

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



Environmental Assessment

Century Exploration Houston, LLC
Proposal to:

Drill and Produce the Phineas #3 and Wile E.
Coyote Wells from One Location Outside the
Beaumont Unit in Orange County, Texas

Big Thicket National Preserve,
Orange County, Texas

September 2013

SUMMARY

In accordance with the National Park Service (NPS) regulations for non-federal oil and gas rights, Century Exploration Houston, LLC (Century) has submitted an application to directionally drill the Phineas #3 and Wile E. Coyote wells from one existing surface location outside the Beaumont Unit of the Big Thicket National Preserve (Preserve) to reach bottomhole targets beneath the units.

This EA evaluates the environmental impacts of two alternatives: the No Action Alternative or baseline alternative, and Century's proposal directionally drill and produce two wells from one surface location outside a Unit of the Preserve to reach bottomhole targets beneath the Unit. By performing all surface operations outside of the Preserve and implementing mitigation measures, operators would substantially reduce impacts on Preserve resources and values. Therefore, the NPS dismissed several topics from detailed analysis, and the EA provides the reasoning that supports this dismissal. Issues that were retained for more detailed analysis include the impact of elevated noise on the natural soundscape and impacts on certain resources and uses on adjacent lands, where impacts could potentially exceed minor levels. For this project, topics included geology and soils.

Through the analyses, the NPS concluded that the intensity of adverse impacts would range from negligible to moderate. No major adverse impacts were identified and no impairment of NPS resources or values would occur as a result of the proposed action. The duration of some impacts would be short-term, lasting from several days to 3 years (during construction and drilling); while other impacts would be long-term, extending beyond 3 years, depending on how long the directionally drilled wells are produced. Most impacts would primarily be localized around point sources, while some impacts could extend into the Preserve and the lands outside of the Preserve.

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 or hand deliver comments to the address below. This EA will be on public review for 30 days ending October 23, 2013. 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.

Douglas Neighbor
Superintendent
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1.0 PURPOSE AND NEED FOR ACTION

This Environmental Assessment (EA) has been prepared to comply with the National Environmental Policy Act (NEPA) to provide a decision-making framework, and to determine whether an Environmental Impact Statement (EIS) should be prepared regarding the Century Exploration Houston, LLC's (Century) submitted application to the National Park Service (NPS) to directionally drill the Phineas #3 and Wile E. Coyote wells from one existing surface location outside the Beaumont Unit of the Big Thicket National Preserve (Preserve) to reach bottomhole targets beneath the Unit.

This EA evaluates the environmental impacts of two alternatives: the No Action Alternative or baseline alternative, and Century's proposals to directionally drill and produce two wells from one surface location outside a Unit of the Preserve to reach bottomhole targets beneath the Unit.

One of the purposes of this analysis is to assist the NPS in their evaluation of Century's application and determine whether Century's directional wells would qualify for an exemption from the NPS's nonfederal oil and gas rights regulations found at 36 CFR 9B. Specifically, § 9.32(e) governs operators that propose to develop nonfederal oil and gas rights in any unit of the National Park System by directionally drilling a well from a surface location outside unit boundaries to a location under federally-owned or controlled lands within park boundaries. Per § 9.32(e), an operator may obtain an exemption from the 9B regulations if the Regional Director is able to determine from available data that a proposed drilling operation under the park poses "no significant threat of damage to park resources, both surface and subsurface, resulting from surface subsidence, fracture of geological formations with resultant fresh water aquifer [sic] contamination or natural gas escape or the like." This EA also serves the purpose of disclosing to the public the potential impacts on the human environment, both inside and outside the Preserve.

When Congress authorized the establishment of the Preserve on October 11, 1974, the U.S. Government acquired surface ownership of the area. Private entities retained the subsurface mineral interests on most of these lands, while the State of Texas retained the mineral interests under the Neches River and navigable reaches of Pine Island Bayou. Thus, the federal government does not own any of the subsurface oil and gas rights in the Preserve. To protect the Preserve from oil and gas operations that may adversely impact or impair Preserve resources and values, the NPS regulates those operations in accordance with NPS laws, policies, and regulations. The NPS recognizes that the applicants possess private property rights to nonfederal oil and gas in the Preserve. Such rights are accorded protection under the 5th Amendment of the U.S. Constitution, which states "...no person shall be deprived of property without due process of law; nor shall private property be taken for public use without just compensation." Figure 1 is a regional/vicinity map depicting the proposed project locations.

The area of analysis for evaluating impacts of the proposed actions in this EA will vary depending on the impact topic. These analysis areas are described for each topic in Section 3. The area of analysis for cumulative impacts includes the Unit of the Preserve and areas contiguous to the Unit (approximately one-half mile beyond Preserve boundaries).

Figure 1. Big Thicket National Preserve – Analysis Area

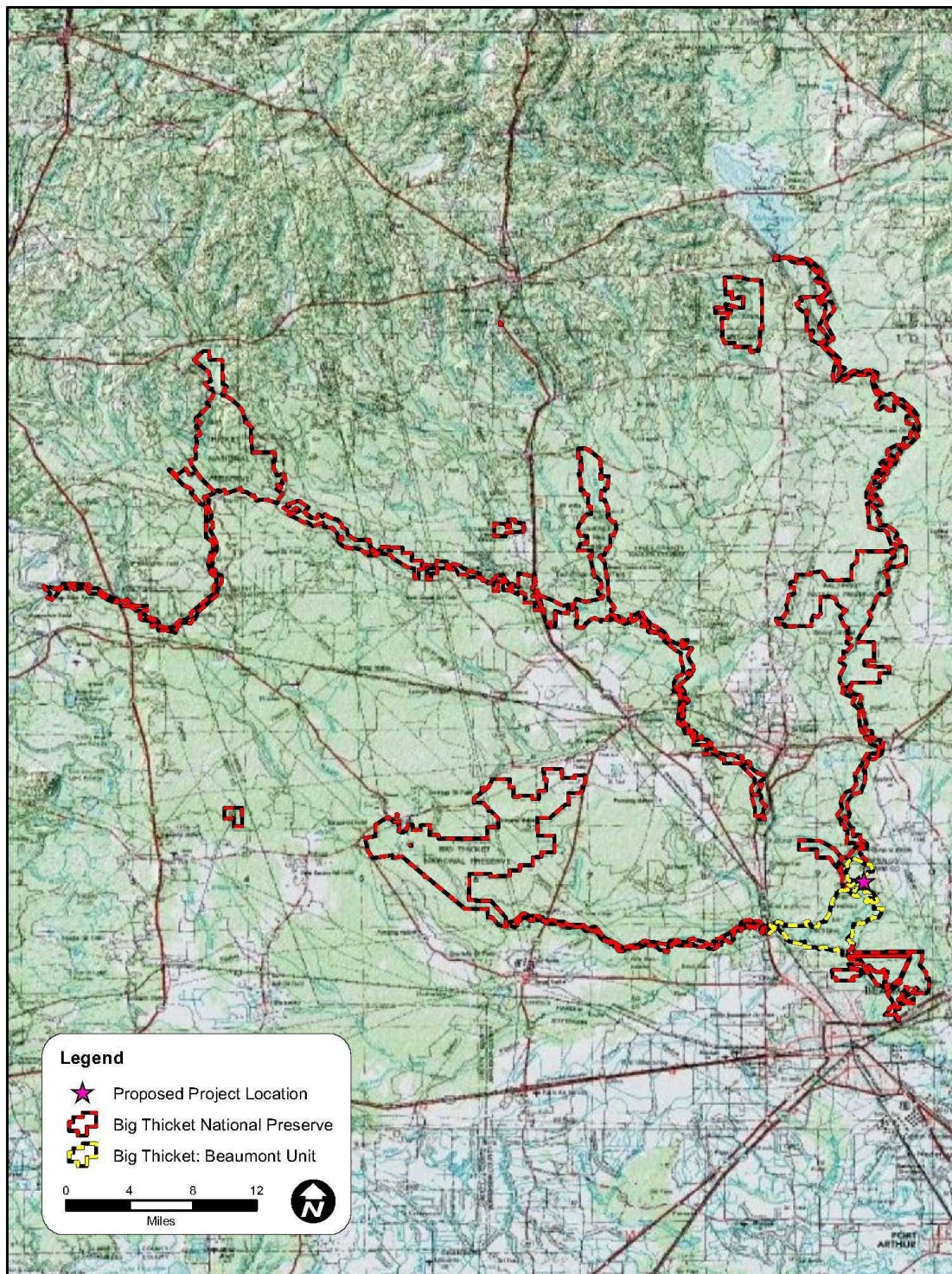
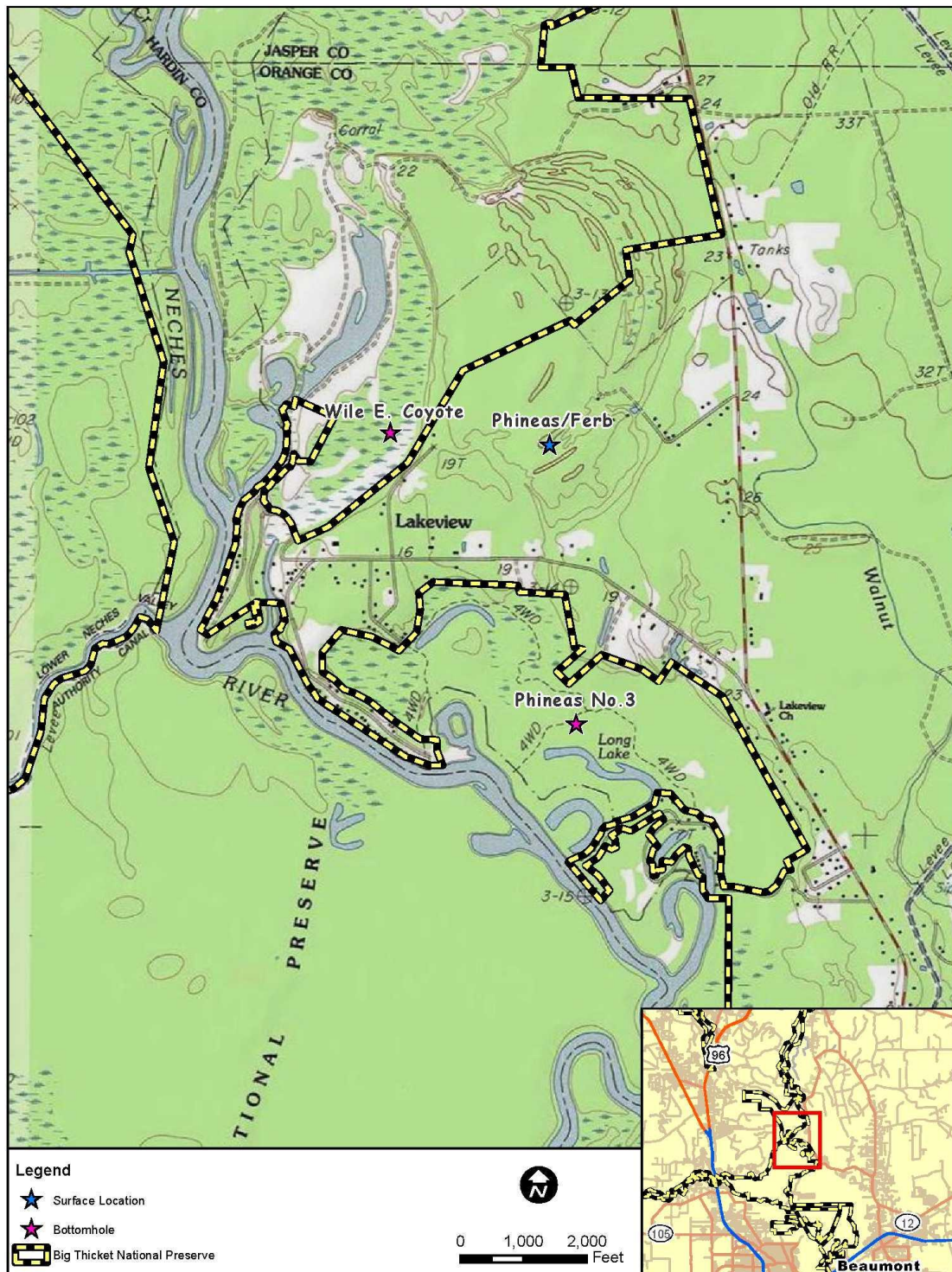


