicle traffic outside the BSC Unit, transpark pipeline operations, industrial facilities both inside and outside the Unit, and light from the nearby towns of Livingston and Woodville. Light from these sources would vary considerably in intensity, wavelength, duration, and hours of operation, but the numerous light sources have increased the background skyglow levels to various extents in the vicinity of the Preserve. As a result of all the potential light sources mentioned, cumulative impacts to the lightscape within the analysis area are anticipated to be long-term, localized to widespread, negligible to moderate, and adverse. Additional impacts from the proposed Project would be short-term, negligible to minor adverse impacts.

Conclusion

The minimal use of lighting during nighttime hours for both action alternatives would result in short-term minor impacts to the natural lightscapes. Because these impacts would be temporary and restricted to the immediate project area (through the use of hooded work lights), this topic was dismissed from further analysis.

VISITOR USE AND EXPERIENCE

The fundamental purpose of all parks and preserves in the United States is the enjoyment of resources and values by the public (NPS 2006). Therefore, this topic is of the utmost importance to NPS and must be carefully evaluated and addressed. NPS encourages the use of park resources for those activities that are uniquely suited to a park setting such as those that encourage an understanding and respect for park resources and values, or those that are appropriate for the purpose for which the park was established (NPS 2006).

Impacts from Project Activities

The installation of the culverts/Geoweb® would have a short-term negligible impact on visitor use and experience if a visitor were to observe the operations (a disruption of the

expected natural scenery, landscapes, and soundscapes). Additionally, the placement of the culverts/Geoweb® could increase the use of illegal ATVs in the area, also impacting visitor use and experience. However, the long-term impacts from the culvert/Geoweb® installation would be beneficial because pipeline crews would no longer need to haul timber mats in and out, thus reducing the duration of their presence in the Preserve during routine maintenance activities.

Impacts from the pipeline lowering to visitor use and experience would be similar to those associated with the culverts/Geoweb® and would primarily be associated with the aesthetically displeasing presence of construction equipment and operations, as well as the resulting impediment to recreational access in the immediate Project area. Project activities may occur during the beginning of hunting season, however the project area is on the edge of the designated hunting zone in the BSC Unit and would cause only minor impact to hunters. These impacts may be caused by the presence of crews or equipment. Impacts to visitor use and experience from the pipe lowering by the open-cut method would be minor and short-term. Impacts from the HDD method to visitor use and experience would be the same as the open-cut method. There may be a slightly greater impact from the pipeline lowering via HDD, as the equipment involved is visually and audibly more obtrusive than that associated with the open-cut method. However, the impact to visitor use and experience would still be minor and short-term.

Cumulative Impacts

Cumulative impacts to visitor use and experience would occur primarily from vehicle traffic, hunting closures, and prescribed burns within the BSC Unit. This would result in minor, adverse cumulative impacts with negligible additional impacts from either action alternative.

Conclusion

Under all proposed alternatives, there is the potential for minor, short-term impacts. Therefore, this topic was dismissed from further analysis and discussion.

PARK OPERATIONS AND MANAGEMENT

The Preserve's *General Management Plan (1980)* identifies three management zones: natural, development, and special use zones. This zoning system recognizes differences in resources and focuses future management on particular types of activities and developments appropriate for each zone. Management zoning specifies how the Preserve is to be managed at full *General Management Plan* implementation, not merely how the area is currently managed (NPS 1980). The proposed Project is located in a special use zone designated for pipeline easements and the surrounding area is designated as a natural zone.

Impacts from Project Activities

Only negligible to minor beneficial impacts are expected as a result of the two action alternatives. The installation of culverts/Geoweb® at key wetland crossings would make fire suppression in the area easier by allowing increased access for fire suppression activities. Additionally, the removal and lowering of the exposed and suspended pipe in

Big Sandy Creek would eliminate a potential safety hazard that could negatively impact park operations and management resulting in minor beneficial impacts to park operations and management.

Cumulative Impacts

Multiple factors may combine at any point to impact park operations and management, and range from requests to access nonfederal oil and gas to unanticipated rescue missions. These factors may range from negligible to moderate and short- to long-term. The proposed Project would contribute a negligible amount to the impact on park operations and management.

Conclusion

The proposed Project would not prevent planned Preserve management activities, and would have a minor beneficial impact on fire suppression in the Preserve and prevention of a pipeline rupture. Therefore, the topic was dismissed from further analysis.

PRIME AND UNIQUE FARMLANDS

The Farmland Protection Policy Act of 1981, as amended, requires federal agencies to consider adverse effects to prime and unique farmlands that would result in the conversion of these lands to non-agricultural uses. Prime or unique farmland is classified by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), and is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. Soils inside the BSC Unit cannot be considered prime and unique farmland soils because they are public lands unavailable for food or fiber production.

ENVIRONMENTAL JUSTICE

Executive Order 12898, “General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” requires all Federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minority and low-income populations and communities. Per the Department of Human Health and Services, Polk County is considered a “low income” county as 22.6% of its residents are below the poverty level (Ibid). Polk county is not considered a minority as the population is 82.4% white (Ibid). Although Polk County is considered “low income”, the proposed action would not have disproportionate health or environmental effects on the community. Therefore, environmental justice was dismissed as an impact topic in this EA.

1.6.2 Impact Topics Retained for Further Analysis

NPS determined that the following impact topics would likely have more than minor impacts and, therefore, have been carried forward for detailed analysis in this EA. These impact topics are listed below along with the reasons why the topic is further analyzed.

Cumulative impacts and the impacts from activities associated with the proposed Project for these topics are discussed in the Environmental Consequences section of this EA.

FLOODPLAINS/WETLANDS

The majority of proposed Project activities associated with the culvert/Geoweb® installations would occur in or adjacent to wetlands or floodplains. Impacts to wetlands and floodplains resulting from the proposed Project activities vary depending on the alternative. Alternative A would result in the potential for long-term, temporary, minor impacts from rutting resulting from the recurring use of heavy equipment to haul in and lay timber mats and removal of mats following maintenance activities. Alternative B would likely incur short-term impacts during construction and long-term impacts from the permanent installation of culverts/Geoweb®. These impacts would likely range from minor to moderate in severity. Alternative C does not differ from Alternative B in the use of culverts and Geoweb® in the wetlands and would therefore have the same impacts. Overall, impacts on floodplains and wetlands are anticipated to be minor for the Geoweb® installation and moderate for the culvert installations; therefore this topic was retained for further analysis. There are no impacts anticipated to wetlands as result of the pipeline lowering component of the proposed Project; however, the pipeline lowering will result in impacts to the Big Sandy Creek floodplain. The extent and intensity of impacts to the floodplain are described in the water resources, geologic and soils resources, vegetation, and fish and wildlife sections.

WATER RESOURCES

The installation of the culverts/Geoweb® are not expected to have any impacts on water resources. Impacts to water resources, including water quantity, quality, and streamflow characteristics would result from the pipeline lowering portion of the proposed Project. Alternative B would require the temporary diversion of water within Big Sandy Creek when work directly within the stream is required, resulting in short-term, moderate impacts to water quality and quantity, as well as streamflow characteristics. Alternative C would not require significant work directly in the stream channel and would therefore result in only minor impacts to water resources. Due to the potential for moderate impacts to water resources from Alternative B, this topic was retained for further analysis.

GEOLOGIC AND SOIL RESOURCES

Varying levels of ground disturbance would occur in the Project area depending on the alternative used. Under Alternative A, the soil would be impacted from the continued use of heavy equipment and increased potential for rutting. Impacts from the installation of the culverts/Geoweb® (both Alternatives B and C) would result in short-term, minor impacts during the installation of the Geoweb® and long-term, moderate impacts from culvert installation. Alternative B proposes to utilize the open-cut method to lower the exposed and suspended pipe. This method would require the excavation of a trench along the existing pipeline easement resulting in short-term, moderate impacts to soils and geology. Alternative C, which proposes to lower the exposed and

suspended pipe via the HDD method, would also have short-term, moderate impacts on soils and geology, though they would be less than those incurred from Alternative B. Due to the range of potential impacts between alternatives, as well as the potential for moderate impacts to soils in the area, this topic has been retained for further analysis. There are not any anticipated impacts to local geology.

VEGETATION

Similar to the topics discussed above, all alternatives have the potential to have minor to moderate impacts on vegetation in the proposed Project area. The degree in which the vegetation is impacted depends on the alternative and specific Project activity considered. Alternative A has the potential for short-term, minor recurring impacts from the use of heavy equipment when the existing easement needs to be accessed. Alternative B would have short-term, minor impacts to vegetation from the laying of the Geoweb®, and may have long-term, moderate impacts on vegetation from the installation of the culverts. Furthermore, Alternative B would require vegetation clearing only in the existing pipeline easement. Alternative C would also have these long-term, moderate impacts from the culvert installation, but would also have long-term, moderate impacts from greater clearing of forested areas necessary to accommodate the HDD equipment and operations. Alternative C would also temporarily change the vegetative composition from forested to herbaceous until trees are reestablished. For these reasons, the vegetation topic has been retained for further analysis.

SOUNDSCAPES

The proposed Project area is located miles away from roads and other sources of anthropogenic sounds making the existing ambient sound relatively quiet and free of unnatural noises. Impacts from Alternative B, including the culvert/Geoweb® installations would be short-term, minor impacts, primarily resulting in daytime noise from general construction activities. Alternative C would also have minor impacts for the culvert/Geoweb® installations, but would have short-term, moderate impacts for the pipe lowering via HDD. Once drilling is initiated, it would continue day and night until the drilling is complete (approximately six to seven days). The soundscape topic has been retained for further analysis, due to the extended period of impact to the soundscape as a result of an HDD, particularly during nighttime hours.

FISH AND WILDLIFE

Impacts to fish and wildlife, including species of concern and unique or important fish and wildlife species and habitat, would result from a combination of impacts associated with soundscapes, lightscapes, water resources, and vegetation impacts. Alternative B would have moderate impacts to water resources, while Alternative C would have moderate impacts to soundscapes and vegetation. The combined impacts of the alternatives would result in short-term, moderate impacts for fish and wildlife in the Project area. For this reason the fish and wildlife topic has been retained for further analysis.

2.0 ALTERNATIVES CONSIDERED

NEPA requires that federal agencies develop a range of reasonable alternatives and provide an analysis of what impacts the alternatives could have on the human environment (the natural and physical environment and the relationship of people with that environment). The alternatives under consideration must include a "no action" alternative as prescribed by 40 CFR 1502.14.

The three alternatives presented in this section were derived from the analysis performed by an interdisciplinary planning team during internal scoping and through feedback from the public during the public scoping period. The interdisciplinary team includes NPS resource specialists from the Preserve and the private contractor working with NPS on behalf of the Special Use Permit applicant (Tennessee Gas) on this EA. The three alternatives include: Alternative A (no action), Alternative B (Open-Cut Method), and Alternative C (HDD Method). The proposed impacts of all three alternatives are discussed in detail in the *Environmental Consequences* section of this EA

2.1 DESCRIPTION OF ALTERNATIVES CARRIED FORWARD

2.1.1 No-Action Alternative (Alternative A)

The no action alternative is a continuation of current conditions and "sets a baseline of existing impacts continued into the future against which to compare impacts of action alternatives" (NPS Director's Order 12, Section 2.7). Under the no action alternative, Tennessee Gas would not install culverts or Geoweb® at wetland crossings, nor would they lower the pipe currently exposed and suspended in Big Sandy Creek. Instead, Tennessee Gas would continue to use their current method of laying timber mats to cross wetlands to access the existing pipeline easement for routine maintenance activities. The continued presence of heavy equipment necessary to transport and remove the timber mats, the extended presence of pipeline crews in the Preserve, and the potential for rutting would remain. Furthermore, the exposed and suspended pipe would remain exposed and suspended and continue to impede and alter the natural processes of Big Sandy Creek, as well as pose an increased safety risk to Park visitors and the surrounding area in the event of a rupture. Over time, the presence of the exposed and suspended pipe would continue to cause scouring of the stream banks, alter flow, and undermine the pipe cover and support in the stream bed. If Alternative A is chosen these processes would, over time, cause greater interference with the Preserve's resources and values.

2.1.2 Open-Cut Method (Alternative B)

Under the proposed action, Tennessee Gas would install culverts at three wetland crossings along the existing maintained pipeline easement and would install semi-permeable Geoweb® at the culvert locations as well as six other wetland crossings to maintain wetland functions, while providing pipeline maintenance crews and NPS fire crews more efficient access to the maintained easement. The use of the Geoweb® would not only prevent the conversion of wetland habitat to uplands, but it would also prevent soil erosion and rutting from vehicle traffic.

Alternative B also proposes to lower an exposed and suspended segment of 24-inch diameter natural gas pipe within Big Sandy Creek via the use of the open-cut method (Appendix A). This method involves the excavation of a trench for the length of the pipeline to be replaced which would be backfilled following the placement of the pipeline below the stream bed.

Access

The proposed action would require access to the Project location from both sides of Big Sandy Creek. The east side of Big Sandy Creek would be accessed via the existing maintained pipeline easement starting from Farm to Market Road 1276 (approximately 1.3 miles). Similarly, the west side of Big Sandy Creek would be accessed via the existing maintained pipeline easement starting from Sunflower Road (approximately 1.6 miles).

Installation of Culverts and Geoweb®

Clearing

All activities associated with the installation of the culverts/Geoweb® would be within the existing maintained pipeline easement; therefore, all vegetation that would be cleared (1.94 acres) would be herbaceous and no tree clearing would be required. Temporary workspace within the maintained easement would be necessary to facilitate construction and would include an approximately 30-foot buffer around the permanent footprint of the culvert/Geoweb® installation where feasible. The vegetation within the workspace would be cleared immediately prior to construction to allow for the installation of the culverts/Geoweb®. To contain disturbed soils during clearing and grading in upland areas and to minimize erosion and sedimentation of wetlands and waterbodies, temporary erosion controls would be installed prior to initial disturbance of soils and would be maintained throughout construction (Appendix B).

Installation of Geoweb® Only

For wetland crossings that would require the installation of Geoweb® only (no culverts), the top eight inches of soil would be excavated to allow placement of the 8-inch thick Geoweb® mats and woven geo-fabric. The top soil would be stockpiled at the immediate construction site. After removal of the eight inches of top soil, the area would be graded and proof-rolled with a loaded construction truck. The geo-fabric and Geoweb® would then be placed in the wetland crossing area. The Geoweb® openings would be filled with a gravel/top soil combination per the manufacturer's recommendations. The Geoweb® would be covered with an additional two inches of the stockpiled topsoil and proof-rolled again (Appendix C). The preservation and use of native soils is critical to successful revegetation in that the existing seed bank is preserved, optimizing the likelihood of the reestablishment of preconstruction vegetation.

Installation of Culverts with Geoweb®

Excavation would occur approximately six inches below the flow line in the stream to allow for the six-inch geo-fabric and gravel layer beneath the culvert (this layer provides additional stabilization and aids in the prevention of scouring under the culvert). The culvert (either one 24-inch diameter culvert or two 24-inch diameter culverts depending on width of the stream crossing) would then be placed in the stream and aligned with the natural flow of the stream. The geo-fabric and gravel would continue to wrap completely around the culvert. After the culvert has been installed, a layer of Geoweb® would be placed on top of the culvert, bridging the banks of the stream, thus allowing stabilized passage of construction vehicles (Appendix C). The installation of the Geoweb® would be the same as described above.

Pipeline Lowering

Clearing and Grading

Prior to construction all work areas would be cleared and graded where necessary to provide a level surface for safe equipment movement (approximately 0.23 acre of tree clearing and 0.38

acre of herbaceous clearing). Large obstacles, such as trees, rocks, brush, and logs would be cleared from all construction work areas. Timber and other vegetative debris would be disposed of in accordance with applicable local regulations and NPS requirements. To contain disturbed soils during clearing and grading in upland areas and to minimize erosion and sedimentation of wetlands and waterbodies, temporary erosion controls would be installed prior to initial disturbance of soils and would be maintained throughout construction.

Trench Excavation

Trench excavation would be used to bury the new pipeline, and involves the use of a trenching machine, backhoe, or similar equipment. The trench would be excavated (approximately 5,000 cubic yards [CY]) to a maximum depth of 10 feet that would allow space for the pipeline, pipeline bedding, and the minimum amount of top cover that would prevent future exposure of the pipe. Typically, the bottom of the trench would be excavated at least 12 inches wider than the diameter of the pipe. The sides would be sloped for safety at a 15 percent grade resulting in a 40-foot wide trench. Sheet piling would be installed along trench walls for additional stabilization. Excavated soils would be stockpiled along the ROW, typically on the side of the trench away from the construction traffic and pipe assembly area (the "spoil side"). Approximately 200 feet on either side of the stream banks would be excavated. On the west side of the stream, 160 feet of pipe would be replaced and on the east side 120 feet of pipe would be replaced. However, additional space would be required to construct ramps to accommodate the equipment needing access to the trench. To prevent re-exposure of the pipe, the length of the pipe proposed to be replaced on each side of the stream was calculated by studying the historic meander rate and orientation of the stream and projecting future meandering and orientation based on the historic data.

During work in the trench, the stream would be temporarily diverted to allow pipeline crews access to the stream bed to install the new pipe. Stream diversion would be accomplished via the use of a flume, allowing the streamflow to be maintained throughout diversion (Appendix B). To temporarily divert the stream using a flume, the flume would be placed in the stream and temporary dikes would be constructed on the upstream and downstream sides. A flange would be installed on the upstream end of the flume and sealed to substrate with sandbags and a polyethylene liner where necessary to ensure a watertight barrier. Any water remaining between the dikes would be pumped out and discharged through a dewatering structure into a well vegetated area. Sediment barriers would then be constructed along the sides of the soil stockpiles, the ends of dikes, and across the construction right-of-way to prevent silt laden water and spoil from reentering the stream.

Following the completion of the in-stream portion of the Project, the stream banks and bed would be restored to pre-pipe exposure/suspension conditions.

Exposed and Suspended Pipe Removal

The exposed and suspended pipe would be removed following the excavation of the trench. The exposed and suspended pipe would be cut 160 feet from the stream bank to the west and 120 feet from the stream bank to the east and lifted out of the trench.

Pipe Stringing and Fabrication

The new pipe (approximately 280 feet) would be strung out along the right-of-way and welded on site. All welders and welding procedures would be qualified in accordance with American Petroleum Institute (API) Standards or the American Society of Mechanical Engineers (ASME) Boil and Pressure Vessel code. For safety purposes, designated personnel would be present on

site during all welding activities to watch for fire hazards. The pipe would be coated as a corrosion prevention measure to further protect the pipe

Lowering In and Backfilling

The completed section of pipe would be lifted off the temporary supports and lowered into the trench by side-boom tractors or, in some cases, other equipment. Before lowering the pipe, the trench would be inspected to ensure that it is free of rock and other debris that could damage the pipe or the coating. In addition, the pipe and trench would be inspected to ensure that the pipe and trench configurations are compatible.

After the pipe is lowered into the trench, the trench would be backfilled using previously excavated materials. Excavated materials deemed unsuitable for backfill would be disposed of in accordance with applicable regulations and NPS requirements.

Hydrostatic Test and Final-Tie-In

Prior to the final tie-in to the existing pipeline, the new pipe would be hydrostatically tested in ground. Approximately 7,520 gallons of water from a municipal source would be trucked in to be utilized for the test. Following completion of the test, the water would be collected and trucked offsite for disposal.

Cleanup and Restoration

Restoration of areas impacted by the culvert/Geoweb® installations would primarily consist of revegetation of the disturbed areas. Per the FERC Plan and Procedures, reseeding would not occur in wetland areas; instead revegetation in wetlands would be accomplished through topsoil segregation to maintain the existing seed bank. Upland areas would be reseeded according to FERC's Plan and seeding recommendations provided by the NPS.

Restoration following the completion of the pipeline lowering would require the same revegetation procedures as discussed for the culvert/Geoweb® installations. However, the pipeline lowering would result in disturbance of the stream bed and banks. Therefore, restoration would be conducted to restore the contours to as close to pre-pipe exposure/suspension conditions as possible. To achieve this, the slopes of the stream will be restored to a -1.49 percent slope rather than the current 3 percent slope that formed as a result of the pipe exposure. Hydrologic models were performed with this data, and it was concluded that the post-construction condition will have a lower water surface profile than is currently present, and will operate with the same flow rate. A complete summary of the hydrologic data collected and reported for this Project is provided in Appendix D.

2.1.3 HDD Method (Alternative C)

Alternative C would only differ from Alternative B in the method used to lower the exposed and suspended pipe. The installation of culverts/Geoweb® at the previously discussed wetland crossings would occur, unchanged from Alternative B. However, instead of lowering the exposed and suspended pipe via the open-cut method, as is described for Alternative B, the exposed and suspended pipe would be lowered via HDD (Appendix E).

Access

Access to the Project area would be the same as described for the proposed action.

Installation of Culverts and Geoweb®

Installation of culverts/Geoweb® would be the same as described for Alternative B (Open-Cut Method).

Pipeline Lowering

Clearing and Grading

Prior to construction all work areas would be cleared and graded where necessary to provide a level surface for equipment movement (approximately 1.07 acres of tree clearing and 0.67 acre of herbaceous clearing). Large obstacles, such as trees, rocks, brush, and logs would be cleared from all construction work areas. Timber and other vegetative debris would be disposed of in accordance with applicable local regulations and NPS requirements. To contain disturbed soils during clearing and grading in upland areas and to minimize erosion and sedimentation of wetlands and waterbodies, temporary erosion controls would be installed prior to initial disturbance of soils and would be maintained throughout construction.

Exposed and Suspended Pipe Removal

To remove the exposed and suspended pipe approximately 160 feet on the west side of the stream and 120 feet on the east side of the stream would need to be excavated (approximately 2,200 CY) to access the pipe. All excavated materials would be stockpiled on site for backfilling. The exposed and suspended pipe would be cut at each end and lifted from the trench.

HDD Method

Following the removal of the exposed and suspended pipe, the HDD equipment would be mobilized and staged on site. Equipment and workspace would be necessary on both sides of the stream at the entrance and exit locations. Equipment and workspace utilized on the entrance side (west side of Big Sandy Creek) would include the drill rig, driller's console, drill pipe, crane, truck for parts, mud cleaning unit, mud mixing tank, mud pumps, mud pit, frac tanks, drilling mud on pallets, and an office trailer. Equipment and workspace utilized on the exit side (east side of Big Sandy Creek) would include the exit pit, lift equipment such as a side boom tractor, welding area, mud cleaning unit, generator, frac tank, and approximately 572 feet of pipe rollers.

Prior to the commencement of drilling, the new pipe would be strung out along the right-of-way on pipe rollers and welded on site as described above for Alternative B. A small diameter pilot hole would be directionally drilled, and then the hole would be reamed, or enlarged, to accommodate the pipe. Following the completion of drilling, the assembled pipe would be pulled through the hole and tied in to the existing pipeline. A drawing detailing the configuration of the HDD components is provided in Appendix E.

The HDD equipment would be configured such that the drilling rig and associated equipment on the entry (west) side and equipment on the exit (east) side are situated primarily off ROW. On the west side of Big Sandy Creek the existing pipeline easement curves before it reaches the stream and continues almost straight after crossing the stream. To cross the stream using the HDD method, it is preferred that, for this site, the entry point be located on the west side and the exit point on the east side of the stream. With this configuration, the pipe would be relatively straight at the time of the pull, thus reducing stresses to the pipe and the force required to pull it through the hole.

Further rationale for the placement of the HDD equipment off right-of-way relates to safety concerns. As a result of DOT's mandate to protect pipelines (CFR 192.103) and to satisfy safety concerns, Tennessee Gas discourages the placement of equipment over all pipelines. Placing

equipment on a gas pipeline adds unnecessary stress and increases the risk of a leak. This stipulation is particularly applicable to the 24-inch pipeline crossing Big Sandy Creek. This pipeline was manufactured and installed in the 1950s. Tennessee Gas has a high level of confidence in the material properties of the pipe; however, for the girth welds between pipe segments, Tennessee Gas must depend on the capabilities of the particular welder and the inspection procedures in the 1950's to determine its level of confidence. There is general agreement that welding techniques in the 1950's are not as advanced as today and inspection methods of that era were not as rigorous. Therefore, to eliminate additional pressure stress the HDD equipment cannot be configured directly over the existing pipeline easement.

Hydrostatic Test and Final Tie-In

Prior to the final tie-in to the existing pipeline the new pipe will be hydrostatically tested with water obtained from a municipal source that will be trucked into and out of the Preserve. The new pipe will first be tested aboveground for four hours. Following pulling the pipe it will be tested again, in ground, for eight hours. Approximately 7,520 gallons of water will be utilized for these tests.

Cleanup and Restoration

Restoration of areas impacted by the installation of culverts/Geoweb® would be the same as is discussed for Alternative B. Restoration of areas impacted by the HDD would be similar to restoration following the use of the open-cut method; however, because vegetation impacts would be much greater and would include more clearing of forested areas, restoration would be longer and more labor intensive. Additionally, greater post-construction management would be necessary to prevent the establishment of non-native or invasive species such as Chinese tallow (*Triadica sebifera*). As was described for Alternative B, the stream banks will be restored to pre-pipe exposure conditions with a slope of -1.49% (Appendix D).

2.2 SUMMARY OF IMPACT AREAS

Table summarizes the total area impacted by each Project component for each action alternative.

Table 2. Summary of Impact Areas Associated with Alternatives B and C

Alternative	Project Component	Land Use	Temporary Impact (acres)	Permanent Impact (acres)	Total Impact (acres)
B/C	Culvert/Geoweb®	Wetland (Riverine and PEM)	0.63	0.11	0.74
		Upland	1.08	0.12	1.20
Subtotal			**1.71**	**0.23**	**1.94**
B	Pipe Lowering by Open Cut	Forested	0.23	0.00	0.23
		Maintained Easement	0.38	0.00	0.38
		Riverine Wetland (Big Sandy Creek)	0.16	0.00	0.16

Alternative	Project Component	Land Use	Temporary Impact (acres)	Permanent Impact (acres)	Total Impact (acres)
Subtotal			**0.77**	**0.00**	**0.77**
Total Impacts for Alternative B		**Wetland**	**0.79**	**0.11**	**0.90**
		Upland	**1.69**	**0.12**	**1.81**
		Total	**2.48**	**0.23**	**2.71**
C	Pipe Lowering by HDD	Forested	1.07	0.00	1.07
		Maintained Easement	0.67	0.00	0.67
		Riverine Wetland (Big Sandy Creek)	0.15	0.00	0.15
Subtotal			**1.89**	**0.00**	**1.89**
Total Impacts for Alternative C		**Wetland**	**0.78**	**0.11**	**0.89**
		Upland	**2.82**	**0.12**	**2.94**
		Total	**3.60**	**0.23**	**3.83**

Table 3 summarizes the total volume of soil disturbance for each Project component for both action alternatives.

Table 3. Summary of Excavation Volumes Associated with Alternatives B and C.

Alternative	Project Component	Volume Excavated (CY)
B/C	Culvert/Geoweb®	160
B/C	Stream Bank Restoration	300
B	Pipe Lowering by Open Cut	5,000
Total Excavation for Alternative B		5,460
C	Pipe Lowering by HDD	2,200
Total Excavation for Alternative C		2,660

2.3 MITIGATION MEASURES

In order to reduce impacts to the Preserve and the environment, Tennessee Gas would implement the following plans:

- FERC Wetland and Waterbody Construction and Mitigation Procedures (FERC Procedures) - this plan includes the procedures intended to identify the baseline mitigation measures that must be followed to minimize the extent and duration of Project-related disturbance on wetlands and waterbodies.
- FERC Upland Erosion Control, Revegetation, and Maintenance Plan (FERC Plan) – this plan is intended to identify baseline mitigation measures that must be followed to minimize erosion and enhance revegetation.
- Spill Prevention Control and Countermeasures (SPCC) Plan – this plan is required for all projects with storage capacity of oil and/or oil-containing products (i.e., diesel, lubrications) exceeding the EPA-specified threshold of 1,320 gallons and where a spill has the potential to discharge into or upon waters of the United States.
- Unanticipated Discovery Plan – this plan outlines the procedures to follow, in accordance with state and federal laws, if archaeological materials or human remains are discovered during construction activities.
- Hurricane Contingency Plan – this plan outlines the procedures to follow should the Project be interrupted by a hurricane.
- Safety and Communication Plan – this plan outlines Tennessee Gas's standard operating procedures to ensure a safe working environment is maintained at all times.
- Reclamation Plan – this plan includes details regarding restoration procedures, including the specific seed mixes and methods that would be utilized to return impacted areas to preconstruction conditions.

Table 4 lists mitigation measures found in the plans identified above. Tennessee Gas would also have a biological monitor on-site full time to enforce compliance with all applicable plans, permits, and conditions during construction. If construction is active on both sides of Big Sandy Creek a biological monitor would be present for each side. Mitigation measures are also discussed under each impact topic carried forward in the *Affected Environment and Environmental Consequences* section of this EA.