Figure 2. Beaumont Unit– Operations Area



1.1 Objectives

The objectives of taking action are to:

- Avoid or minimize impacts on the Preserve's resources and values, visitor use and experience, and human health and safety;
- Prevent impairment of the Unit's resources and values;
- Provide Century, as the lessee of nonfederal oil and gas mineral interests, access to explore for and develop oil and gas resources in a manner that will assure the natural and ecological integrity of the Preserve.

1.2 Special Mandates and Direction

The NPS evaluates project-specific proposals for directionally drilling and producing wells from surface locations outside the Preserve on a case-by-case basis prior to deciding whether to issue an exemption in accordance with § 9.32(e). The following discussion is a summary of the basic management direction the NPS follows for issuing such an exemption.

1.2.1 Big Thicket National Preserve Enabling Act

Congress established the Preserve with the Big Thicket National Preserve Enabling Act of October 11, 1974, Pub. L. No. 93-439, 88 Stat. 1254, codified as amended at 16 U.S.C. §§ 698-698e (2000), as the nation's first preserve, "[i]n order to assure the preservation, conservation, and protection of the natural, scenic and recreational values of a significant portion of the Big Thicket area in the State of Texas and to provide for the enhancement and public enjoyment thereof". The authorizing legislation directs the Secretary of the Interior to administer the lands within the Preserve "in a manner which will assure their natural and ecological integrity in perpetuity". The Preserve comprises 15 separate units, totaling approximately 112,000 acres. After the Preserve's establishment, the United States began acquiring lands within the Preserve's authorized boundaries. However, private entities retained ownership of the mineral estate underlying their lands, and the State of Texas retained ownership of the mineral estate underlying the Neches River and navigable reaches of Pine Island Bayou. Although the United States does not own any of the mineral estates underlying the Preserve, Congress charged the NPS with protecting the Preserve from oil and gas operations that may adversely impact the Preserve's resources and values. The statute states:

In the interest of maintaining the ecological integrity of the preserve, the Secretary [of the Interior] shall ... promulgate and publish such rules and regulations in the *Federal Register* as he deems necessary and appropriate to limit and control the use of, and activities on, Federal lands and waters with respect to ... exploration for, and extraction of, oil, gas, and other minerals ... 16 U.S.C. § 698c(b)

The establishment of Big Thicket as a national preserve created a new National Park System category, which meets different criteria than other parks and recreation areas within the System. These criteria were set forth in the House of Representatives committee report (House Committee Report No. 93-676 pertaining to the establishment of Big Thicket National Preserve and Big Cypress National Preserve, approved on the same date), as follows:

In the past, the Congress has authorized and established many areas for inclusion in the National Park System: national parks, national monuments, national recreation areas, national historic sites, and others. A systematic effort has been made to establish

standards or criteria for each of these different categories in an effort to maintain the integrity of the values which each attempts to serve. The description of the [Big Thicket] area as a national preserve will establish a new category which can serve as a feasible and desirable vehicle for the consideration of other nationally significant natural areas which differ from the qualities attributed to national parks and national recreation areas. The committee chose to call the area a preserve rather than a reserve, feeling that such distinction may be important.

Reserve refers to stock, or a commodity held for future use. Preserve refers more definitively to the keeping or safeguarding of something basically protected and perpetuated for an intended or stated purpose, as with the specific objectives for [Big Thicket] provided by this legislation. In general, national preserves will be areas of land and/or water which may vary in size, but which possess within their boundaries exceptional values or qualities illustrating the natural heritage of the Nation. Such areas would often be characterized by significant scientific values, including, but not limited to, ecological communities illustrating the process of succession, natural phenomena, or climax communities. In addition they could be characterized by a habitat supporting a vanishing, rare or restricted species; a relict flora or fauna persisting from an earlier period; or large concentrations of wildlife species. Other scientific, geologic, geomorphic or topographic values might also contribute to the purposes for which an area might be recognized.

The principal purpose of these areas should be the preservation of the natural values which they contain. They might differ, in some respects, from national parks and monuments insofar as administrative policies are concerned. Hunting, for example, subject to reasonable regulation by the Secretary, could be permitted if such activities could be conducted without jeopardizing the natural values for which the area seeks to preserve. Management of the watershed resources might also be appropriate if that would enhance the value of the preserve as it serves other needs.

All management activities within these areas should be directed toward maintaining the natural and scientific values of the area, including the preservation of the flora and fauna and the reestablishment of the indigenous plant and animal life, if possible. Areas where scientific discoveries or historical events took place would contribute to the values of the preserve and should be managed in a manner which will maximize both the natural and historical values.