Table 4. Mitigation Measures for Alternatives B and C

Mitigation Measures for Action Alternatives		Resource(s) Protected	Regulatory Requirement
Alternative	Culverts/Geoweb® and Pipeline Lowering		
B, C	Comply with USACE regulations and permits.	Water Resources, Geology & Soils	USACE requirement per Nationwide Permit 14 Linear Transportation (Culvert/Geoweb®); Nationwide Permit 12 Utility Lines (Pipe Lowering)
	Install silt fencing to prevent sediment from leaving the work area and entering the river and/or adjacent wetlands.	Water Resources, Wetlands, Soils, Vegetation	FERC Procedures
	Prepare and comply with Spill Prevention Control and Countermeasure (SPCC) Plan to prevent spills and properly clean-up should one occur.	All Natural Resources and Human Health and Safety	EPA requirement per 40 CFR, Chapter 1, Subchapter D, Part 112 – Oil Pollution Prevention
	Re-seed the Project footprint with a native seed mix per the NPS's recommendations. Monitor the area for revegetation progression until successful, usually one to three years.	Vegetation	FERC Plan
	Clean all equipment (land vehicles and water vessels) before entering the Project area to prevent the introduction of non-native and/or invasive species.	All Natural Resources	NPS mitigation measure
	Provide notifications to Preserve employees and visitors about activities that may impact visitor use or experience.	Visitor Use , Human Health and Safety	Additional Tennessee Gas mitigation measure
	Restore the Project footprint to original contours as much as possible.	Geology & Soils, Vegetation	USACE Nationwide Permit General Conditions, FERC Plan and Procedures
	Prepare and comply with the Unanticipated Discovery Plan if any cultural resources are discovered during construction.	Cultural Resources	Additional Tennessee Gas mitigation measure
	Adhere to the NPS Limited Idling Policy.	Air Quality	NPS mitigation measure
	Adhere to the NPS No Kill/Harass Wildlife Policy	Fish and Wildlife	NPS mitigation measure
	Provide education to all crews associated with the Project in regards to minimizing impacts to sensitive environmental	All Natural Resources	NPS mitigation measure

Mitigation Measures for Action Alternatives		Resource(s) Protected	Regulatory Requirement
	resources.		
	Utilize a third-party monitor to oversee mitigation measures employed to minimize environmental impacts.	All Natural Resources	NPS mitigation measure.
C	Adhere to Tennessee Gas's HDD Contingency Plan including a Frac Out Contingency Plan.	Geology &Soils, Water Resources	Additional Tennessee Gas mitigation measure

2.4 Alternative SUMMARIES

Table compares the ability of the no action alternative (Alternative A), the Open-Cut Method (Alternative B), and the alternative to the proposed action (Alternative C) to meet the Project objectives. The objectives for this Project are identified in the *Purpose and Need* section of this EA.

Table 5. Summary of Alternatives and Ability to Meet Project Objectives

Project Objectives	No-Action - Alternative A	Open-Cut Method - Alternative B	HDD Method- Alternative C
Avoid or minimize impacts on the Preserve's resources and values.	Yes	Yes	No
Create a long-term solution to crossing streams and wetlands during pipeline maintenance activities.	No	Yes	Yes
Lower pipe in Big Sandy Creek so it is no longer exposed and suspended and future exposure and hazard risks are prevented.	No	Yes	Yes

Table 6 summarizes the anticipated environmental impacts for all three alternatives. Only those impact topics that have been carried forward for further analysis are included in this table. The *Environmental Consequences* section of this EA provides a more detailed explanation of impacts carried forward.

Table 6. Environmental Impact Summary by Alternative

Impact Topic	Project Component	Alternative A – No Action	Alternative B – Open-Cut Method	Alternative C – HDD Method
Wetlands and Floodplains	Culvert/Geoweb Installation	The no action alternative would continue to require the use of heavy equipment to install and remove timber mats at wetland and stream crossings to facilitate routine maintenance activities. The increased use of heavy equipment and the longer duration of pipeline crews and equipment present in the Preserve allow for the potential for increased disturbance and rutting in wetlands.	Alternative B would have short-term, moderate adverse impacts to wetlands. These impacts would primarily occur during the installation of the permeable Geoweb®. Following the installation of the Geoweb®, the wetlands would be restored to preconstruction conditions, with the exception that they would now be protected against rutting and erosion from vehicles.	Alternative C would have the same impacts from the culvert/Geoweb® installations as Alternative B.
	Pipeline Lowering	The no action alternative would allow the exposed and suspended pipe to continue to scour and erode the banks of Big Sandy Creek impacting the associated floodplain.	Alternative B would result in short-term, moderate adverse impacts to floodplains from the removal of the pipe and the temporary diversion of water in the stream during construction in the stream bed. There would also be long-term, moderate beneficial impacts due to the removal of the pipe.	Alternative C would result in short-term, minor adverse impacts to floodplains as a result of the removal of the suspended pipe. There would also be long-term, moderate beneficial impacts due to the removal of the pipe.

Impact Topic	Project Component	Alternative A – No Action	Alternative B – Open-Cut Method	Alternative C – HDD Method
Water Resources	Culvert and Geoweb® Installation	Alternative A continues to provide greater opportunity for rutting in the wetlands during pipeline maintenance activities, which can cause increased sedimentation from stormwater runoff to the adjacent streams.	Installation of the culvert/Geoweb® could result in short-term, minor adverse impacts to water quality from accidental fuel spills. However, the use of best management practices would reduce the likelihood that these events would occur.	Alternative C would have the same impacts from the culvert/Geoweb® installations as Alternative B.
Water Resources	Pipeline Lowering	Alternative A would result in long-term, minor adverse impacts from the continued exposure of the pipeline which is altering the natural hydrologic regime of Big Sandy Creek.	Alternative B would result in short-term, moderate adverse impacts to water resources from the temporary diversion of water in the stream during construction in the stream bed, and long-term, moderate beneficial impacts due to the removal of the pipe.	Alternative C would result in short-term, minor adverse impacts to water resources as a result of sedimentation because the suspended pipe would still be removed; though water would not have to be diverted out of the stream for construction. There would also be long-term, moderate beneficial impacts due to the removal of the pipe.
Geology and Soils	Culvert/Geoweb® Installation	Alternative A would increase the potential for soil erosion, rutting and compaction from the use of heavy equipment necessary to install and remove timber mats at wetland and stream crossings. These impacts would likely be minor, long-term adverse impacts.	Alternative B would result in short-term and long-term, minor adverse impacts to soils where the Geoweb® is installed and from construction vehicle traffic. There may also be long-term, moderate adverse impacts to soils due to an impermeable substance (culvert) placed in the ground. There is also potential for soil erosion near the ends of the culverts.	Alternative C would have the same impacts from the culvert/Geoweb® installations as Alternative B.

Impact Topic	Project Component	Alternative A – No Action	Alternative B – Open-Cut Method	Alternative C – HDD Method
	Pipeline Lowering	Alternative A would not have any impact on geology or soils in regards to the pipeline lowering as excavation would not occur.	Alternative B would result in short-term, moderate adverse impacts to soils due to the amount of soil excavation that would be required. However, pre-construction contours would be restored as close to practicable following construction and reseeding would occur in non-wetland areas to reestablish vegetation as quickly as possible.	Alternative C would result in short-term, moderate adverse impacts from excavations set back from the stream banks to facilitate the removal of the exposed and suspended pipe. Soils would also be moderately impacted during drilling. However, pre-construction contours would be restored as close to practicable following construction, and reseeding would occur in non-wetland areas to reestablish vegetation as quickly as possible.
Vegetation	Culvert/Geoweb® Installation	Alternative A would have short-term, minor recurring adverse impacts to vegetation. The use of heavy equipment and the continued installation and removal of timber mats would temporarily disturb vegetation in the area during maintenance activities.	Alternative B would only result in short-term, minor adverse impacts to vegetation from the installation of the Geoweb®. Following the installation, the vegetation would be allowed to return. However, there would be long-term, moderate adverse impacts to vegetation from the installation of the culverts in which the vegetation over the culvert would be converted from mixed upland and wetland vegetation to predominantly upland vegetation.	Alternative C would have the same impacts from the culvert/Geoweb® installations as Alternative B.

Impact Topic	Project Component	Alternative A – No Action	Alternative B – Open-Cut Method	Alternative C – HDD Method
	Pipeline Lowering	Alternative A would have long-term moderate impact to vegetation as a result of artificial scouring from the pipe exposure and suspension causing vegetation to slough into the creek.	Alternative B would result in long-term, minor adverse impacts to herbaceous vegetation through the clearing of the existing maintained pipeline easement. However, reseeding would occur in non-wetland areas to reestablish vegetation as quickly as possible.	Alternative C would have long-term, moderate adverse impacts to vegetation due to the acreage of trees that would be cleared, in addition to the clearing of the maintained easement, to accommodate the HDD equipment. However, reseeding would occur in non-wetland areas to reestablish vegetation as quickly as possible.
Soundscapes	Culvert/Geoweb® Installation	Alternative A would have a negligible impact on soundscapes from noise associated with the heavy equipment needed to install and remove timber mats during routine maintenance.	Alternative B would result in short-term, minor adverse impacts from construction activities during daylight hours for the duration of the Project, and long-term beneficial impact due to decreased duration of presence in the Preserve for routine maintenance activities.	Alternative C would have the same impacts from the culvert/Geoweb® installations as Alternative B.
Soundscapes	Pipeline Lowering	Alternative A would not have any impact on the soundscape.	Alternative B would result in short-term, minor adverse impacts from construction activities during daylight hours for the duration of the Project.	Alternative C would have short-term, moderate adverse impacts from the use of 60-70 percent more equipment than the open-cut method, and continuous drilling for approximately seven days or until the drilling is complete.

Impact Topic	Project Component	Alternative A – No Action	Alternative B – Open-Cut Method	Alternative C – HDD Method
Fish and Wildlife	Culvert/Geoweb® Installation	Alternative A would not have any impact on fish and wildlife.	Alternative B would have short-term, minor adverse impacts that would primarily consist of temporary displacement of more mobile species to adjacent habitats for the duration of the construction activities and the direct mortality of small, less mobile species that are unable to leave the Project area.	Alternative C would have the same impacts from the culvert/Geoweb® installations as Alternative B.
	Pipeline Lowering	Alternative A would result in the continued exposure of the pipeline in Big Sandy Creek which is altering flow and sedimentation that could have minor adverse impacts on aquatic species.	Alternative B would result in a combination of impacts to water resources, soundscapes, vegetation, and lightscapes. Additionally, fish would be directly impacted by the stream diversion. Therefore, Alternative B would have short-term, minor adverse impacts to fish and wildlife.	Alternative C would result in a combination of impacts to water resources, soundscapes, vegetation, and lightscapes. Therefore, Alternative C would have short-term, moderate adverse impacts to fish and wildlife.

2.5 IDENTIFICATION OF THE ENVIRONMENTALLY PREFERABLE ALTERNATIVE

According to the CEQ regulations implementing NEPA (43 CFR 46.30), the environmentally preferable alternative is the alternative "that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources. The environmentally preferable alternative is identified upon consideration and weighing by the Responsible Official of long-term environmental impacts against short-term impacts in evaluating what is the best protection of these resources. In some situations, such as when different alternatives impact different resources to different degrees, there may be more than one environmentally preferable alternative."

Based on the analysis presented in this document, Alternative B (open-cut method) is the environmentally preferable alternative for several reasons: 1) It would create a long term solution to wetland crossing on the right-of-way; 2) It would greatly minimize the potential for a catastrophic pipeline incident; and 3) Although the impacts to some resources (geology and soils and water resources) would be greater than those caused by Alternative C, impacts under Alternative B would be shorter term.

Alternative C (HDD) is not environmentally preferable because although it also would create a long term solution to wetland crossing on the right-of-way and greatly minimize the potential for catastrophic pipeline incident, certain resources, such as vegetation and wildlife, would experience greater impacts. Alternative A (No Action) is not environmentally preferable because while it would not result in new resource impacts, it would not provide a solution for wetland crossing on the right-of-way. Furthermore, hydrologic impacts caused by the exposed pipe would continue and may potentially worsen.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section analyzes the potential environmental consequences, or impacts, that would occur as a result of implementing the no action alternative (Alternative A), the open-cut method (Alternative B), and the HDD method (Alternative C). Topics analyzed in this section include: wetlands and floodplains, water resources, geology and soils, vegetation, soundscapes, and fish and wildlife. All remaining impact topics were dismissed as discussed in the *Purpose and Need* section of this EA.

Direct, indirect, and cumulative effects are analyzed for each resource topic carried forward. Potential impacts are described in terms of type, context, duration, and intensity. General definitions for these terms follow, while more specific impact thresholds are given for each resource at the beginning of each section. A description of each resource topic included in this section is contained in the *Affected Environment* section of this EA.

Type describes the classification of the impact as either beneficial or adverse, and either direct or indirect:

Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.

Adverse: A change that moves the resource away from a desired condition or detracts from its appearance or condition.

Direct: An effect that is caused by an action and occurs in the same time and place.

Indirect: An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.

Context describes the area or location in which the impact would occur (i.e., site specific, local, regional, or even broader).

Duration describes the length of time an effect would occur, either short-term or long-term:

Short-term: Impacts generally last only during project activities, but could take up to three years to resume their conditions following project activities.

Long-term: Impacts could take more than three years beyond the period of project activities for resources to resume their conditions.

Intensity describes the degree, level, or strength of an impact. For this analysis, intensity has been categorized into negligible, minor, moderate, and major. Because definitions of intensity vary by resource topic, intensity definitions are provided separately for each impact topic analyzed in this EA.

3.1 CUMULATIVE ANALYSIS

The CEQ, which implements NEPA, requires assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined in 40 CFR 1508.7 as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions." Cumulative impacts are considered for each impact topic.

Past, Present, and Reasonably Foreseeable Actions

Over time, NPS protection provided to all resources within the Preserve is expected to improve resource conditions; however, cumulative actions within and outside the Preserve could continue to adversely impact these resources. Cumulative impacts combine the impacts of the three alternatives considered with other past, present, and reasonably foreseeable future actions. Given this, the following sources of impact were identified for the purpose of conducting the cumulative effects analysis.