National preserves may accommodate significant recreational uses without impairing the natural values, but such public use and enjoyment would be limited to activities where, or periods when, such human visitation would not interfere with or disrupt the values which the area is created to preserve. Construction of physical facilities of any kind would be minimized and would be limited to those developments which are essential to the preservation and management of the area and the safety of the public. To the extent such facilities are deemed necessary and appropriate, they would be constructed in a manner which would minimize their impact on the environment and their intrusion on the natural setting.

Given the park's enabling statute, oil and gas exploration and development activities at the Preserve is an activity clearly contemplated by Congress and addressed in both statute and NPS regulations, and are not unusual or unexpected occurrences. Mineral exploration and development is addressed in the Preserve's General Management Plan (GMP) and Oil and Gas Management Plan (OGMP).

1.2.2 NPS Nonfederal Oil and Gas Regulations, 36 CFR 9B

The authority to manage and protect federal property arises from the Property Clause of the United States Constitution. The Property Clause provides that “Congress shall have Power to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States...” (U.S. Const. Art. IV, § 3, cl. 2).

In 1916, Congress exercised its power under the Property Clause and passed the NPS Organic Act, 16 U.S.C. § 1 *et seq.* Section 3 of the Organic Act authorizes the Secretary of the Interior to “make and publish such rules and regulations as he may deem necessary or proper for the use of the parks...”.

Pursuant to § 3 of the NPS Organic Act and individual park statutes, including that of the Preserve, the Secretary of the Interior promulgated regulations at 36 CFR Part 9, Subpart B (9B regulations) in 1979. The 9B regulations apply to operations that require access on or through federally-owned or controlled lands or waters in connection with non-federally owned oil and gas resources in all National Park System units (36 CFR § 9.30(a)). The NPS’s jurisdiction under these regulations does not extend to any activities occurring outside park boundaries, even if such activities are associated with a nonfederal oil and gas operation occurring inside a park.

The NPS Nonfederal Oil and Gas Rights Regulations (36 CFR 9B) and other regulatory requirements assist park managers in managing oil and gas activities so they may be conducted in a manner consistent with the NPS mandate to protect park resources and values. In implementing these regulations, the NPS must determine whether proposed operations meet the 36 CFR 9B approval standards and whether the operations have the potential to impair park resources and values.

Section 9.32(e) of the regulations governs operators that propose to develop their nonfederal oil and gas rights in a park by directionally drilling up to five wells from a surface location outside unit boundaries to a location under federally-owned or controlled lands or waters within park boundaries. It is limited in scope to those aspects of the directional drilling operation occurring within park boundaries.

Per § 9.32(e), an operator may obtain an exemption from the 9B regulations if a Regional Director is able to determine from available data that a proposed drilling operation under the park poses “no significant threat of damage to park resources, both surface and subsurface, resulting from surface subsidence, fracture of geological formations with resultant fresh water aquifer [sic] contamination or natural gas escape or the like”. The regulations define operations as “all functions, work and activities within a unit in connection with exploration for and development of oil and gas resources, the right to which is not owned by the United States...” (36 CFR § 9.31(c), underlining added). The potential impacts considered in the § 9.32(e) exemption process relate only to effects on park resources from downhole activities occurring within the boundary of the park, not threats to park resources associated with the operation outside of park boundaries.

Under the regulations, the NPS may determine that 1) an operator qualifies for an exemption from the regulations with no needed mitigation to protect park resources from activities occurring within park boundaries; 2) an operator qualifies for an exemption from the regulations with needed mitigation to protect subsurface park resources from activities occurring within park boundaries; or 3) an operator must submit a proposed plan of operations and a bond to the NPS for approval. Each one of these legally permissible options is briefly described below.

1. Exemption with No Mitigation (*no approval or permit issued*): The NPS determines that the proposed operation inside the park qualifies for an exemption under § 9.32(e) without any mitigation or conditions required by the NPS on the downhole activities. This option will arise when there is no potential for surface or subsurface impacts in the park from the downhole activities (e.g., the wellbore [the hole that forms the well] does not intercept an aquifer within the park). Under this option, the NPS is not granting an approval or issuing a permit.
2. Exemption with Mitigation (*no approval or permit issued*): The NPS determines that the proposed operation inside the park qualifies for an exemption under § 9.32(e) if there is no potential for surface impacts to park resources from downhole operations in the park and the operator adopts mitigation measures or conditions that reduce potential impacts on subsurface resources (e.g., an aquifer) to "no measurable effect". As in option #1 above, the NPS is not granting an approval or issuing a permit.
3. Plan of Operations (approval and "permit" issued): This regulatory option would apply if the NPS determines that it cannot make the requisite finding for a § 9.32(e) exemption because (1) impacts to surface resources from the downhole operations are involved, or (2) impacts to subsurface resources cannot be adequately mitigated to yield "no measurable effect." This option would also apply if an operator does not apply for an exemption and the NPS does not consider granting an exemption on its own initiative. In these cases, a prospective operator must submit and obtain NPS approval of a proposed Plan of Operations and file a bond before commencing directional drilling activities inside a park. The required plan and bond will be limited in scope to those aspects of the directional drilling operation that occur within park boundaries. As a result, many of the general plan information requirements set forth under § 9.36 would not apply. Mitigation measures and/or conditions of approval would be integral to this option. Such mitigation could encompass the protection of cultural resources, cave/karst resources, aquifers, floodplains, wetlands and other surface resources from operations occurring inside the park. Under this option, an operator must have the NPS's approval of a proposed plan before commencing any activity in the boundaries of the park. The approved plan constitutes the operator's "permit".

The proposed directional wells from one surface location would qualify for an Exemption with No Mitigation (option 1) because no surface access in the Preserve would be needed for any phase of drilling, production, transportation, or reclamation activities; and the bottomholes would be drilled to cross the Preserve boundary at a substantial depth so as not to cross usable quality groundwater. The NPS identified no resource occurring on the surface of the Preserve that could be affected by the wellbore crossing into the plane of the Preserve at substantial depth to extract hydrocarbons and other associated liquids from beneath the Preserve. There is no threat to park resources or values regardless of what methods and materials Century uses to drill, case, cement, or plug and abandon the sections of the hole inside the Preserve. Likewise, if the wells are produced, any method of completion, stimulation, or injection that occurs inside the Preserve within the bottomhole, would not pose a substantial threat of damage to Preserve resources and values.

1.2.3 Protecting Park Resources from External Activities

The NPS may seek compensation under 16 U.S.C. § 19jj and other appropriate statutes, if any activities outside park boundaries, including oil and gas operations, damage park resources.

1.2.4 NPS Monitoring of Nonfederal Oil and Gas Operations

The NPS ability to monitor and inspect directional drilling operations is limited to downhole operations within the park (e.g., setting and cementing surface casing and plugging operations, etc.). As a practical matter, monitoring of downhole activities inside the park can only be accomplished from the surface location outside the park. As a result, the NPS may need to access the surface location and should make such access a condition of an exemption under option 2 or a condition of approval under option 3. The NPS must coordinate the timing of such access with the operator. For directional drilling operations sited outside the park, the 9B regulations provide no authority to require an operator to grant the NPS access for the purpose of observing compliance with terms unrelated to the downhole activities inside the park. When the NPS has made an upfront determination that a directional drilling operation is exempt without conditions from the regulations because of the lack of impacts, there is no 9B regulatory reason to access the surface location outside the park (option 1).

Where a state or federal agency, other than the NPS, has applied mitigation measures via their respective environmental compliance or permitting processes, that agency, not the NPS, has sole responsibility for monitoring and enforcing its mitigation measures. In the event the NPS becomes aware of a compliance concern related to another agency's jurisdiction, the NPS should alert that agency in a constructive manner.

1.2.5 National Environmental Policy Act

The National Environmental Policy Act (NEPA) applies to major federal actions. NEPA requires agencies to take a "hard look" at the environmental consequences of their proposed actions (Robertson v. Methow Valley Citizens Council; 490 U.S. 332, 350 (1989)). A legally adequate NEPA document (EA or EIS) must consider the direct, indirect, and cumulative impacts (effects) of the proposed action on the environment, along with connected, cumulative impacts (effects) of the proposed action, and similar actions, on the environment (40 CFR § 1508.25; DO-12 Handbook, Chapter 2, § 2.4).

The requirements of NEPA are triggered by federal actions (projects, activities, or programs funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistances; those requiring a federal permit, license, or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a federal agency). The NEPA process must be completed before a decision can be made to proceed with the proposal.

While it can be argued that NEPA is not triggered under options 1 and 2 described above because the NPS does not grant an approval or issue a permit under these options, the prudent course of action the NPS has selected is to comply with this statute in making § 9.32(e) determinations. In addition, the NEPA document will contain the analysis and documentation required under § 9.32(e) and will disclose to the public the potential impacts that could occur both inside and outside the Preserve.