- Drought – Texas has experienced an extended period of drought in recent years. Depending on the duration of the drought, it can have minor to moderate impacts on the environmental resources in the area.
- Hurricanes – While catastrophic hurricane events are rare in BTNP, the strong storms that accompany them can cause substantial damage to all resources within the Preserve.
- Transpark oil and gas activities – Past transpark pipeline construction and regular maintenance activities continue to impact environmental resources in the analysis area. No new transpark pipelines are currently proposed to cross the Preserve in the BSC Unit.
- NPS operations – NPS performs regular management oversight of visitor uses, oil and gas projects, and resource preservation within the Preserve. Impacts to several environmental resources may occur in the analysis area from NPS use of motorized vehicles and prescribed burning.
- Recreational activities – Preserve visitors and adjacent landowners use the analysis area for hunting, canoeing, kayaking, and recreational fishing. These activities may impact environmental resources in the analysis area.

Cumulative Impact Analysis Area – All Resources

The analysis area used to determine cumulative impacts is not the same for all resources because each past, present, and foreseeable future action has specific spatial and temporal impacts. The proposed Project area within the cumulative analysis area is approximately three miles wide and incorporates all equipment access roads, and the Preserve (Figure 1).

Table 1 lists and explains the rationale for each area determination by impact topic, and the circumstances identified for conducting the cumulative effect analysis.

Table 7. Cumulative Impact Analysis Area

Impact Topic	Cumulative Analysis Area	Analysis Area Determination
Geology and Soils Water Resources Vegetation Floodplains Wetlands Aquatic Species and Wildlife Species of Concern Invasive Non-Native Species	General Project area	These impact topic resources are closely interrelated and dependent on each other. The extent of impacts to these topics will primarily be restricted to the resources present in the Project footprint, or within a few hundred feet of the footprint.
Soundscape Lightscape Visitor Use and Experience Biosphere Reserve Designation Park Operations Cultural Resources	Big Sandy Creek Unit	These impacts are specific to Preserve resources and values and are only discussed in relation to impacts directly to the Big Sandy Creek Unit of the Preserve.
Air Quality Socioeconomics Catastrophic Pipeline Incidents Global Climate Change	Polk County	These resources are discussed in relation to regional impacts.

3.2 WETLANDS AND FLOODPLAINS

Introduction. For regulatory purposes under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas." Executive Order 11990, Protection of Wetlands, requires each agency to provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

Wetlands are transitional environments between terrestrial and aquatic ecosystems which are characterized by a high water table or standing water. The wetland classification system that is used by the federal government characterizes wetlands as those lands that have at least one of the following three criteria: 1) at least periodically, the land supports predominately hydrophytes; 2) the substrate is predominantly un-drained hydric soil; and 3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year (NPS 2010; Cowardin et al. 1979).

Executive Order 11988, Floodplain Management, requires each agency to provide leadership and take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for (1) acquiring, managing, and disposing of federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

In managing floodplains on park lands, NPS management policy directs that NPS will (1) manage for the preservation of floodplain values; (2) minimize potentially hazardous conditions associated with flooding; and (3) comply with NPS Organic Act and all other federal laws and executive orders related to the management of activities in flood-prone areas, including Executive Order 11988 (Floodplain Management), NEPA, applicable provisions of the Clean Water Act, and the Rivers and Harbors Appropriation Act of 1899. Specifically, NPS will:

- Protect, preserve, and restore the natural resources and functions of floodplains;
- Avoid the long- and short-term environmental effects associated with the occupancy and modification of floodplains; and,
- Avoid the direct and indirect support of floodplain development and actions that could adversely affect the natural resources and functions of floodplains or increase flood risks (NPS 2006; sec 4.6.4).

Approximately 50 percent of the Preserve consists of floodplains. Floodplains are lowland, relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands and including (at a minimum) areas subject to temporary inundation by a regulatory flood (NPS 2003). Several of the proposed Project sites are located within the 100-year floodplain for Big Sandy Creek (NPS 2010).

All wetlands, but especially those within the floodplains, are vital to the health and function of the ecosystem. Forty percent, or approximately 35,000 acres, of the Preserve consists of wetlands. Most of the wetland areas in the Preserve are characterized as forested wetlands consisting of bottomland hardwood forests. However, because the proposed Project areas occur primarily within the existing, maintained pipeline easement, no forested wetlands would be impacted by the preferred alternative. Floodplain wetlands play important roles in the riparian

ecosystem. They reduce floods by slowing water flow through vegetation which also improves water quality since slowing the floodwater means less sediment is transported downstream. Wetlands harbor a diversity of plant and animal life and are important for food, cover, and water resources for wetland and upland animal species alike.

On July 20-21 and November 22, 2011 wetland delineations were conducted in the proposed Project area in order to identify and classify wetlands, vegetation, and soils potentially impacted by the Project. During the survey four palustrine emergent (PEM) wetlands and five riverine wetlands (streams) were identified. A complete description of the conditions documented during these surveys is provided in the Wetland Delineation Report provided in Appendix F.

Area of Analysis. The area of analysis for water resources includes the immediate location of the proposed Project.

Methodology and Assumptions. The methodology used for assessing impacts to wetlands and floodplains (primarily wetlands for this Project) was based on a review of existing literature and studies, information provided by Preserve staff, and professional judgment. The thresholds for this impact assessment are as follows:

Intensity Level Definitions.

Negligible: Impacts would result in a change to wetlands or floodplains but the change would be so slight that it would not be of any measurable or perceptible consequence. Any impacts would be temporary and the wetland would continue to maintain its ecological integrity and functions.

Minor: Impacts would result in a detectable change to wetlands or floodplains, but impacts would be expected to be small, of little consequence, and localized. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts would result in a change to wetlands or floodplains that would be readily detectable and localized. Alterations of wetland integrity and function may also occur. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful.

Major: Impacts would result in a change to wetlands or floodplains that would have substantial consequences on a regional scale. The ecological integrity and function of the wetland may change. Extensive mitigation measures would be needed to offset any adverse effects, and their success would not be guaranteed.

3.2.1 Impacts of Alternative A (No Action)

Under the no action alternative no long-term solution would be employed at the various stream and wetland crossings within the existing, maintained pipeline easement.

Pipeline crews access this area for routine maintenance on an annual to bi-annual basis. The pipeline crews would continue to cross the streams and wetlands when they need to access the pipeline easement by hauling in large timber mats to place on or over the wetlands and streams to minimize impacts from crossing. The use of timber mats requires large, heavy equipment including 18-wheeled trucks to haul the mats in and out, as well as a small crane to maneuver the mats. The use of this equipment increases the likelihood that rutting would occur in the wetland areas.

Impacts to the wetlands from rutting would be highly localized and temporary in nature. Thus, the no action alternative would result in negligible to minor short-term impacts to the wetlands in the Project area.

Additionally, if the pipe in Big Sandy Creek is not lowered, it would continue to be undermined, becoming increasingly suspended and creating greater potential for a catastrophic rupture. If a catastrophic rupture occurred, there would be significant altering of the floodplains potentially resulting in long-term, moderate, adverse impacts.

Cumulative Impacts: Cumulative impacts to wetlands in the area include those resulting from both transpark pipeline operations and drought. Current impacts to the wetlands from transpark pipeline operations include easement maintenance and vehicle traffic. Persistent periods of drought can cause minor to moderate impacts on wetlands in the area. The effects of Alternative A would not contribute more than localized negligible adverse impacts for the culverts/Geoweb® portion of the project to the overall cumulative impacts of these actions. However, moderate to major adverse impacts could contribute to the overall cumulative impacts should a catastrophic rupture occur.

Conclusion: Under the no action alternative a permanent solution to stream and wetland crossings would not be employed. Pipeline crews would continue to use temporary timber mats when they need to access the pipeline easement and incur negligible to minor impacts on the wetlands in the area. .

3.2.2 Impacts of Alternative B (Open-Cut Method)

Alternative B is the proposed action and consists of two Project components; the installation of culverts/Geoweb® at wetland crossings and lowering the exposed and suspended pipe in Big Sandy Creek via the open-cut method. There would be no impacts to wetlands as a result of the pipeline lowering, though the floodplain associated with Big Sandy Creek will be impacted. Appendix C provides complete drawings for all nine culvert/Geoweb® sites including acreages associated with temporary and permanent disturbances.

Geoweb®: Installing Geoweb® creates a long-term solution to protect wetlands from vehicle traffic when accessing the pipeline easement for maintenance. The permeable nature of the Geoweb® allows the wetland to be protected from disturbances while maintaining its integrity and function. There would be short-term, minor adverse impacts following the installation of the Geoweb® while the wetland revegetates; however it would create long-term, minor beneficial impacts by preventing rutting or other disturbances to the wetland.

Culverts: Under Alternative B culverts with Geoweb® would be installed at three riverine wetland (stream) crossings. Impacts from the installation of culverts would be both short and long-term, moderate impacts resulting from the disturbances caused during the installation process (see section 2.1.2 for a description of this process) and the addition of the culvert to the environment.

Pipeline Lowering via Open-Cut: Impacts to floodplains from the pipeline lowering via open-cut would result in temporary, moderate adverse impacts to the Big Sandy Creek floodplain. Impacts would primarily result from bank disturbance and vegetation removal associated with the removal of the existing pipe. Lowering the exposed and suspended pipe would also result in long-term, minor beneficial impacts to the floodplain due to the cessation of scouring associated with the exposed and suspended pipe.

Mitigation Measures: To minimize impacts to wetlands and floodplains disturbed by the installation of culverts/Geoweb® Tennessee Gas would use Geoweb® wherever possible and ensure that all disturbed areas were returned to the original grade and revegetated.

Cumulative Impacts: Cumulative impacts are the same as those described for Alternative A. However, the impacts from the proposed action would create additional moderate impacts on the previously discussed cumulative impacts.

Conclusion: The use of Geoweb® would have short-term, minor, adverse impacts due to the disturbance of the wetland during installation. However, the wetland would recover following the installation resulting in long-term, minor beneficial impacts by preventing rutting. The installation of the culverts would result in short and long-term moderate impacts to the wetlands.

3.2.3 Impacts of Alternative C (HDD Method)

Alternative C differs from Alternative B only in the method used to lower the exposed and suspended pipe. This alternative proposes to use a HDD to lower the pipe under Big Sandy Creek, rather than the open-cut method proposed in Alternative B. The use of culverts/Geoweb® at wetland crossings would be the same. Impacts to floodplains from the pipeline lowering via the use of a HDD would be similar to those discussed for Alternative B with slightly less ground disturbing impacts to the stream banks and associated floodplains.

3.3 WATER RESOURCES

Introduction. In accordance with the *NPS Management Policies 2006,* NPS will perpetuate surface waters and groundwaters as integral components of park aquatic and terrestrial ecosystems. NPS policies also require protection of water quality consistent with the Clean Water Act (NPS 2006; sec 4.6.1). Furthermore, the NPS must adhere to the Clean Water Act (40 CFR Parts 100-149) which seeks to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." To enact this goal, the U.S. Army Corps of Engineers (USACE) has been charged with evaluating federal actions that result in potential degradation of Waters of the United States and issuing permits for actions consistent with the Clean Water Act. The U.S. Environmental

Protection Agency (EPA) also has responsibility for oversight and review of permits and actions, which affect Waters of the United States.

The Project area is located within the Neches River Basin. All streams crossed by the proposed Project are tributaries of Big Sandy Creek. Big Sandy Creek rises in central Polk County, Texas and continues to meander southeast for 47 miles into Hardin County where it terminates at the junction with Kimball Creek. Sixteen miles of Big Sandy Creek are protected within the confines of the Preserve.

Big Sandy Creek has high water quality and contains significant wildlife habitat value (NPS, 1995). High levels of dissolved oxygen and stable temperature regimes allow Big Sandy Creek to successfully support a variety of warm-water aquatic species (NPS 2010). Other water quality indicators, including those typically associated with contamination from oil operations, such as dissolved solids, specific conductance, chloride concentrations, and nutrient levels (ammonium, orthophosphate, and nitrate) are all within state water quality standards (NPS 2010). The only contaminants within Big Sandy Creek that exceed EPA water quality criteria are total phosphorous (20 percent of the samples tested) and one sediment sample that exceeded acute criteria for aluminum. There are also a few areas in the upper portion of the watershed in which fecal coliform bacteria concentrations exceeded state water quality standards for contact recreation (NPS 2010). The overall water quality in the Big Sandy Creek watershed is good; however, more recent studies indicate that, with the exception of improvements to turbidity and chlorides, the overall quality of the watershed is declining (NPS 2010).

Water resources (including water quality, quantity, and stream flow) within the BSC Unit are important not only to the local fish and wildlife, but are also used for recreation by visitors. Alteration of water quality, quantity, flow, and sedimentation can have cascading impacts throughout an ecosystem including changes in aquatic and terrestrial animal species composition, habitat types, and the overall health and resilience of the ecosystem. The Texas Water Development Board (TWDB) has identified Big Sandy Creek for consideration as an ecologically unique stream segment based on its biological function, riparian conservation area, and exceptional aesthetic value (NPS 1995).

Area of Analysis. The area of analysis for water resources includes the Project footprint as well as the area of effect which would be 500 feet upstream and 100 feet downstream of the Project area.

Methodology and Assumptions. The methodology used for assessing impacts to water resources was based on a review of existing literature and studies, information provided by Preserve staff, and professional judgment. The thresholds for this impact assessment are as follows:

Intensity Level Definitions.

Negligible: Impacts to water resources would be so slight that it would not affect the quality, quantity, flow, or overall hydrology of water in the system. Water resources would continue to be consistent with historical or baseline conditions.

Minor: Impacts would result in a detectable change to water resources, but impacts would be expected to be small, of little consequence, and localized. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts would result in a change to water resources that would be readily detectable and localized. Alterations of wetland integrity and function may also occur. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful.

Major: Impacts would result in a change to water resources that would have substantial consequences on a regional scale. The ecological integrity and function of the wetland may change. Extensive mitigation measures would be needed to offset any adverse effects, and their success would not be guaranteed.

3.3.1 Impacts of Alternative A (No Action)

Under the no action alternative no long-term solution would be employed at various stream and wetland crossings within the existing maintained pipeline easement, and the exposed and suspended pipe in Big Sandy Creek would remain. Pipeline crews access this area for routine maintenance on an annual to bi-annual basis. The pipeline crews would continue to cross the streams and wetlands when they need to access the pipeline easement by hauling in large timber mats to place on or over the wetlands and streams to minimize impacts from crossing. The use of timber mats requires large, heavy equipment including 18-wheeled trucks to haul the mats in and out as well as a small crane to maneuver the mats. The use of this equipment increases the likelihood that rutting would occur in the wetland areas, potentially increasing sedimentation and flow into adjacent waterbodies.

The effects of inaction on the exposed and suspended pipe would be the continued scouring and alteration to the processes, including flow, of Big Sandy Creek. Over time, these impacts could result in significant loss of bank vegetation, increased sedimentation downstream, further exposure and suspension of the pipe, and overall alteration of the stream's natural processes. Furthermore, if the pipe continues to be suspended, it would be a potential safety hazard that could result in a catastrophic incident impacting water resources in the area.

Cumulative Impacts: Cumulative impacts to water resources in the impact area include those resulting from flood pulses and upstream pollutants. Overall, cumulative impacts in the area are considered minor with Alternative A contributing additional moderate impacts.

Conclusion: Under the no action alternative there would be no long-term solution for pipeline maintenance crews to cross wetlands and waterbodies. The continued use of timber mats at these crossings increases the risk of rutting to occur in the soil. Not only

would ruts impact wetlands by altering their hydrology, but they would also create channels for unfiltered stormwater runoff to enter adjacent waterbodies, potentially increasing sedimentation and contamination. Furthermore, the exposed and suspended pipe would continue to impede flow and other natural processes of Big Sandy Creek. The velocity of the water on the downstream side of the exposed and suspended pipe would continue to increase as the water further scours and undercuts the pipe causing more significant exposure and suspension within the stream. Continued and elongated suspension of the pipe also provides increased potential for a catastrophic rupture. Alternative A would result in long-term, moderate adverse impacts to water resources.

3.3.2 Impacts of Alternative B (Open-Cut Method)

Alternative B is the proposed action and consists of two Project components; the use of culverts/Geoweb® at wetland crossings and the lowering of the exposed and suspended pipe in Big Sandy Creek via the open-cut method. The impacts on water resources associated with each of these Project components are discussed below.

Culverts/Geoweb®: Hydrologic modeling for the culvert/Geoweb® installations (Appendix H) indicates that the installation of culverts/Geoweb® are not anticipated to impact water resources. However, short-term, minor adverse impacts to water quality could be possible if a fuel spill occurred from equipment on site.

Pipeline Lowering via Open-Cut: Lowering the currently exposed and suspended pipe in Big Sandy Creek requires two steps. First, the existing pipe must be removed, and second, the new pipe must be entrenched beneath the stream bed. Using the open-cut method, both steps would require the temporary diversion of water within the stream channel to facilitate Project activities. The resulting disturbance to Big Sandy Creek would result in short-term, moderate adverse impacts to water quantity and quality during Project activities and the subsequent bank restoration efforts. Water quantity and flow would be temporarily altered while water is being diverted and sedimentation would be increased immediately following construction and restoration efforts resulting in temporary impacts to water quality. Sedimentation can have a detrimental effect on water quality by increasing turbidity and causing a potential decrease in the amount of dissolved oxygen present.

Alternative B would also result in long-term, moderate beneficial impacts to water quality, quantity and stream flow. The current position of the exposed and suspended pipe has caused it to be nearly fully suspended within the stream. This suspension has caused increased water velocity on the downstream side of the pipe which has resulted in significant scouring and undercutting of the stream banks and bed. The removal of the pipe from the stream would eliminate this effect and restoration of the banks would prevent continuation of scouring and undercutting. Furthermore, the depth to which the pipe would be lowered in combination with the length of pipe to be lowered would prevent the likelihood of any future exposure.

Mitigation Measures: Tennessee Gas would minimize impacts to water resources through the implementation of best management practices (BMPs) such as the use of silt fence where necessary, adherence to the FERC Procedures, and adherence to their

SPCC Plan. Additionally, biological monitors would be present on site during all construction activities to ensure proper use of these mitigation measures.

Cumulative Impacts: Cumulative impacts to water resources would be the same as discussed for Alternative A. Impacts from Alternative B would result in moderate additional impacts to the cumulative impacts previously discussed.

Conclusion: Impacts to water resources associated with Alternative B would be short-term, moderate adverse impacts and long-term, moderate beneficial impacts.

3.3.3 Impacts of Alternative C (HDD Method)

Alternative C differs from Alternative B only in the method used to lower the exposed and suspended pipe. This alternative proposes to use a HDD to lower the pipe under Big Sandy Creek, rather than the open-cut method proposed in Alternative B. The use of culverts/Geoweb® at wetland crossings would be the same. Impacts associated with each of these components are discussed below.

Culverts/Geoweb®: As discussed above (Section 4.3.2), no impacts from the installation of culverts/Geoweb® to water resources are anticipated as a result of the proposed Project.

Pipeline Lowering via HDD: Impacts to water resources from the use of a HDD to lower the exposed and suspended pipe would reduce the adverse impacts to water resources that were discussed for Alternative B; however, the overall impacts would still be short-term, moderate adverse impacts and long-term, moderate beneficial impacts. Adverse impacts to water resources would be less than with the open-cut method because water would not need to be diverted out of the stream. Rather, the exposed and suspended pipe would be cut at each end beyond the stream banks and lifted out. This removal would result in minor disturbance of the stream banks that would have the potential to temporarily increase sedimentation. Sedimentation may also be temporarily increased during bank restoration activities, as discussed for Alternative B. The lowering of the pipe would be conducted entirely below ground via the HDD and would only impact on the stream directly if a frac out were to occur. A frac out occurs when the pressure from drilling the pilot hole is released and the natural bentonite drilling mud seeps into a nearby waterbody. Until the frac out is cleaned up, it can cause temporary increases in sedimentation resulting in decreases to water quality.

The long-term, moderate beneficial impacts from the removal of the pipe would be the same as was discussed for Alternative B.

Mitigation Measures: To minimize the effect of Alternative C on water resources, Tennessee Gas would implement BMPs during construction and restoration activities and would prepare a Frac-Out Contingency Plan to minimize impacts to water resources due to a release of drilling mud.

Cumulative Impacts: Cumulative impacts to water resources would be the same as discussed for Alternative A. Impacts from Alternative C would result in moderate additional impacts to the cumulative impacts previously discussed.

Conclusion: Impacts to water resources associated with Alternative C would be short-term, moderate adverse impacts and long-term, moderate beneficial impacts.

3.4 GEOLOGY AND SOILS

Introduction. According to NPS *Management Policies 2006*, NPS will preserve and protect geologic resources as integral components of park natural systems. NPS will (1) assess the impacts of natural processes and human activities on geologic resources; (2) maintain and restore the integrity of existing geologic resources; (3) integrate geologic resource management into service operations and planning; and (4) interpret geologic resources for park visitors. These policies also state that NPS will strive to understand and preserve the soil resources of park units and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources (NPS 2006; sec 4.8.2).

The Preserve lies within the Flatwoods and Lower Coastal Plain geographic areas of southeast Texas. The topography is nearly level in the southern part to gently rolling in the northern part of the Preserve. The BSC Unit lies mostly in the Lower Coastal Plain with slopes generally from one to three percent, and ranging from 0.5 to 12 percent (NPS 2005).

The youngest and most seaward geologic unit of the Gulf Coastal Plain is the Pleistocene age Beaumont Formation, deposited less than 125,000 years ago. The Beaumont Formation was deposited by deltaic and fluvial (river) processes and consists of predominantly fine-grained deposits. The Beaumont Formation has a reported lithology of roughly 60 percent clay with the remainder composed of silts and sands. This high percentage of clay causes the Beaumont Formation to act as an aquitard (inhibiting the flow of water). Moving northward, the older Pleistocene age formations, deposited between 125,000 to 2,500,000 years ago, are the Montgomery and Bentley Formations (also mapped as Upper and Lower Lissie Formations, respectively). These units consist of clay, silt, and sand with minor amounts of gravel. The thickness of each of these units ranges from 75 to 125 feet. The oldest Pleistocene deposit in the Preserve is the Willis formation. The soils in the Willis Formation are coarser than those in the Montgomery and Bentley Formations; however their lithologies are very similar. The Willis formation underlies both the Big Sandy Creek Unit as well as the Beech Creek Unit (NPS 2005).

Over 60 percent of the soils in the BSC Unit consist of sandier textured soils (NPS 2005). The following six soil types are mapped within the proposed Project area (NRCS 2012a; NRCS 2012b).

- *Dallardsville loamy, very fine sand, 0 to 2 percent slopes*: Soils of the Dallardsville series are very deep, moderately well drained soils with slow permeability. These soils were formed in loamy eolian deposits over fluviomarine deposits and are partially hydric.
- *Doucette loamy fine sand, 1 to 5 percent slopes*: Soils of the Doucette series are deep, well drained, and moderately permeable. These soils formed in sandy and loamy coastal plain sediments, are found on interfluves, and are not considered hydric.

- *Hatliff loam, frequently flooded:* Soils of the Hatliff series are deep, moderately well drained, moderately rapidly permeable soils that formed from alluvial sediments. These soils are partially hydric and found on floodplains.
- *Pinetucky fine sandy loam, 1 to 5 percent slopes*: Soils of the Pinetucky series are deep, moderately well drained, moderately slowly permeable soils that formed in loamy coastal plain sediments of the Pleistocene age. These soils are not hydric and are found on interfluves.
- *Stringtown-Bonwier association, strongly sloping*: Soils of the Stringtown series are deep, well drained, moderately permeable soils that formed in weakly consolidated loamy sediments. Soils of the Bonwier series are deep, well drained, moderately slowly permeable soils on uplands formed in stratified loamy and clayey coastal plain sediments of Pleistocene Age. The Stringtown-Bonwier association is not hydric and is found on interfluves.
- *Woodville fine, sandy loam, 1 to 5 percent slopes*: Soils of the Woodville series are deep, somewhat poorly drained, very slowly permeable soils on uplands that are formed in thick beds of unconsolidated clayey coastal plain sediments of the Miocene Age. These soils are found on interfluves and are not hydric.

Area of Analysis. The area of analysis for geology and soils includes the area of disturbance for the proposed Project (Project footprint).

Methodology and Assumptions. The methodology for assessing impacts on geology and soils is based on county soil maps and reports, similar project impacts, professional judgment and was developed through consultation with NPS staff. The thresholds for this impact assessment are as follows:

Intensity Level Definitions.

Negligible: Alteration to geology and/or soils would be so slight that it would not affect the soils ability to sustain biota, water quality, and hydrology. Geology and soils would be consistent with historical or baseline conditions.

Minor: Alteration to geology and/or soils would not affect its ability to sustain biota, water quality, and hydrology. Slight alterations in geology and soils would be consistent with historical or baseline conditions. Mitigation measures, if needed to offset adverse impacts, would be simple and successful.

Moderate: Alteration to geology and/or soils would affect its ability to sustain biota, water quality, and hydrology. Alterations to geology and soils may occur. Mitigation measures, if needed to offset adverse impacts, could be extensive but would likely be successful.

Major: Alteration to geology and/or soils would have a lasting impact on its ability to sustain biota, water quality, and

hydrology. Alterations to geology and soils would occur. Extensive mitigation measures would be needed to offset any adverse impacts and their success could not be guaranteed.

3.4.1 Impacts of Alternative A (No Action)

Under Alternative A, no long-term solution would be employed at the various stream and wetland crossings within the existing, maintained pipeline easement and the exposed and suspended pipe in Big Sandy Creek would not be lowered. The continued use of heavy equipment to install and maneuver timber mats at stream and wetland crossings increases the opportunity for rutting in the soil to occur. Impacts to the soil and geology of the area would be short-term and negligible to minor, depending on the extent of the rutting.

Cumulative Impacts: Cumulative impacts to soil and geology result from current transpark pipeline and NPS operations, including vehicles and mowing tractors used to maintain the pipeline easement and the use of fire vehicles by NPS. These impacts would be short-term and minor in nature.

Conclusion: Alternative A would result in negligible to minor impacts to soils in the proposed Project area; however, pipeline crews would have to continue to install and maneuver timber mats, creating more opportunities for disturbances to the soil.

3.4.2 Impacts of Alternative B (Open-Cut Method)

Alternative B is the proposed action and consists of two project components; the use of culverts/Geoweb® at wetland crossings and the lowering of the exposed and suspended pipe in Big Sandy Creek via the open-cut method. The impacts on soils associated with each of these Project components are discussed below.

Geoweb®: The installation of Geoweb® would result in short-term, minor adverse impacts to soils during and immediately following installation. Long-term, negligible adverse impacts to soils would also result from vehicle traffic at the wetland crossings.

Culverts: The use of culverts would have long-term, moderate adverse impacts to the soils in the proposed Project area. These impacts would result from the installation of an impermeable culvert into the riverine wetland. A summary of the total volumes of soil disturbance associated with the culvert/Geoweb® installations is provided in Table 4 (Appendix C provides site specific soil disturbance volumes).

Pipeline Lowering via Open-Cut: The use of the open-cut method to lower the exposed and suspended pipe in Big Sandy Creek would result in short-term, moderate adverse impacts to soils and geology. The open-cut method would require the excavation of a 400-foot long, 40-foot wide, and 10 feet deep trench to relay the exposed and suspended pipe under Big Sandy Creek. All excavation (5,000 cy) would occur within the previously disturbed pipeline easement. Following completion of the Project the soils would be back filled into the trench and the trench revegetated. The soils present in the excavation area for the open-cut method are Dallardsville loamy very fine sand, 0 to 2 percent slopes and Hatliff loam, frequently flooded. Both of these soil types have

relatively low liquid limits of 23.9 and 16.2 percent respectively, meaning they also have a low potential for compaction (NRCS 2012).

Due to the previously disturbed nature of the excavation area, as well as the low propensity for soil compaction, the impacts from the open-cut method on soils and geology is expected to be short-term (soil would be replaced following Project completion and the pipeline easement would be revegetated within one growing season), moderate adverse impacts.

Mitigation Measures: Tennessee Gas would minimize impacts to soils and geology from Alternative B by the use of BMPs (including bank stabilization measures such as the application of jute or curlex), adherence to FERC Plan and Procedures, the SPCC Plan, and a Project design that ensures adequate restoration following the completion of Project activities.

Cumulative Impacts: Cumulative impacts to soils in the area are the same as those described in Alternative A. Additional cumulative impacts from the proposed alternative would be moderate.

Conclusion: Impacts to soils resulting from the installation of the culverts/Geoweb and pipeline lowering via the open-cut method would range from short to long-term and minor to moderate.

3.4.3 Impacts of Alternative C (HDD Method)

Alternative C is similar to Alternative B in that it would involve the same use of culverts/Geoweb® at wetland crossings, but in lieu of lowering the exposed and suspended pipe via the open-cut method, Alternative C proposes the use of a HDD to lower the pipeline.

Culverts/Geoweb®: Impacts from culverts/Geoweb® under Alternative C would be the same as Alternative B.