The types of impacts considered are direct, indirect, and cumulative. Actions may be connected, cumulative, and similar.

1. Connected actions are closely related and, therefore, should be discussed in the EA. Actions are connected if they:
 - a. Automatically trigger other actions that may require environmental analysis under NEPA;

- b. Cannot or will not proceed unless other actions are taken previously or simultaneously; or
- c. Are interdependent parts of a larger action that depend on the larger action for their justification.

Connected actions occurring outside of the park related to the directional drilling operation inside the park include the construction of the well pad(s), mineral flowline(s), and access road(s); drilling and completion; hydrocarbon production and transportation; and well plugging and surface reclamation. The impacts of these connected actions both inside and outside the Preserve will be addressed in this EA.

2. Cumulative actions when viewed with other proposed actions may have cumulatively significant impacts and should, therefore, be discussed in the same environmental document. Cumulative actions that should be analyzed in the NEPA document include surface drilling and production operations outside of the park as well as any other activities that may have additive impacts on resources (e.g., logging, road building, construction projects, prescribed burns, etc.).
3. Similar actions when viewed with other reasonably foreseeable or proposed agency actions have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography. An agency may wish to analyze these actions in the same NEPA document. The agency should do so when the best way to assess the combined impacts of similar actions or reasonable alternatives to such actions is to treat them in a single impact statement. Similar actions could include activities such as the construction of private and public roads, drilling of water wells, and other types of construction activities. Similar actions were not identified for analysis in this EA.

1.2.6 Approved Park Planning Documents

Approved park planning documents also provide a framework for determining how nonfederal oil and gas operations are conducted within the Preserve

The General Management Plan (GMP) is the major planning document for all National Park System units. The GMP sets forth the basic philosophy of the unit, and provides strategies for resolving issues and achieving identified management objectives required for resource management and visitor use. The GMP includes environmental analysis and other required compliance documentation. A GMP was completed for the Preserve in 1980. The Preserve is currently in the process of finalizing a new GMP.

The NPS completed an Oil and Gas Management Plan (OGMP) for the Preserve in 2006. The OGMP:

- Identifies Preserve resources and values susceptible to adverse impacts from oil and gas operations;
- Establishes performance standards and impact mitigation measures for oil and gas operations to protect and prevent impairment to Preserve resources and values from adverse impacts from oil and gas operations;
- Establishes performance standards and impact mitigation measures for oil and gas operations to avoid or minimize impacts from oil and gas operations on visitor use and enjoyment, and human health and safety;

- Provides holders of oil and gas rights reasonable access for exploration and development; and
- Provides pertinent information to oil and gas operators to facilitate planning and compliance with NPS and other applicable regulations.

Century's proposal is in accordance with the goals and objectives articulated in the abovementioned planning documents.

1.3 Issues and Impact Topics Evaluated

In accordance with Director's Order 12, scoping, or requesting early input before the analysis formally begins, is required on all EAs prepared by NPS. Although public scoping is encouraged where an interested or affected public exists, issuing offices are only required to involve appropriate federal, state, and local agencies and any affected tribe. The issuing office decides the method of scoping.

Early in the planning and development of the directional drilling application by Century, the NPS conducted scoping with them and their consultants, Perennial Environmental Services, LLC (Perennial); and others, to identify the resources, values, and other concerns that could be potentially impacted by drilling and producing the wells, to define major issues, alternatives, potential impacts, and mitigation measures. Scoping was conducted through meetings, telephone conversations, written comments, and on-site observations and assessments. The Preserve released a public scoping brochure to solicit public input prior to completing the EA for this proposal.

The Preserve released a public scoping brochure generally describing the proposed action and an additional action that has since been postponed on May 24, 2013, to announce a 30-day public scoping period. The public scoping brochure was mailed to affected state, federal, and local agencies, and other interested persons and organizations including: the Alabama Coushatta Tribe of Texas, the Austin and Houston Sierra Clubs, the Big Thicket Association, Perennial, Century, the Railroad Commission of Texas, the Texas Commission on Environmental Quality, the Texas Committee on Natural Resources, the Texas Historical Commission, and the U.S. Fish and Wildlife Service. The Preserve also posted the public scoping brochure on the park's website. One scoping comment letter was received from the Lone Star Chapter and Houston Regional Group of the Sierra Club. Substantive scoping comments focused on analyzing cumulative effects, acquisition of mineral rights, analysis of alternatives, and enforceability of mitigation measures.

Based on project scoping concerns, and the level and extent of potential impacts likely to occur, the NPS determined that the impact topics listed in Table 1, below, would likely have more than minor impacts and, therefore, would be carried forward for detailed analysis in Section 3 of this EA. Other impact topics were addressed by taking a hard look at potential impacts; however, these were dismissed from further analysis because their impacts would not be expected to exceed minor levels (Section 1.4).

Table 1. Impact Topics Carried Forward for Detailed Analysis in Section 3.0

Phineas #3 and Wile E. Coyote Wells
<ul style="list-style-type: none"> • Soundscapes • Adjacent Lands <ul style="list-style-type: none"> • Geology and Soils

Based on the above list of impact topics, issue statements were developed to help define problems or benefits pertaining to the proposal to drill and produce two directional wells (see Table 2). The issue statements describe a cause and effect relationship between an activity and the impact topic.

Table 2. Issue Statements for Impact Topics Retained for Detailed Analysis

Impact Topic	Issue Statement
Natural Soundscapes in the Beaumont Unit	<ul style="list-style-type: none"> Existing natural soundscapes in the project area is intermittently impacted by human development, as it is located within actively cultivated and harvested timber land. Natural sounds are intrinsic elements of the environment that are vital to the functioning of ecosystems and can be used to determine the diversity and interactions of species within communities. Natural soundscapes are often associated with parks and preserves and are considered important components of the visitor experience as well as the natural wildlife interactions. Maintenance of the access road and well pad along with associated noise from construction and operation equipment would affect the quality of the natural soundscape in the general vicinity of the operations. This would extend on a smaller scale to the production phases. Vehicles and equipment used for maintenance of the access road and well pad; and drilling production, plugging, and reclamation activities, would result in increased noise in the vicinity of operations.
Adjacent Landowners, Resources, and Uses	<p>Siting of the proposed wells outside the Preserve could result in adverse impacts on neighboring lands and landowners, including impacts on geology and soils, wildlife, wetlands and floodplains, and vegetation, as well as certain other resources that could be affected outside the Preserve at more than negligible levels. Those retained for detailed analysis outside the Preserve boundaries include the following:</p> <ul style="list-style-type: none"> Geology and Soils. Construction and operation of the proposed facilities would result in impacts to geology and soils outside the Preserve at the Phineas/Ferb surface location. <ul style="list-style-type: none"> Maintenance of the access road and well pad could increase surface runoff, soil erosion, rutting and compaction; affect the permeability of the soils (and other soil characteristics); and could directly and indirectly affect the growth and regeneration of vegetation. Soils compacted by foot or vehicle use could reduce soil permeability, change surface drainage patterns, and hinder the penetration of plant roots. In general, clayey soils are more subject to compaction than sandy soils. The release of hydrocarbons or other contaminating and hazardous substances from vehicles, equipment, or flowlines during drilling and production operations could alter the chemical

Impact Topic	Issue Statement
	and physical properties of the soil in the vicinity of the oil and gas activities. Changes in soil properties could result directly from contact with contaminants on-site or indirectly via runoff from contaminated areas.

1.4 Issues and Impact Topics Eliminated from Further Analysis

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;
- They would not be affected by the proposal, or the likelihood of impacts are not reasonably expected; and
- Effects (following any needed mitigation) would not exceed minor levels, and there is little controversy on the subject or reason to otherwise include the topic. Generally, a minor effect would result in a detectable change, but the change would be small and of little consequence.

Table 3. Impact Topics Eliminated from Further Analysis

Phineas #3 and Wile E. Coyote Wells
<ul style="list-style-type: none"> • Socioeconomics • Air Quality • Lightscares • Vegetation in and outside the Beaumont Unit • Geology and soils in the Beaumont Unit • Water Resources in and outside the Beaumont Unit • Prime and Unique Farmland Soils in the Beaumont Unit • Cultural Resources in and outside of the Beaumont Unit • Fish and Wildlife in and outside the Beaumont Unit • Catastrophic Incidents, such as well blowouts, well fires, or major spills • Visitor Use and Experience in the Beaumont Unit • Climate Change • Threatened and Endangered Species in and outside of the Beaumont Unit and other species of management concern in the unit • Environmental Justice

The following sections explain why each of these topics was dismissed from further evaluation and provides limited analyses that support the dismissals. Wherever appropriate, the analyses describe the effects of “in-park operations” and “connected actions”.

- **In-Park Operations** would consist of the subsurface operations taking place under the Preserve; i.e., the wellbore crossing into the Preserve at substantial depth, so as to not cross usable quality groundwater, to reach bottomhole targets beneath the Preserve to extract hydrocarbons and other associated fluids.
- **Connected Actions** would consist of activities associated with access road and well pad maintenance, production facilities and flowline, drilling and completion, hydrocarbon production and transportation, and well plugging and surface reclamation impacts on the human environment.

The analysis of impacts from in-park operations contains the analysis and documentation required under 9B regulations. The analysis of impacts from connected actions satisfies a broader NEPA requirement to assess impacts on the human environment.

1.4.1 Socioeconomics

Socioeconomic issues include the effect of the proposed drilling and possible production of the wells on the local and regional economies. The description presented below of past, present, and reasonably foreseeable oil and gas development in and adjacent to the Preserve provides supporting data to base the cumulative impact analyses in this section and for analyses presented in Section 3.

The proposed actions would generate an unknown amount of revenue for the local economy through rents or other payments to adjacent private landowners. Mineral owners would receive bonus payments for leases and could subsequently receive rentals or royalties. Local businesses would receive revenue from purchase of food, fuel, lodging, and other incidental purchases by drilling and production crews and managers. However, revenue from oil and gas production would likely only affect a small number of people, and the individuals or groups affected would not necessarily be from the socioeconomic area in the vicinity of the project. On the other hand, increased oil and gas activity in the area could potentially have restrictive effects on the local economy. An example of this effect would be fluctuations in the housing market and/or property values with the development of oil and gas operations near residences or from the demand for housing from workers. In addition, a small amount of managed timber land is occupied by the well pad and would remain uncultivated until the wells are plugged and the project area reclaimed.

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 to administer the Preserve. In addition, tourism-related expenditures contribute to the economy and also create jobs to support tourism. The NPS has estimated that there were approximately 140,489 visitors to the Preserve in 2011 (NPS, Public Use Statistics Office 2011). The only way the Preserve tracks visits to the individual units is through hunting surveys. During the 2012-2013 hunting season, 200 permits were issued to hunt in the Beaumont Unit, and those permitted hunters reported taking 649 trips. Other visitor uses in the Beaumont Unit include boating, hiking, and bird watching. Several picnic areas, boat launches, and designated fishing areas are located within the Unit.

It is estimated that in the 2005 fiscal year, visitors to the Preserve spent a total of \$6,592,000 creating or supporting 141 jobs (Stynes 2006). In the event of a serious oil spill and/or 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. However, the likelihood of this happening is relatively low, because the applicants would be required to take precautions to prevent accidents under Federal statute and numerous Statewide Rules administered by the Railroad Commission of Texas (RRC). Please see the section below that addresses the possibility of catastrophic incidents, such as well blowouts, well fires, or major spills.

The Preserve lies within the RRC's District 3. RRC District 3 includes 29 counties in southeast Texas. Seven counties within District 3 contain portions of the Preserve. As of December 2010, there were approximately 7,841 regular producing oil wells and 3,828 regular producing gas wells in RRC District 3, totaling 11,669 wells. Of these, 2,920 wells, or 25 percent of the District total, are located within the seven Preserve counties. These include 2,093 oil wells and 827 gas wells. The number of wells currently producing oil or gas from nonfederal mineral acreage beneath the Preserve is very small in relation to both the total producing wells in the seven counties containing the Preserve and the total producing wells in RRC District 3.

The NPS has prepared a revised reasonably foreseeable development (RFD) scenario to project future oil and gas development, based on an assessment by the United States Geological Survey (USGS) of remaining hydrocarbons beneath the Preserve (Schenk 1999). The revised RFD was produced in response to public comments received on the *Draft Oil and Gas Management Plan Environmental Impact Statement* (NPS 2005), for which the original RFD had been produced, and the increase in drilling activity experienced in RRC District 3 in 2005 and throughout the United States and Texas from 2002 to present (Baker Hughes Incorporated 2007). The RFD provides a reasonable assumption of future development of nonfederal oil and gas for park planning purposes, and provides a basis for measuring potential environmental impacts. It does not represent a benchmark or decision point for acceptable levels of activity that could occur to develop the oil and gas underlying the Preserve. During the revision effort, the USGS's assessment of the remaining hydrocarbon potential beneath the Preserve was reviewed, and the NPS contacted operators who have recently drilled wells in and adjacent to the Preserve to verify the assumptions made.

The RFD projects that, initially, three dimensional (3-D) seismic surveys would be conducted throughout the entire Preserve, and the data obtained would be used to delineate oil and gas drilling prospects. It was assumed that approximately 40 additional wells would be drilled over the next 15 to 20 years to produce the 4 million barrels of oil and natural gas liquids (condensate) and 94 billion cubic feet of natural gas from Tertiary and Upper Cretaceous-age reservoirs assumed to underlie the Preserve. Based on an exploratory drilling success rate of approximately 50 percent and a developmental drilling success rate of 75 percent, of the 40 wells anticipated to be drilled, 27 could be commercially successful (the remaining 13 would be plugged as dry holes). The NPS acknowledges that the RFD is based on available production data, and that more or fewer wells could be drilled or produced. Under the RFD scenario, it would reasonably be anticipated that Preserve-wide, up to 465 acres could be disturbed for geophysical exploration operations; and up to 241 acres could be developed for drilling, production, and transportation operations for a total future development of 706 acres.

Due to the narrow, linear nature of many of the Preserve's units many of the drilling and production operations are anticipated to follow the existing trend for siting from surface locations outside the Preserve to access hydrocarbons beneath the units using directional drilling technology. However, exploratory and development wells are expected to be sited within some units that are greater in size, like the Big Sandy Creek and Neches Bottom and Jack

Gore Baygall Units. Therefore, it is possible that the actual acreage disturbed by drilling, production and transportation operations would approximate that projected by RFD. However, the NPS expects the actual figure to fall somewhere between the RFD projection and zero acres (which would be the case if all oil and gas well under the Preserve were drilled directionally without disturbance of the federal surface).

One 3-D seismic survey has been conducted in the Beaumont Unit. In 2012, Cimarex Energy Company conducted a survey that encompassed portions of the Lower Neches River Corridor, Little Pine Island-Pine Island Bayou Corridor, Village Creek Corridor, and Beaumont Units. Over 90% of the seismic activities were completed using heliportable drills. All-terrain vehicle mounted drills were only utilized on established roads.

The trend over the past decade for drilling wells to produce oil and gas underlying the Preserve is towards directionally drilling from surface locations outside the Preserve to bottomhole targets beneath the Preserve. From 1998 through the present, there have been no wells drilled from surface locations within the Preserve. However, oil and gas exploration and development has continued during that time. Since the last well drilled from inside the Preserve was completed in 1997, 34 directional wells were drilled from surface locations outside the Preserve to reach bottomhole targets beneath the Preserve. During the same period, applicants received 9.32(e) exemption determinations for 23 wells that have not been drilled.

There are 20 drilled and abandoned wells within the Beaumont Unit. They include 13 dry holes, 3 that produced oil and/or gas, and 4 that produced gas only. There are 9 pipelines located within the Unit. Of these, 5 transport natural gas, 1 is for liquefied petroleum gas (LPG), 1 is for propane, 1 is a combination propane or LPG pipeline, and the remaining pipeline transports crude oil.

In 2012, Choice Exploration, Inc. received a 9.32(e) exemption for up to five wells under the Beaumont Unit. These wells are located in the southwest portion of the unit near US-69. At the time of this assessment, only one of the five wells has been drilled. However, the Choice location is approximately 5.4 miles from the Phineas/Ferb well pad, thus limiting the potential for additive impacts to Preserve resources.

Impacts from In-Park Operations and Connected Actions: The analysis of impact to socioeconomic resources is not separated into in-park operations and connected actions, since both the in-park bottomhole and connected action together are needed to produce the effect on socioeconomics. The proposed action (if the directional wells were drilled and hydrocarbons discovered and produced) would result in only a short-term, negligible, beneficial effect on the local or regional economy, since they represent such a small amount to the total production in RRC District 3. The amount of revenue generated from leases, royalties, and rents would be very limited, and revenue related to production would not necessary be retained locally. Revenue from sales of goods to crews would be limited, sporadic, and short-term.