Pipeline Lowering via HDD: The use of a HDD to lower the exposed and suspended pipe would result in slightly less ground disturbance than the use of the open-cut method, but would still incur short-term, moderate adverse impacts to soils and geology in the area. Because the existing pipe would still have to be removed prior to drilling in the new pipe, Alternative C would still require approximately 150 feet of soil excavation along the pipeline easement. Additionally, the HDD equipment would have to be located outside of the pipeline easement due to the bend the in pipe and for safety purposes and would, thus, result in additional minor disturbance of the soil surface outside of the existing pipeline easement.

Due to the previously disturbed nature of the excavation area (2,000 CY), the minor soil surface disturbances associated with the placement of the drilling equipment (200 CY), as well as the disturbances associated with the stream bank restoration (300 CY), the impacts associated with the HDD method are expected to be similar to those of the open-cut method in that they would be short-term, moderate adverse impacts to soils and geology.

Mitigation Measures: Mitigation measures implemented to minimize impacts to soils and geology from activities associated with Alternative C would be the same as discussed for Alternative B.

Cumulative Impacts: Cumulative impacts would be the same as those discussed for Alternative B.

Conclusion: Alternative B and C would result in the similar short-term, moderate, adverse impacts to soil resources in the area, as compared to the no action alternative.

3.5 VEGETATION

Introduction. Vegetation is a fundamental component of the biological diversity of the Preserve. Roughly 1,300 species of trees, shrubs, forbs, and grasses have been documented growing in the Preserve (Harcombe 2007). A variety of environmental factors including geography, climate, and soil composition contribute to the botanical diversity of the Preserve. The Preserve lies at an ecotone between forests to the east and prairies to the west. Moderated by warm Gulf breezes, the climate of the region is sub-tropical with relatively high levels of rainfall that are evenly distributed throughout the year. Just a short distance west, rainfall begins to drop off quickly, and this sudden transition partly explains why the Big Thicket is the farthest western extent of many eastern plant species. Soil conditions ranging from relatively impermeable clays to coarse sands also contribute substantially to the floristic diversity of the Preserve.

Vegetation alliances as assessed by PBS&J (2003) that occur within the Project footprint are the *Quercus (laurifolia, phellos)* Seasonally Flooded Forest Alliance to the west, *Pinus taeda-Quercus (alba, falcate, stellata)* Forest Alliance to the east, and *Paspalum notatum* Herbaceous Alliance within the maintained easement.

Vegetation documented during site assessments for the proposed Project conducted on July 20-21 and November 22, 2011 consisted of upland and wetland herbaceous species with some shrubs present in the uplands, as well as deciduous forested areas (Wetland Delineation Report provided in Appendix F). The dominant herbaceous upland species present include bermudagrass (*Cynodon dactylon*), dallisgrass (*Paspalum dilatatum*), bahiagrass (*Paspalum notatum*), Johnson grass (*Sorghum halepense*), Indian woodoats (*Chasmanthium latifolium*), slender aster (*Eurybia comacta*), poison ivy (*Toxicdendron radicans*), and fall panicgrass (*Panicum dichotomiflorum*). Dominant upland tree/shrub species include American beautyberry (*Callicarpa americana*), yaupon holly (*Ilex vomitoria*), loblolly pine (*Pinus taeda*), southern dewberry (*Rubus trivialis*), sawtooth blackberry (*Rubus argutus*), and blackjack oak (*Quercus marilandica*).

The dominant herbaceous wetland species present in the proposed Project area are swamp smartweed (*Polygonum hyddropiperoides*), cypress swamp sedge (*carex joorii*), soft rush (*Juncus effuses*), lizard's tail (*Saururus cernuus*), climbing hempvine (*Mikania scandens*), shortbristle horned beaksedge (*Rhynchospora corniculata*), sweetscent (*Pluchea odorata*), anglestem beaksedge (*Rhynchospora caduca*), sand spikerush (*Eleocharis montevidensis*), ovate false fiddleleaf (*Hydrolea ovata*), savannah panicgrass (*Phanopyrum gymnocarpon*), floating primrose-willow (*Ludwigia peploides*) and common buttonbush (*Cephalanthus occidentalis*).

Area of Analysis. The area of analysis for vegetation includes the area in the immediate vicinity of the proposed Project.

Methodology and Assumptions. The methodology used for assessing impacts to vegetation communities included survey identification of the communities in the Project area, the review of existing literature and studies, information provided by Preserve staff, and professional judgment to determine the potential effects from pipeline replacement activities on the structure, composition, or distribution of plant communities. In addition, this analysis considers the changes in vegetation communities that could occur after restoration is completed. The thresholds for this impact assessment are as follows:

Intensity Level Definitions.

Negligible: Operations would not cause discernible alteration to vegetation structure, composition, abundance, and diversity.

Minor: Operations would cause limited alteration to vegetation structure, composition, abundance, and diversity. Mitigation measures, if needed to offset adverse effects, would be simple and successful. Revegetation is readily achievable through natural successional and seeding processes.

Moderate: Operations would cause alteration to vegetation structure, composition, abundance, and diversity. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful. Revegetation is achievable but likely requires additional resources to accomplish goals.

Major: Operations would cause substantial alteration to vegetation composition, abundance, and diversity. Extensive mitigation measures would be needed to offset any adverse effects, and their success would not be guaranteed. Revegetation may not be attainable even with substantial efforts.

3.5.1 Impacts of Alternative A (No Action)

Under Alternative A, no long-term solution would be employed at the various stream and wetland crossings within the existing maintained pipeline easement and the exposed and suspended pipe in Big Sandy Creek would not be lowered. The continued use of heavy equipment to install and maneuver timber mats would increase the opportunity for rutting and flattening of vegetation to occur. These impacts would be short-term and minor.

The effects of inaction on the exposed and suspended pipe would be the continued scouring and alteration to the processes, including flow, of Big Sandy Creek. Over time, these impacts could result in loss of bank vegetation. Furthermore, if the pipe continues

to be suspended, it would be a potential safety hazard that could result in a catastrophic incident impacting vegetation in the area.

Cumulative Impacts: Cumulative impacts to vegetation in the area are moderate and result from vehicle traffic, mowing, prescribed burning, and drought. Alternative A would result in minor additional impacts to the existing cumulative impacts.

Conclusion: Under Alternative A, the continued use of timber mats at wetland and stream crossings would result in short-term, minor impacts in addition to the moderate cumulative impacts.

3.5.2 Impacts of Alternative B (Open-Cut Method)

Alternative B is the proposed action and consists of two Project components; the use of culverts/Geoweb® at wetland crossings and the lowering of the exposed and suspended pipe via the open-cut method. The impacts associated with each of these Project components are discussed below. A summary of vegetation disturbance acreages associated with each Project component is provided in Table 4. Additional site specific disturbance acreages are provided in Appendices A, C, and E.

Geoweb®: The utilization of Geoweb® would result in short-term minor impacts to vegetation. These impacts would be caused by the installation of the Geoweb®; however, the area would be expected to be fully revegetated within three years. The current vegetation type at the proposed crossings is entirely herbaceous, so there would be no change in vegetative composition.

Culverts: The installation of culverts would result in long-term, moderate impacts due to the change in vegetative composition around the culverts. The vegetation at these crossings would change from its current composition of a mix of wetland and upland vegetation to predominantly upland vegetation.

Pipeline Lowering via Open-Cut: The use of the open-cut method to lower the exposed and suspended pipe in Big Sandy Creek would result in long-term, minor adverse impacts to vegetation (Appendix A). The majority of vegetation that would be cleared would be herbaceous vegetation that is regularly maintained within the existing pipeline easement (0.38 acre). However, minor amounts of tree clearing (0.23 acre), including species such as water oak (*Quercus laurifolia*), loblolly pine (*Pinus taeda*), and sweet gum (*Liquidambar styraciflua*), would be required along the periphery of the easement to maintain a safe trench with 15% side slopes and the installation of sheet piling for additional trench wall stabilization. The cleared herbaceous vegetation would be restored within one growing season; however the trees would not return within three years of completion of the Project, making the impacts to vegetation long-term.

Mitigation Measures: Impacts to vegetation would be minimized by adherence to the FERC Plan and Procedures including topsoil segregation in wetlands and re-seeding disturbed upland areas. Invasive species control such as wash stations prior to entry to the Preserve and use of weed free hay bale structures would also be implemented to help prevent invasive species from establishing in disturbed areas.

Cumulative Impacts: Cumulative impacts on vegetation are the same as were discussed for Alternative A. Additional impacts from the proposed alternative actions would be minor.

Conclusion: Impacts from the use of the Geoweb® would be short-term and minor, as vegetation would be re-established within three years of installation and would not result in a change in composition. However, there would be moderate impacts to vegetation from the installation of the culverts because there would be a change in vegetative composition from a mix of upland and wetland vegetation to predominantly upland vegetation types. Additionally, there would be minor, long-term adverse impacts from lowering the exposed and suspended pipe via the open-cut method.

3.5.3 4.4.3 Impacts of Alternative C (HDD Method)

Alternative C is similar to Alternative B in that it would involve the same use of culverts/Geoweb® at wetland crossings, but in lieu of lowering the exposed and suspended pipe via the open-cut method, Alternative C proposes the use of a HDD to lower the pipeline. The impacts associated with each of these Project components are discussed below.

Culverts/Geoweb®: Impacts on vegetation resulting from the installation of culverts/Geoweb® would be the same as described for Alternative B.

Pipeline Lowering via HDD: The use of a HDD to lower the exposed and suspended pipe would result in long-term, moderate adverse impacts to vegetation in the Project area. Not only would the lowering require vegetation clearing within the pipeline easement as in Alternative B (0.38 acre), it would also require 1.07 acres of tree clearing (including species such as water oak, loblolly pine, and sweet gum) outside the existing easement for placement of drilling equipment (Appendix E). Therefore, impacts to vegetation from the use of a HDD would be long-term and moderate.

Mitigation Measures: Mitigation measures to minimize impacts from activities associated with Alternative C would be the same as was discussed for Alternative B; however, more extensive invasive species control would be required in areas where tree clearing occurs to prevent the establishment of Chinese tallow (*Triadica sebifera*).

Cumulative Impacts: Cumulative impacts on vegetation would be the same as described for Alternative B, with additional impacts from Alternative C being moderate.

Conclusion: The impacts to vegetation under Alternative C would be greater than the other two alternatives because the installation of the pipe through use of the HDD would require 365 percent more tree clearing than Alternative B.

3.6 SOUNDSCAPES

Introduction. Part of the Preserve's resources includes the sounds associated with its natural environment, often referred to as "natural sounds" or "natural quiet". Natural quiet generally includes the naturally occurring sounds of winds aloft in the trees, calling birds, as well as the quiet associated with still nights (NPS 2005). According to NPS *Management Policies 2006*, park natural soundscape resources encompass all of the natural sounds that occur in parks, including the physical capacity for transmitting those

natural sounds and the interrelationships among park natural sounds of different frequencies and volumes. NPS will preserve, to the greatest extent possible, the natural soundscapes of parks. The NPS will also restore degraded soundscapes to the natural condition wherever possible, and will protect natural soundscapes from degradation from inappropriate noise.

"Noise" can be defined as unwanted sound, and noise levels are most commonly expressed in decibels (dB). Unless otherwise stated, most noise levels, especially for environmental noise measurements are rated using the A-weighting network (dBA). The A-scale provides meter readings that are correlated with human sensitivity to noise at sound pressure levels (SPL) below 70 dB (Cowan 1993). Sources of noise within the Preserve and surrounding areas include automobiles, boat motors, motorcycles, all-terrain vehicles, various types of equipment (e.g., tractors, log skidders, chainsaws, lawn mowers, etc), powerlines and transformers, and firearms. Single automobiles produce noise levels in the range of 70 dBA near the vehicle, while moderately heavy traffic may produce noise levels in the range of 85-90 dBA near the roadway (NPS 2005).

Inappropriate sound can be particularly harmful to fish and wildlife by interfering with sounds necessary for animal communication, including territory establishment and defense, courtship, predation, predator avoidance, migration, and foraging. The impact of noise masking important sounds for wildlife extends to the listening area for that individual. The listening area is the area in which an organism can hear sounds. Increased ambient sounds decrease a particular organism's listening area and can result in avoidance mechanisms, abnormal behavior, increased stress levels, or movement to a less desirable habitat.

Noise can also negatively impact visitor experience by disrupting a visitor's ability to enjoy the expected tranquility, serenity, and solitude that comes from a completely natural or historic environment.

Area of Analysis. The area of analysis for soundscapes is all area within 2,000 feet of Project activities.

Methodology and Assumptions. The methodology for assessing impacts on soundscapes is based on similar project impacts, professional judgment and was developed through consultation with NPS staff. The thresholds for this impact assessment are as follows:

Intensity Level Definitions.

Negligible: Operations would not cause discernible alteration to the natural soundscape in the area.

Minor: Operations would cause limited alteration to the natural soundscape. Mitigation measures, if needed to offset adverse effects, would be simple and successful. No long-term or permanent additions to the natural soundscape would occur and all impacts would cease following the completion of Project activities.

Moderate: Operations would cause alteration to the natural soundscape from prolonged noise making activities. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful. Impacts would not be permanent and would cease following completion of Project activities.

Major: Operations would cause substantial alteration to the natural soundscape. Impacts to the natural soundscape would be long-term or permanent and extensive mitigation measures would be needed to offset any adverse effects, and their success would not be guaranteed.

3.6.1 Impacts of Alternative A (No Action)

Under Alternative A no long-term solution would be employed for stream and wetland crossings by pipeline maintenance crews. As such, crews would continue to use timber mats at all crossings which require heavy equipment including semi-trucks and a small crane. Because of the infrequency and short duration of these maintenance activities, impacts to the soundscape, even with the use of large equipment, is negligible. Also under Alternative A, the exposed and suspended pipe in Big Sandy Creek would remain. Because the existing conditions do not create additional sounds to the area, there would be no impact on soundscapes from the continued exposure and suspension of the pipe in Big Sandy Creek.

Cumulative Impacts: The existing natural soundscape in the area of analysis is relatively quiet with little to no anthropogenic sounds. The area is several miles from any major roads and the majority of anthropogenic sounds are from visitors, the occasional aircraft and prescribed burning. Cumulative impacts to the soundscape are minor. Alternative A would result in negligible additional impacts to the existing soundscape.

Conclusion: Impacts to the soundscape from Alternative A would be negligible as the existing soundscape would not be altered by inaction.

3.6.2 Impacts of Alternative B (Open-Cut Method)

Alternative B is the proposed action and consists of two Project components; the use of culverts/Geoweb® at wetland crossings and the lowering of the exposed and suspended pipeline via the open-cut method. The impacts associated with each of these Project components are discussed below.