Cumulative Impacts: Cumulative impacts on socioeconomics within the project area would continue to occur because of Preserve operations, visitor use, hunting, development including oil and gas operations, commercial timber harvest, and the associated revenue with each of these impacts. An example of the latter would be residential or commercial development adding to the tax base of the area. The divestiture of timberlands surrounding the Preserve by traditional, integrated forest products companies could also affect socioeconomics of the area. All three of the major landholding neighbors to the Preserve, International Paper, Louisiana Pacific, and 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.

Additionally, oil and gas development is prevalent in the area. In RRC District 3, in which the Project is located, there are over 7,500 oil producing wells and over 4,500 gas producing wells. A total of nearly 3,000 oil and gas wells, or 25 percent of the district total, are located within the seven counties of the Preserve.

It is unclear what the cumulative effect to socioeconomics of institutional investment in timberlands and continued development of oil and gas resources adjacent to the Preserve would be. As impacts from the proposed directional wells are not expected to create more than a negligible impact on the local or regional economy, the implementation of the proposals is not expected to add cumulative impacts to socioeconomic values in the project area.

Conclusion: Because revenue from oil and gas production of the two wells would likely affect only a small number of people and their development would have such a small effect on the local and regional economies, socioeconomics were dismissed from further analysis in this EA.

1.4.2 Catastrophic Incidents, such as Well Blowouts, Well Fires, or Major Spills

One issue related to the proposed actions is the potential for catastrophic incidents, including well blowouts, well fires, or major spills. The RRC oversees the State's oil and gas industry, gas utilities, pipelines, safety in the liquefied petroleum gas industry, and surface mining and reclamation of coal and uranium. The RRC divides the states up into 12 Districts for purposes of administering and regulating oil and gas operations under its jurisdiction, and maintains statistics on blowout and well control problems, and spills. In this section, data are provided for calendar years 2011 and 2012 for incidents reported in RRC District 3, which includes Big Thicket National Preserve and would be representative of blowout events/well control problems, fires and spills that occur in or adjacent to the Preserve. RRC District 3 includes 29 counties in southeast Texas. Data are also presented for the seven counties within District 3 in which the Preserve is located.

As of September of 2012, there were approximately 7,697 oil producing wells and 3,733 regular gas producing wells in RRC District 3, totaling 11,430 wells. Of these wells, a total of 2,934 or 25 percent of the District total are located within the seven counties where the Preserve is located. These include 2,100 oil wells (27 percent of the District total) and 834 gas wells (22 percent of the District total). See <http://www.rrc.state.tx.us/data/wells/wellcount/index.php>.

Table 4 below, shows the number of reported well control problems, well fires, and major spills in RRC District 3 during calendar years 2011 and 2012. The source of this data is from the RRC website at <http://www.rrc.state.tx.us>.

Table 4. Well Control Problems, Well Fires, and Major Spills in RRC District 3 and the Seven Counties around Big Thicket National Preserve during 2011 and 2012

Type of Incident	No. of Incidents in RRC District 3 during 2011 and Rate of Occurrence	No. of Incidents in 7 Counties around Big Thicket National Preserve during 2011 and Rate of Occurrence	No. of Incidents in RRC District 3 during 2012 and Rate of Occurrence	No. of Incidents in 7 Counties around Big Thicket National Preserve during 2012 and Rate of Occurrence
Blowouts or Well Control Problems during Drilling Operations	6 1 well control problem per 1,834 wells per year	1 1 well control problem per 2,941 wells per year	2 1 well control problem per 5,716 wells per year	0 0 well control problems per 2,934 wells per year
Well Fires	1 1 well fire per 11,300 wells per year	1 1 well fire per 2,941 wells per year	1 1 well fire per 11,430 wells per year	0 0 well fires per 2,934 wells per year
Major Oil Spills (defined as exceeding 5 barrels)	3 1 major spill per 3,767 wells per year	1 1 major spills per 2,941 wells per year	9 1 major spill per 1,270 wells per year	7 1 major spill per 419 wells per year

Well Blowouts: The term “blowout” means the uncontrolled escape of formation fluids (water/brine, oil, gas) from a well. Given present day technology, a well blowout is extremely rare. According to RRC data, the vast majority of reports deal with well control problems that never manifested in full, sustained blowouts.

During 2011, there were six well control problems reported in RRC District 3, of which one was located in the counties where the Preserve is located. None of these incidents affected the resources and values in the Preserve. During 2012, there were two well control problems reported in RRC District 3, of which none were located in the counties where the Preserve is located. See <http://www.rrc.state.tx.us/data/drilling/blowouts/district3.php>.

Of the 34 directional wells drilled at the Preserve since 1986 for which the NPS issued a § 9.32(e) exemption determinations, the Comstock Black Stone B1 is the only well that reported well control problems. The well control problems reported by Comstock for the Black Stone B1 well did not result in a well blowout or well fire. During wireline operations to retrieve the measured well depth, the internal float on the drill string failed and the packoff on the wireline lubricator failed, resulting in oil-based drilling mud flowing up the drill pipe. The wireline was pulled out of the hole, the safety valve was shut in and the well was secured. No injuries or fatalities

occurred during the incident. The well control problems did not result in impacts off the well pad; and there were no impacts on the resources and values in the Preserve.

Well Fires: During 2011, there was one well fire that resulted from well control problems encountered during well drilling. The reported fire in RRC District 3 equates to 1 fire for every 11,300 wells per year. This fire occurred within the seven-county area where the Preserve is located. During 2012, one fire was reported in RRC District 3, but was not located in one of the seven counties where the Preserve is located.

Major Spills: The RRC defines “major spills” as those exceeding five barrels of oil and required reporting releases of that amount (Tex. Admin. Code Tit. 16, § 1.30 (2005)). During 2011, in RRC District 3, there were 3 spills reported greater than 5 barrels of oil, equating to approximately 1 spill for every 3,767 wells per year. One of the 3 spills was located in the seven counties where the Preserve is located.

During 2012, in RRC District 3, there were 9 spills reported greater than 5 barrels of oil, equating to approximately 1 spill for every 1,270 wells per year. A total of 7 of the 9 spills were located in the seven counties where the Preserve is located.

Any oil and gas operator that could reasonably be expected to discharge oil in harmful quantities, as defined in 40 CFR 110.3, into navigable waters, as defined by 40 CFR 110.1, is required to have a Spill Prevention, Control, and Countermeasure Plan (SPCC Plan) in accordance with 40 CFR Part 112. Some of the specific requirements that an operator of onshore oil drilling and workover facilities must adhere to under 40 CFR 112.14, SPCC Plan requirements for onshore oil drilling and workover facilities, include:

- Meet the general requirements listed under Sec. 112.7, and also meet the specific discharge prevention and containment procedures listed under this section.
- Position or locate mobile drilling or workover equipment so as to prevent a discharge as described in Sec. 112.1(b).
- Provide catchment basins or diversion structures to intercept and contain discharges of fuel, crude oil, or oily drilling fluids.
- Install a blowout prevention (BOP) assembly and well control system before drilling below any casing string or during workover operations. The BOP assembly and well control system must be capable of controlling any well-head pressure that may be encountered while that BOP assembly and well control system are on the well.

Due to these requirements, in the rare event of a major spill consisting of five or more barrels of oil, the spill would be rapidly contained and removed, so that impacts are short-lived and limited to the immediate area of operations. In the event that a spill did occur and did spread into the Preserve, the impacts could be remedied and mitigated over time. In the rare event that spilled substances from a well blowout or major spill would be transported into the Preserve, or a well fire would spread into the Preserve, the NPS would seek damages and restoration costs under the Park System Resources Protection Act, 16 U.S.C. § 19jj (2005). While applicability of the Park System Resources Protection Act would be applied only after damages to the Preserve’s resources or values have occurred, this tool is also an effective deterrent for operators to apply the necessary preventative measures to prevent an incident from affecting the Preserve.

Analysis of impacts from reasonably expected spill incidents, which would not reach the magnitude of a reportable major spill consisting of five or more barrels of oil, is presented under other impact topics in Sections 1 and 3 of this EA.

Impacts from In-Park Operations: Under the Proposed Action, the two directional wells would be drilled from one well pad located outside the Unit boundary. The proposed in-park operations, consisting of the directionally drilled wellbores crossing into the plane of the Unit at depths below the usable quality groundwater zone and extracting hydrocarbons and other fluids from beneath the Unit, would have no impact on the surface regardless of what methods and materials Century uses to drill, case, cement, or plug and abandon the section of the holes inside the Unit. Likewise, if the well(s) are produced, any methods of completion, stimulation, or injection that occur inside the Unit would not pose a substantial threat of damage to park resources. Surface subsidence caused by fluid withdrawals is not a reasonable expectation because of the properties (depth, porosity, compaction, hydropressure, etc.) of the target reservoirs and adjacent overlying sediments. Fracture of geologic formations with resultant usable quality water zone contamination is not an issue in the § 9.32(e) determination because activities inside the Preserve would occur below the deepest usable quality water zone. Further, in-park operations would have no potential for well-blowouts, well fires, or major spills.

Impacts from Connected Actions: The NPS recognizes that unplanned incidents associated with oil and gas operations such as well blowouts, fires, and major spills near the boundaries of the Preserve present a risk of damage to park resources and values. However, the rates of occurrence for such incidents are low and are not a reasonable expectation of project implementation. If such an incident did occur, required mitigation measures provided in Century's application would reduce the potential for spilled substances or a well fire to spread into the Preserve, and would provide for timely response and cleanup. Therefore, there is a reasonable expectation that the spill would be confined to the well pad, or, if it did reach the Preserve, that the natural environment could be reclaimed or would otherwise recover over time so that impairment would not occur. In the event that Preserve resources or values would be damaged, the NPS could seek remedy both on the ground and in the form of monetary compensation. Any further analysis on this topic would be highly speculative.

Cumulative Impacts: Cumulative impacts related to this topic can be assessed by examining relevant data for wells located within the counties that contain the Preserve. There are very low rates of occurrence for all three types of incidents, ranging from 1 well fire to 1 major spill reported in 2011 out of a total of 11,300 wells in service. Cumulatively, the addition of two directional well bores from one surface location in this proposed action would not add more than negligible effects to these regional incident statistics.

Conclusion: Because there would be no potential for a catastrophic incident occurring as a result of the in-park operations of the directional wells, and because the likelihood of such incidents from the connected actions is very low, it is not expected that catastrophic incidents, such as well blowouts, well fires and major spills in and outside the Unit, would result in more than negligible impacts, and this topic was dismissed from further analysis in this EA.

1.4.3 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 United States Census Bureau, Orange County is not considered "low income" as <20% of their residents are below the poverty level (13.6% per the United States Census Bureau, 2011). Orange County consists predominately of white persons, comprising 88.0% of the total population. Furthermore, the proposed action

would not have disproportionate health or environmental effects on the community and therefore, environmental justice was dismissed as an impact topic in this EA.

1.4.4 Prime or Unique Farmland Soils in the Unit

As a result of a substantial decrease in the amount of open farmland, Congress enacted the Farmland Protection Policy Act (Public Law 97-98). In August 1980, the Council on Environmental Quality directed that Federal agencies must assess the effects of their actions on prime or unique farmland soils classified by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS). Prime or unique farmland is defined as soil that particularly produces general crops such as common foods, forage, fiber, timber, and oil seed; unique farmland is defined as soil that produces specialty crops such as fruits, vegetables, and nuts. Prime and unique farmland soils are those that are actively being developed and could be converted from existing agricultural uses to nonagricultural purposes, as described above. Urban or built-up land, public land, and water areas cannot be considered prime farmland.

Soils inside the Unit cannot be considered prime and unique farmland soils because they are public lands unavailable for food or fiber production. The Farmland Protection Policy Act only applies to direct Federal actions and does not apply to the connected actions identified in this EA (that is, the surface disturbances outside the Unit).

Because there are no prime and unique farmland soils in the Unit, and the Farmland Protection Policy Act does not apply to private projects on private properties, this impact topic was dismissed from further analysis in this EA.

1.4.5 Geology and Soils

The geology and soils within the Preserve adjacent to the proposed wells were examined to determine if more than negligible effects could occur from either in-park or connected actions (NRCS, 2013). The soils at the surface location outside of the Preserve are described as Bienville-Camptown complex (BtA). The soils at the Wile E. Coyote and Phineas 3 wells are described as Bleakwood loam (BwA) and Estes clay (EsA), respectively. The characteristics of each of these are further described below.

Bienville-Camptown complex is comprised of both the Bienville series as well as the Camptown series. The Bienville series consists of very deep, somewhat excessively drained, moderately rapidly permeable soils. Slope is dominantly 1 to 3 percent, but ranges from 0 to 5 percent. Bienville soils are listed as non-hydric by the NRCS. The Camptown series consists of very deep, very poorly drained and ponded soils. These nearly level soils are in long and narrow relict stream meander channels and depressions. Slope ranges from 0 to 1 percent but mainly less than 1 percent. Camptown soils are listed as hydric by the NRCS.

Bleakwood soils consist of very deep, poorly drained, moderately permeable soils on floodplains. Slopes range from 0 to 2 percent. Bleakwood soils are listed as partially hydric by the NRCS. Estes soils consist of very deep somewhat poorly drained soils with high runoff. Estes soils occur on floodplains with slopes ranging from 0 to 1 percent.

Impacts from In-Park Operations: Under the Proposed Action, both wells would be directionally drilled into the Preserve at substantial depths under the land surface from a privately owned surface location approximately 1,301 feet from the Beaumont Unit boundary. The Phineas 3 wellbore would cross into the Unit at a depth of 7,139 feet true vertical depth (TVD) to a target depth of approximately 11,100 feet TVD, extracting minerals from beneath the Unit. The Wile E. Coyote well would be directionally drilled from the same surface location

(different azimuth) approximately 1,301 feet from the Beaumont Unit boundary and the wellbore would cross into the Unit at a depth of 7,740 feet TVD to a target depth of 11,100 feet TVD, extracting minerals from beneath the Unit. Therefore, based on these depths below the surface of the Preserve, there would be no impacts on the geology and soils within the Preserve from the in-park subsurface operations proposed for any of the wells.

Impacts from Connected Actions: To evaluate whether the proposed activities outside the Preserve could impact geology and soils in the adjacent Unit, the NPS considered the potential for surface subsidence caused by the production of hydrocarbons and the potential for contamination of adjacent lands from operations outside the Preserve. For this, the NPS examined types and volumes of contaminants that would be present at the well/production site, the probability of release, and the potential for migration into the Unit.

The potential for subsidence is not a concern in the vicinity of the Preserve. The hydrocarbon producing zones are deep and have moderate porosity. There is a long history of oil and gas production in the area without evidence of subsidence occurring.

The potential for runoff of contaminants onto Preserve soils was evaluated for the project area. There is very little potential for impacts to geology and soils in the Preserve at the surface location.

The potential for runoff of contamination to offsite soils was considered for all phases of oil and gas development: construction, drilling, production, and plugging/reclamation. The effects from the connected actions to geology and soils would be primarily associated with surface impacts from vehicle use, construction, drilling, and fluid transport at the well pad. Construction operations would require clearing of land, removal of vegetation, and disturbance of soils, especially at the well pad. During rain events, runoff containing sediment or oils from construction equipment could reach adjacent lands. Drilling and production could result in releases of hydrocarbons, produced waters, or treatment chemicals, which could runoff to neighboring properties, along with soil from bare areas on the pad. No major spills would be likely, as previously described (see “Catastrophic Incidents”, above). Plugging and reclamation would provide for regrading of soils and revegetation, but runoff and the potential for off-site contamination would persist until the sites were totally reclaimed and any cleanup completed.

However, the potential for runoff to reach lands inside the Preserve would be remote, based on site topography and the mitigation measures that Century has committed to for all phases of the operation. The site is relatively flat, and with low gradient sheet flow drainage toward the Unit with the overall pathway of migration into the Unit being over 1,300 feet. Mitigation would include constructing a berm around the well pad, constructing a washout/emergency pit, using a closed-loop containerized mud system, reducing the size of the well pad after drilling completion, constructing a 2-foot berm around the tank battery, and adherence to a SPCC Plan. Erosion control measures would include the use of mulching, seeding, silt fences, and hay bales (see Table 6 for a complete list of mitigation). Reclamation would include restoring the site to original contours, removal of any contaminated soils, replacing topsoil, and revegetation. Based on these measures and site conditions, there would be a low potential for migration of contaminants into the Unit; and if it were to occur, there would be ample time and space to respond to even a major release before there would be impacts on geology and soils in the Unit. The potential for adverse impacts to soils and geology in the Unit would be negligible from the development of the Phineas/Ferb wells over the short or long-term.

Cumulative Impacts: Vehicle uses, existing and future oil and gas operations in and outside the Preserve, maintenance of transpark oil and gas pipelines, routine park operations, forestry

operations adjacent to the Preserve, and continued land development near the Preserve boundary would all contribute to cumulative impacts on geology and soils in the Preserve. The cumulative effect of drilling and producing the up to 40 wells projected in the RFD scenario was considered in the Preserve's *Oil and Gas Management Plan Environmental Impact Statement* (NPS, 2005), and negligible to minor cumulative impacts were identified for this impact topic. Overall, the proposed actions would contribute negligible adverse effects to the cumulative impacts on geology and soils in the Preserve.