Culverts/Geoweb®: Impacts to the natural soundscape from the installation of the culverts/Geoweb® would be short-term, minor adverse impacts that would occur only during construction activities. Noise producing equipment would include a backhoe, side boom, and trucks for loading materials. Immediately following the completion of Project activities, the natural soundscape would be restored. Additionally, all work would be conducted during daylight hours and would not impact nocturnal species that rely on sound to hunt.

Pipeline Lowering via Open-Cut: Impacts associated with the open-cut method for the pipeline lowering would be similar to those discussed for the culvert/Geoweb® component of the Project in that they would occur only during construction activities and cease immediately following completion of the Project. Noise producing equipment associated with the open-cut method include, a backhoe, a side boom, four trucks, a bull dozer, a flatbed truck, two pumps, and a generator. As with the culvert/Geoweb® component, all construction activities associated with the open-cut method would occur during daylight hours, and would have no impact on nocturnal species that rely on sound to hunt. The open-cut method would result in short-term, minor adverse impacts to the natural soundscape in the area of analysis.

Mitigation Measures: There are no mitigation measures that can be effectively implemented to minimize effects from Alternative B on the natural soundscape.

Cumulative Impacts: Cumulative impacts would be the same as discussed for Alternative A. Alternative B would result in minor additional impacts to the existing soundscape.

Conclusion: Impacts from Alternative B to the natural soundscape of the area would be short-term, minor adverse impacts, which would cease immediately following the completion of construction activities. Additionally, all activities would occur during day light hours, having no effect on noise-sensitive nocturnal species.

3.6.3 Impacts of Alternative C (HDD Method)

Alternative C is similar to Alternative B in that it would involve the same use of culverts/Geoweb® at wetland crossings, but in lieu of lowering the exposed and suspended pipe via the open-cut method, Alternative C proposes the use of a HDD to lower the pipeline. The impacts associated with each of these Project components are discussed below.

Culverts/Geoweb®: Impacts to the natural soundscape associated with the culvert/Geoweb® component of the Project would be the same as was discussed for Alternative B.

Pipeline Lowering via HDD: Impacts to the natural soundscape for the pipeline lowering component of the Project via the use of a HDD would result in short-term, moderate adverse impacts in the area of analysis. Similar to impacts associated with Alternative B, general construction activities such as pipe removal and bank restoration would result in impacts to the natural soundscape. However, the use of a HDD requires 60-80 percent more equipment than the open-cut method (including an additional generator, drilling rig, trailer, mixing tank, and three frac tanks). Additionally, the use of the HDD to drill the pilot hole would be continuous (24 hours a day) until the hole is completed (approximately seven days). During this time, noise-sensitive nocturnal species would likely be temporarily displaced from the area until this portion of the Project is complete.

Mitigation Measures: No mitigation measures have been identified that can be effectively implemented to minimize effects from Alternative C on the natural soundscape.

Cumulative Impacts: Cumulative impacts would be the same as discussed for Alternative A. Alternative C would result in moderate additional impacts to the existing soundscape.

Conclusion: Impacts from Alternative C to the natural soundscape of the area would be short-term, moderate adverse impacts that would cease following the completion of the Project. The use of the HDD would require continuous drilling for approximately seven days that may impact noise-sensitive nocturnal species in the area.

3.7 FISH AND WILDLIFE

Introduction. Following *NPS Management Policies 2006*, the NPS will maintain as parts of the natural ecosystems of parks all plants and animals native to park ecosystems by preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur; restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions; and minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them (NPS 2006; sec 4.4.1).

The Endangered Species Act of 1973 (16 USC § 1531-1544) requires examination of impacts on all federally-listed threatened, endangered, and candidate species. Section 7 of the Endangered Species Act requires all federal agencies to consult with the U.S. Fish and Wildlife Service (FWS) (or designated representative) to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitats. The NPS is also required to inventory, monitor, and manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible. Furthermore, the NPS is required to inventory other native species that are of special management concern to parks (such as rare, declining, sensitive, or unique species and their habitats) and manage them to maintain their natural distribution and abundance (NPS 2006; sec 4.4.2.3).

Protection under the Migratory Bird Treaty Act of 1918 (16 USC § 703-712, plus amendments) makes it unlawful without a license to pursue, hunt, kill, capture, possess, buy, sell, purchase, or barter any migratory bird, including the feathers or other parts, active nests, eggs, or migratory bird products. In addition, this act serves to protect environmental conditions for migratory birds from pollution or other ecosystem degradations.

The Preserve is host to an abundance of fish and wildlife species. The diversity of species present in the Preserve is a testament to the quality and variety of habitat the Preserve offers. At least 67 mammal species, 306 bird species, 92 reptile and amphibian species, and 92 fish species have been observed within the Preserve.

Common mammal species that occur in the Preserve are raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), white-tailed deer (*Odocoileus virginianus*), swamp rabbit (*Sylvilagus*

aquaticus), southern flying squirrel (*Glacomys volans*), red bat (*Lasiurus borealis*), and nine-banded armadillo (*Dasypus noverncinctus*).

Bird species present within the Preserve vary depending on the time of year and the migratory status of the species. Some species that are commonly seen throughout the Preserve at least some part of the year include great horned owl (*Bubo virginianus*), pileated woodpecker (*Dryocopus pileatus*), wood duck (*Aix sponsa*), tufted titmouse (*Baeolophus biocolor*), eastern meadowlark (*Sturnella magna*), belted kingfisher (*Megaceryle alcyon*), red-winged blackbird (*Agelaius phoeniceus*), and red-shouldered hawk (*Buteo lineatus*).

There have been few studies on the herpetofauna (amphibians and reptiles) present within the Preserve. Some species that are commonly seen include dwarf salamander (*Eurycea quadridigitata*), northern cricket frog (*Acris crepitans*), Gulf Coast toad (*Bufo valliceps*), common snapping turtle (*Chelydra serpentina*), Mississippi mud turtle (*Kinosternon subrubrum*), green anole (*Anolis carolinensis*), five-lined skink (*Eurneces fasciatus*), Texas rat snake (*Elaphe obsoleta lindheimeri*), eastern hognose snake (*Heterodon platirhinos*), and southern cottonmouth (*Agkistrodon piscivorous*).

The species of fish inhabiting a body of water is greatly dependent on the water quality, flow rate, riffle rate, vegetation, and substrate. Big Sandy Creek is a relatively small stream that provides habitat to a variety of smaller fish species. Some of the species that have been documented in Big Sandy Creek include pirate perch (*Aphredoderus sayanus*), southern brook lamprey (*Ichthyomyzon gagei*), dusky darter (*Percina sciera*), bullhead minnow (*Pimpephales vigilax*), spotted bass (*Micropterus punctulatus*), longear sunfish (*Lepomis megalotis*), and blacktail shiner (*Cyprinella vinusta*) (Moring 2003).

In addition to the more common species listed above, the Preserve also provides habitat for both federally and state listed threatened and endangered species (Appendix G). Federally listed species that are known to occur in the Preserve are the wood stork (*Mycteria americana*), as a transient speices, and Texas trailing phlox (*Phlox nivalis texensis*). Other federally listed species such as the piping plover (*Charadrius melodus*), brown pelican (*Pelecanus occidentalis*), Louisiana black bear (*Ursus americanus leuteolus*), Louisiana pine snake (*Pituophis ruthveni*), and red-cockaded woodpecker (*Picoides borealis*) are known to occur in the area but have not been documented in the Preserve. A population of Texas trailing phlox occurs in the vicinity of the Project area (over 800 feet from the project footprint), but will not be impacted by the proposed action. There are 18 state listed species known to occur in the Preserve. These species include six species of mussel, Texas horned lizard (*Phrynosoma cornutum*), alligator snapping turtle (*Macrochelys temminckii*), timber rattlesnake (*Crotalus horridus atricaudatus*), northern scarlet snake (*Cemophora coccinea copei*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), paddlefish (*Polyodon spathula*), creek chubsucker (*Erimyzon oblongus*), blue sucker (*Cycleptus elongates*), white-faced ibis (*Plegadis chihi*), American peregrine falcon (*Falco peregrines anatum*), swallow-tailed kite (*Elanoides forficatus*), and Bachman's sparrow (*Aimophila aestivalis*).

Area of Analysis. Impacts to fish and wildlife are a combination of impacts to water resources, vegetation, soundscapes, and lightscapes; therefore, the area of analysis is the greatest extent to which these four impact areas reach. In this case the area of analysis would be 2,000 feet from the Project (soundscape) and 500 feet upstream and 100 feet downstream (water resources).

Methodology and Assumptions. The methodology used for assessing impacts to fish and wildlife included identification of the species in the Project area, the review of existing literature and studies, information provided by Preserve staff, and professional judgment to determine the potential effects from pipeline replacement activities on the species or their habitat. The thresholds for this impact assessment are as follows:

Intensity Level Definitions.

Negligible: Operations would not cause discernible alteration to fish and wildlife species population dynamics, size or individual fitness.

Minor: Operations would cause limited impacts to fish and wildlife species and would not affect species on a population level. Mitigation measures, if needed to offset adverse impacts, would be simple and successful.

Moderate: Operations would cause alteration to fish and wildlife species on a population level temporarily. Mitigation measures, if needed, could be extensive, but would likely be successful.

Major: Operations would cause significant alteration to fish and wildlife species on a population level. Extensive mitigation measures would be needed to offset any adverse effects, and their success would not be guaranteed.

3.7.1 Impacts of Alternative A (No Action)

Under Alternative A the proposed Project would not occur and there would be no long-term solution to streams and wetlands periodically crossed by pipeline crews for maintenance activities. Therefore, pipeline crews would continue to use timber mats at these crossings, which require the use of heavy equipment and prolong their presence in the Preserve. Despite the increased presence of disturbances during maintenance activities, the infrequency of disturbance for maintenance, coupled with the relatively short duration of the activities when they do occur, impacts to fish and wildlife would be negligible.

Also under Alternative A, the exposed and suspended pipe in Big Sandy Creek would remain exposed and suspended. This could have potential minor to moderate impacts on fish and wildlife depending on the extent to which the pipe continues to be suspended in the stream. The pipe's presence in the stream has caused changes in the stream flow and other natural processes that fish and wildlife species may rely on. Furthermore, if the pipe continues to become suspended, it would be a potential safety

hazard that could result in a catastrophic incident impacting fish and wildlife as well as their habitat.

Cumulative Impacts: Cumulative impacts to fish and wildlife in the area of analysis include hunting and fishing, prescribed burning, water quality, and hurricanes. Alternative A would cause additional minor to moderate impacts to fish and wildlife species.

Conclusion: the existing conditions in the Project area would remain the same under Alternative A. For the stream and wetland crossings, this would only result in short-term negligible adverse impacts to fish and wildlife. However, if the existing conditions were maintained for the exposed and suspended pipe in Big Sandy Creek, there would be the potential for minor to moderate adverse impacts to fish and wildlife. The exposed and suspended pipe is already causing minor impacts to fish species by altering stream flow and other natural processes of the stream. The continued suspension of the pipe could increase these potential impacts from minor to moderate should a catastrophic incident occur.

3.7.2 Impacts of Alternative B (Open-Cut Method)

Alternative B is the proposed action and consists of two Project components; the use of culverts/Geoweb® at wetland crossings and the lowering of the exposed and suspended pipe via the open-cut method. The impacts associated with each of these Project components are discussed below.

Culverts/Geoweb®: The installation of culverts/Geoweb® at wetland crossings would cause short-term, minor adverse impacts to fish and wildlife resulting from the construction noise and presence in the area. There is a possibility that during excavation less mobile species including small mammals, reptiles, and amphibians may be taken. However, due to the relatively small amount of excavation required, these impacts would not significantly impact wildlife populations at the local scale.

Pipeline Lowering via Open-Cut: Impacts from the pipeline lowering via the open-cut method would be short-term, moderate adverse impacts. While construction activities and small amounts of vegetation clearing would have minor impacts on fish and wildlife in the area, the temporary stream diversion would result in moderate impacts, especially to fish.

Mitigation Measures: Mitigation measures would be implemented to minimize the effect Alternative B would have on fish and wildlife in the area, primarily from the temporary stream diversion. During in-stream activities, while water is being diverted around the trench, a minimum of two biological monitors would be present 24-hours a day until natural flow is restored to the stream. Furthermore, Tennessee Gas would abide by NPS's strict no-kill policy for any fish or wildlife encountered during the Project.

Cumulative Impacts: Cumulative impacts would be the same as discussed for Alternative A. Alternative B would cause additional minor impacts to fish and wildlife.

Conclusion: Overall, Alternative B would result in short-term, moderate adverse impacts to fish and wildlife from a combination of impacts from construction of the

culverts/Geoweb and the temporary diversion of Big Sandy Creek that would be required if the open-cut method was used to lower the exposed and suspended pipe.

3.7.3 Impacts of Alternative C (HDD Method)

Alternative C is similar to Alternative B in that it would involve the same use of culverts/Geoweb® at wetland crossings, but in lieu of lowering the exposed and suspended pipe via the open-cut method, Alternative C proposes the use of a HDD to lower the pipeline. The impacts associated with each of these Project components are discussed below.

Culverts/Geoweb®: Impacts to fish and wildlife resulting from the installation of culverts/Geoweb® would be the same as discussed for Alternative B.

Pipeline Lowering via HDD: Similarly to Alternative B, lowering the exposed and suspended pipe in Big Sandy Creek using the HDD method would result in short-term, moderate adverse impacts to fish and wildlife in the area; however, the cause of these impacts would differ. Impacts to fish and wildlife from using the HDD would primarily be from noise during 24-hour drilling operations and the amount of tree clearing that would be necessary to accommodate the drilling equipment. The noise from drilling would temporarily disrupt and likely displace wildlife species in the area, and could have adverse impacts on noise sensitive species' ability to hunt and/or avoid predation. Additionally, the 1.07 acres of tree clearing would reduce available habitat for a wide range of species that rely on, or otherwise utilize, mature growth trees.

Mitigation Measures: Mitigation measures implemented to minimize impacts from Alternative C would be the same as was discussed for Alternative B.

Cumulative Impacts: Cumulative impacts to fish and wildlife in the area are the same as was discussed in Alternative A. Alternative C would result in minor contributions to the cumulative impacts.

Conclusion: Alternative C would result in short-term, moderate adverse impacts to fish and wildlife. Impacts would primarily result from continuous noise during drilling activities and the clearing of trees to accommodate the drilling equipment.

4.0 CONSULTATION AND COORDINATION

4.1 INTERNAL SCOPING

Internal scoping was conducted by an interdisciplinary team comprised of NPS Big Thicket National Preserve biologists and the private contractor working with NPS to generate this EA. Interdisciplinary team members met via conference call on October 14, 2011 and again on April 18, 2012 to discuss the following:

- Purpose, need, and objectives for the Project;
- Various alternatives;
- Potential environmental impacts;
- Past, present, and reasonably foreseeable future projects that may have cumulative effects; and
- Possible mitigation measures.

4.2 EXTERNAL SCOPING

External scoping was conducted to inform applicable agencies and the public about the proposal to allow Tennessee Gas to install culverts/Geoweb® in the BSC Unit of the Preserve. This effort was initiated with the distribution of the October 28, 2011 scoping brochure, which provided information about Tennessee Gas's Right-of-Way Improvement and Pipeline Lowering Project. With this scoping brochure, the public was given a 30-day period to comment on the Project, ending November 28, 2011. An amended scoping brochure for the Project was distributed on March 27, 2012 with a 30-day comment period ending April 27, 2012.

The following agencies or government groups were sent scoping information or were contacted for information regarding the Project:

Federal Agencies – U.S. Fish and Wildlife Service (USFWS) Clear Lake Ecological Services Field Office; U.S. Army Corps of Engineers (USACE) Galveston District

U.S. Congressional Delegation – Senator Kay Bailey Hutchison, Senator John Cornyn, and Congressman Kevin Brady

State Agencies – Railroad Commission of Texas, Oil and Gas Division District 3; Texas Historical Commission; Texas Parks and Wildlife Department, Wildlife Division

Affiliated Native American Groups – The Alabama-Coushatta Tribe of Texas

Organizations - Big Thicket Association; Sierra Club Lone Star Chapter and Houston Regional Group (Sierra Club); and Texas Conservation Alliance

During the 30-day scoping period, one letter was received in response to the proposed Project.

The Sierra Club had several comments regarding the installation of culverts/Geoweb® at the proposed stream and wetland crossings. The Sierra Club requested that additional information about the Geoweb® be provided and that future scoping notices provide sufficient information about the proposed techniques. They also recommend the implementation of a monitoring program for the Project to ensure Tennessee Gas's compliance and diligence in the protection of soils and water from construction activities. The Sierra Club also requires that NPS address implementation of the court ruling in favor of the Sierra Club regarding the assessment of

impacts and the methodology used, from impairment and NEPA perspectives, which were deemed "inadequate, arbitrary, and capricious". Finally, the Sierra Club suggested that NPS provide for mitigation for greenhouse gas emissions in the EA. They also request the development of a Climate Change Ecological Resilience and Resistance Plan (CCERRP) to be included in the EA.

The Sierra Club requests for further information about culvert installation, the Geoweb material, and project monitoring have been addressed in this document. This document does not discuss the Sierra Club's views on past impact determinations and NEPA analysis. Air quality and climate change are discussed in section 1.6.1 *Impact Topics Dismissed from Further Analysis.*

4.3 AGENCY CONSULTATION

In accordance with the Endangered Species Act, the NPS sent a letter on 07/02/2012 to the U.S. Fish and Wildlife Service indicating a determination of no effect to listed species. The U.S. Fish and Wildlife Service Clear Lake office does not issue concurrence letters in response to no effect determinations. The NPS acquired the state listed rare, threatened, and endangered species list from the Texas Parks and Wildlife Department webpage at http://www.tpwd.state.tx.us.

Tennessee Gas retained Moore Archaeological Consulting, Inc. (MAC) to conduct cultural resources investigations of the general area, including the proposed Project area. This survey was conducted on January 23-27, March 21, and April 2-6, 2012 to comply with Section 106 of the National Historic Preservation Act (NHPA) and as required by NPS. Results of the cultural resources investigation concluded that no cultural resources are located within the proposed Project footprint and that *No Properties are Adversely Affected.* During surveys, five cultural sites were identified and delineated within the existing ROW; however, none of these sites occurred within the Project footprint. A report of the archaeological and cultural resources investigation was prepared and submitted to the Texas Historical Commission (THC) on 07/02/2012. A response from THC is anticipated within 30 days of submittal.

4.3.1 Permits and Approvals

In addition to NPS, several federal and state regulatory agencies have permitting, approval authority, or consultation requirements for the proposed Project. A summary of the permits and authorizations required for the proposed Project are listed in Table. All approvals and permit requirements listed in Table must be met before the NPS will make a decision regarding Tennessee Gas's Special Use permit application.

Table 7. Summary of Permits, Approvals, and Regulatory Requirements for the Proposed Project

Permit/Approval/Consultations	Agency	Agency Status
Section 7 Endangered Species Act	U.S. Fish and Wildlife Service (FWS), Texas Clear Lake Field Office	NPS determined there will be "no effect" on listed species for this Project. FWS Clear Lake does not consult on "no effect" determinations. However, NPS contacted FWS via letter on July 2, 2012 to notify FWS of the NPS "no effect" determination.
Section 106, National Historic Preservation Act (NHPA)	Texas Historical Commission (THC)	A letter dated July 2, 2012 was sent to the THC seeking concurrence with the NPS determination of "no historic

Permit/Approval/Consultations	Agency	Agency Status
		properties affected."
Section 404 Permits	U.S. Army Corp of Engineers (USACE Texas Galveston Office)	Application filed June 5, 2012. Consultations are on-going.
Special Use Permit	National Park Service (NPS)	The EA was released on July 18, 2012. Tennessee Gas will submit a special use permit application to NPS based on mitigation developed during the EA process and NPS will not issue the SUP without all other federal permits in place.
Threatened, Endangered, and Special Concern Species Consultation	Texas Parks and Wildlife Department (TPWD)	Consultation with TPWD was completed by Tennessee Gas and NPS to determine state species of concern (including threatened and endangered) occurrences within the Project area, and the potential effect(s) of the proposed Project on state-listed species of concern.

4.4 NATIVE AMERICAN CONSULTATION

The NPS requested the presence of the Alabama-Coushatta Tribe of Texas Tribal Historical Preservation Officer (THPO) at an internal scoping site visit on October 20, 2011. The THPO requested a shovel test be performed prior to any ground disturbance. A copy of the cultural resources survey described above was sent in a letter to the THPO on 07/19/2012.

4.5 LIST OF RECIPIENTS AND PUBLIC REVIEW

The EA will be released for public review on July 2, 2012. To inform the public of the availability of the EA, NPS will publish and distribute a letter or press release to various agencies, tribes, and members of the public on the Preserve's mailing list. Copies of the EA will be provided to interested individuals, upon request. Copies of the document will also be available on the NPS website "Planning, Environment, and Public Comment" at http://parkplanning.nps.gov/bith.

The EA is subject to a 30-day public comment period ending August 2, 2012. During this time, the public is encouraged to submit their written comments to the NPS address provided at the beginning of this document. Following the close of the comment period, all public comments will be reviewed and analyzed, prior to the release of a decision document. NPS will issue responses to substantive comments received during the public comment period, and will make appropriate changes to the EA, as needed.

The following list of recipients will receive a copy of the EA:

Tribal Government

Alabama-Coushatta Tribe of Texas

Oil & Gas Department

Tribal Administrator

Historical Preservation

Federal Government

US Congressman Kevin Brady, 8th Congressional District

Senator John Cornyn, Texas

Senator Kay Hutchison, Texas

State Government

Guy Grossman, Oil and Gas Director, Railroad Commission of Texas, District 3, Houston, TX

Amy Turner, Texas Parks and Wildlife Department, Wildlife Division, Victoria, TX

Oil and Gas Industry and Consultants

, Tennessee Gas Pipeline Company, LLC, Houston, TX

Organizations and Businesses

Brandt Mannchen, Chair, Big Thicket Committee, Lone Star Chapter of the Sierra Club, Houston, TX

Mary Catherine Johnston, President, Big Thicket Association, Sour Lake, TX

Janice Bezanson, Executive Director, Texas Conservation Alliance, Tyler, TX

Kevin Cronin, Cronin Appraisal Services, Beaumont, TX

4.6 LIST OF PREPARERS

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National Park Service, Big Thicket National Preserve, Kountze, Texas

- Stephanie Burgess, Preserve Biologist, Oil and Gas Program Manager
- Kevin Noon, Wetland Biologist
- Jalyn Cummings, Preserve Hydrologist

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APPENDIX A
Pipeline Lowering via the Open-Cut Method Drawing

APPENDIX B
Construction Typicals

APPENDIX C
Culvert and Geoweb® Site Specific Drawings

APPENDIX D
Hydrologic Modeling and Restoration Plan for Big Sandy Creek

APPENDIX E
Pipeline Lowering via the Horizontal Directional Drill Method Drawing

APPENDIX F
Wetland Delineation Report

APPENDIX G
Federal and State Threatened and Endangered Species Lists and Determinations for Polk County, Texas

Threatened and Endangered Species Potentially Occurring within Polk County, Texas						
Common Name	**Scientific Name**	**Federal Status[1]**	**State Status[2]**	**Habitat Description[3]**	**Assessment Result**	**Impact**
Mammals						
Black bear	*Ursus americanus*	NL	T	This species occurs in upland and wetland forests and adjacent clearings. They utilize hollow trees, fallen logs, or other cavities as dens.	Not known to occur within Project area.	No effect
Louisiana black bear	*Ursus americanus luteolus*	NL	T	This species depends on diverse, productive bottomland forest with a variety of food resources, including hard-mastproducing species; high quality habitat includes remote areas with little or no human activity.	Not known to occur within Project area.	No effect
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	NL	T	This species roosts in buildings, mines, and hollow trees in the spring and summer and near water during the winter.	Not known to occur in the Project area.	No effect
Red wolf	*Canis rufus*	NL	E	This species is found in upland and lowland forests, shrublands, coastal prairies, and marshes in areas with thick vegetative cover.	Not known to occur in the Project area.	No effect
Birds						
American peregrine falcon	*Falco peregrinus anatum*	DL	T	This species is a habitat generalist and may occupy habitats ranging from tundra, moorlands, steppe, and seacoasts to mountains, open forested regions, and human population centers. They nest on	Not known to occur in the Project area.	No effect

Threatened and Endangered Species Potentially Occurring within Polk County, Texas						
Common Name	**Scientific Name**	**Federal Status[1]**	**State Status[2]**	**Habitat Description[3]**	**Assessment Result**	**Impact**
				ledges or in holes on cliffs or buildings.		
Bachman's sparrow	*Aimophila aestivalis*	NL	T	This species is only found in mature, old-growth pine woodlands with frequent fire regimes.	Not known to occur in the Project area.	No effect
Bald eagle	*Haliaeetus leucocephalus*	DL	T	This species breeds near coastal areas including bays, rivers, and lakes. They perch in both deciduous and coniferous trees.	Not known to occur in the Project area.	No effect
Peregrine falcon	*Falco peregrinus*	DL	T	This species is a habitat generalist and may occupy habitats ranging from tundra, moorlands, steppe, and seacoasts to mountains, open forested regions, and human population centers. They nest on ledges or in holes on cliffs or buildings.	Not known to occur in the Project area.	No effect
Piping plover	*Charadrius meodus*	NL	T	This species is only present in Texas during the nonbreeding season. They occur on sandy beaches, algal flats, and mudflats in close proximity to the ocean.	Not known to occur in the Project area.	No effect
Red-cockaded woodpecker	*Picoides borealis*	E	E	Nest in mature pine with low understory vegetation (<1.5m); forage in pine and pine hardwood stands > 30 years of age, preferably >10" dbh.	Not known to occur in the Project area.	No effect
Swallow-tailed kite	*Elanoides forficatus*	NL	T	This species nests in wetland forests and forages in open wetlands.	Not known to occur in the Project area.	No effect
Wood Stork	*Mcteria americana*	NL	T	This species is found in marshes, swamps, lagoons, ponds, and flooded fields.	Not known to occur in the Project area.	No effect

Threatened and Endangered Species Potentially Occurring within Polk County, Texas						
Common Name	**Scientific Name**	**Federal Status[1]**	**State Status[2]**	**Habitat Description[3]**	**Assessment Result**	**Impact**
Fish						
Creek chubsucker	*Erimyzon oblongus*	NL	T	This species occurs in small rivers and creeks.	Not known to occur in the Project area.	No effect
Paddlefish	*Polyodon spathula*	NL	T	This species occurs in slow moving waters of medium to large rivers.	Not known to occur in the Project area.	No effect
Invertebrates						
Louisiana pigtoe	*Pleurobema riddellii*	NL	T	This species occurs in streams and moderate rivers with flowing waters.	Not known to occur in the Project area.	No effect
Sandbank pocketbook	*Lampsilis satura*	NL	T	This species occurs in small to larger rivers with moderate flows.	Not known to occur in the Project area.	No effect
Southern hickorynut	*Obovaria jacksoniana*	NL	T	This species is found in medium sized rivers with low to moderate flow.	Not known to occur in the Project area.	No effect
Texas heelsplitter	*Potamilus amphichaenus*	NL	T	This species is found in small to medium rivers and reservoirs.	Not known to occur in the Project area.	No effect
Texas pigtoe	*Fusconaia askewi*	NL	T	This species is found in rivers with mixed mud, sand, and fine gravel substrates.	Not known to occur in the Project area.	No effect
Reptiles						
Alligator snapping turtle	*Macrochelys temminchii*	NL	T	This species is found in slow moving, deep waters of rivers, sloughs, oxbows, canals, and lakes.	Not known to occur in the Project area.	No effect

Threatened and Endangered Species Potentially Occurring within Polk County, Texas						
Common Name	**Scientific Name**	**Federal Status[1]**	**State Status[2]**	**Habitat Description[3]**	**Assessment Result**	**Impact**
Louisiana pinesnake	*Pituophis ruthveni*	NL	T	This species is found in longleaf pine savannahs with sandy soils and adequate herbaceous ground cover.	Not known to occur in the Project area.	No effect
Timber rattlesnake	*Crotalus horridus*	NL	T	This species is found in hardwood pine flatwoods, river bottoms, hydric hammocks, hardwood forests, and cane fields of alluvial plain hill country.	Not known to occur in the Project area.	No effect
Plants						
Texas trailing phlox	*Phlox nivalis ssp. texensis*	E	E	This species is found in deep, sandy soils in fire-maintained openings in upland longleaf pine savannahs or post oak-bluejack oak woodlands.	Occurs adjacent to the Project area; however all populations are known and will not be impacted.	No effect
[1]Federal Status: NL=Not federally listed in Polk County, Texas DL=Delisted E=Endangered						
[2]State Status: NL=Not state listed in Polk County, Texas T=Threatened E=Endangered						
[3]Information on habitat was obtained from NatureServe (2012)						

APPENDIX H
Culvert and Geoweb® Hydrologic Modeling