Conclusion: Because impacts on the Preserve's geology and soils from in-park oil and gas operations, and impacts from the connected actions would be negligible based on the flat site topography and mitigation that would help to confine any releases to the site, the topic of geology and soils in the adjacent Unit of the Preserve was dismissed from further analysis in this EA.

1.4.6 Water Resources: Groundwater, Streamflow, Floodplain and Wetlands

The Phineas/Ferb surface location is an existing well pad located within recently harvested timberlands. The area is very flat with little to no slope. The nearest waterbodies are the backwaters of the Neches River and are located more than 2,000 feet from the well pad. Because this is an existing well pad and access road, and Century would implement all of the mitigation measures described above for geology and soils that would prevent contaminated fluids and sediments from leaving the site, there would be no additional impacts to floodplains, wetlands, special aquatic sites, or "other waters of the United States" in or outside of the Beaumont Unit.

Impacts from In-Park Operations: Under the Proposed Action, the wells would be directionally drilled from outside the Preserve and the wellbores would cross into the Unit at substantial depths, as described under "Geology and Soils", above. Therefore, there would be no impacts on groundwater quality as a result of the wells.

Impacts from Connected Actions: The Phineas/Ferb surface location is on an existing well pad and accessed by an existing road; therefore, there would not be any additional impacts to wetlands or waterbodies. Century's proposed surface casing and cementing program, site location, site design, and mitigation measures that would be implemented at the surface location during drilling, and production activities are designed to confine impacts to the well pad further preventing impacts to water resources.

Cumulative Impacts: Vehicle uses, existing and future oil and gas operations in and outside the Unit, maintenance of transpark oil and gas pipelines, routine park operations, forestry operations adjacent to the Unit, and land development near the Unit boundary could contribute to cumulative impacts on water resources, floodplains or wetlands in and around the Beaumont Unit. An analysis of the cumulative effect of drilling and producing the up to 40 wells projected in the RFD scenario was performed in the Preserve's *Oil and Gas Management Plan Environmental Impact Statement* (NPS, 2005), and up to moderate impacts were identified from all actions that could affect water resources, floodplains and wetlands in the cumulative impacts analysis area. The effects of the proposed action would not contribute more than negligible adverse impacts to the overall cumulative impact of all these actions in the region.

Conclusion: There would be no impacts from the wells on water resources from in-park oil and gas operations, and impacts from the connected actions would be negligible based on the lack of water resources at the site, mitigation to prevent off-site contamination, and the low chance of catastrophic release. Therefore, the topic of water resources, streamflow, floodplains, and wetlands in the Beaumont Unit was dismissed from further analysis in this EA.

1.4.7 Fish and Wildlife

The abundant and diverse vegetation of the Preserve supports terrestrial habitats for a variety of wildlife. Wildlife species in the area “are typical deciduous forest assemblages from the eastern and southeastern United States and resemble in some degree wildlife in sub-tropical forest communities. The diverse wildlife assemblages of this region are a result of numerous factors including topography, climate, hydrologic regimes, soil type, and physiography (Frasier Group, 1998). Between about fifty and sixty species of mammals are either documented or believed to inhabit the Preserve (Cooper, et al. 2004). Birds are the most visible and diverse group of vertebrate fauna found in the Preserve. Currently, while no comprehensive survey of avifauna has been conducted, 176 species have been documented in the Preserve (Ibid). Approximately 85 species of reptiles and amphibians could inhabit the Preserve (NPS, 2005).

All areas of proposed activity would be situated in areas with a history of extensive land disturbance, including agriculture and commercial forest management. Due to the decreased diversity of vegetation in species, spatial and temporal composition, periodic clearing, lack of high quality food in the understory, and lack of aquatic habitat, it is anticipated that the project areas adjacent to the Preserve would support a low diversity of wildlife. The process of cutting and regrowth provides opportunities for some species, such as edge or grassland dependent species during the initial years after harvest, while detracting from the habitat of others. Schmidly et al. (1979) noted this phenomenon in small mammals at the Preserve, and also observed that the practice of clear-cutting during harvest reduced diversity in those taxa. Typical species that inhabit these areas include such mammals as raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), gray foxes (*Urocyon cinereoargenteus*), eastern cottontail rabbits (*Sylvilagus floridanus*), Virginia opossum (*Didelphis virginiana*), coyotes (*Canis latrans*), beaver (*Castor canadensis*) and white-tailed deer (*Odocoileus virginianus*), which are often found in relatively disturbed or urbanized settings and are generally distributed throughout Texas.

Animals that inhabit the outer boundaries of the Preserve, however, have become somewhat accustomed to nearby disturbances and noise, since forestry operations and other uses occur in close proximity to the Preserve.

Impacts from In-Park Operations: Under the Proposed Action, both wells would be directionally drilled at substantial depths beneath the Unit. Due to the distance of the well pad from the Preserve, there would be no impacts on wildlife either inside or outside the Unit from the subsurface operations associated with the wells.

Impacts from Connected Actions: Impact to wildlife in and outside the Unit resulting from drilling would include continual disturbance from noise and artificial lighting until drilling is completed. Elevated noise could displace wildlife or disrupt wildlife feeding, denning, nesting, and reproduction, but most displaced wildlife is expected to return to the areas after becoming acclimated to some noise disturbance. Displaced wildlife could increase competition in adjacent areas over the short-term. Additional long-term impacts to wildlife could occur during the production of the wells from the potential use of compressors; however, Century’s proposed mitigation measure to use hospital-grade mufflers would minimize this impact allowing wildlife in the area to become acclimated over time. Based on the lack of high quality habitat in the project area, the short-term nature of high noise drilling operations, implementation of mitigation measures during well production, and the low potential for leaks or spills to migrate offsite to surrounding habitats, impacts to wildlife inside and outside the Unit would be localized, short-term, minor, and adverse.

Cumulative Impacts: Vehicle uses, existing and future oil and gas operations in and outside the Unit, maintenance of transpark oil and gas pipelines, routine park operations, recreational activities including hunting in and outside the Unit, forestry operations adjacent to the Unit, and residential, commercial, and industrial development, with the associated clearing of vegetation and long-term loss of habitat, would result in minor, adverse impacts on wildlife in the area of analysis. An analysis of the cumulative effect of drilling and producing the up to 40 wells projected in the RFD scenario was performed in the Preserve's *Oil and Gas Management Plan Environmental Impact Statement* (NPS, 2005) and up to minor adverse impacts were identified from all actions that could affect wildlife in the cumulative impacts analysis area. Other actions taken within the area of analysis to protect wildlife resources of the Preserve and on adjacent lands through planning and/or permitting requirements are expected to maintain or improve some habitat for certain species, with cumulative beneficial effects. As a result of all these actions, cumulative impacts to wildlife within the analysis area are anticipated to be long-term, localized to widespread, minor, and adverse.

Conclusion: Production and plugging/reclamation activities associated with the wells would cause localized and short- to long-term increases in artificial noise and light associated with vehicle traffic and heavy equipment, resulting in short- to long-term, negligible to minor adverse impacts. Production impacts would be short- to long-term and minor due to the ongoing disturbance at the sites and occasional workovers. However, due to the distance of the well pad from the Preserve boundary, there would be no impacts to wildlife from connected actions within the Preserve. Additionally, there would be no impacts to fish and wildlife from in-park actions because of the depth at which those actions would occur. Cumulative effects to wildlife are expected to be long-term, localized to widespread, negligible to moderate, and adverse. Therefore, the impact topic of fish and wildlife both inside and outside of the Beaumont Unit was dismissed from further analysis in this EA.

1.4.8 Vegetation

Impacts on vegetation would occur from the proposed action both outside the Unit as well as on land located within the Unit if runoff occurs (similar to impacts to soils and geology discussed above).

The Phineas/Ferb well pad is existing and would not require additional clearing. Therefore their use would have no additional impact on vegetation outside of the Preserve. Through the implementation of mitigation measures discussed in "Water Resources" above, impacts to vegetation within the Preserve from activities outside of the Preserve would be minimized.

Impacts from In-Park Operations: Under the Proposed Action, both wells would be directionally drilled into the Preserve at substantial depths under the land surface, as described under "Geology and Soils". There would be no impacts on vegetation either within or outside of the Preserve from the in-park subsurface oil and gas operations proposed for the wells.

Impacts from Connected Actions: The possible impacts to the vegetation inside the Preserve from all phases of development would be similar to those described above under "Geology and Soils" and "Water Resources" for both the wells, with the primary concern being off-site migration of contaminants and sediment that could adversely affect adjacent vegetation. Hydrocarbons, chemicals and produced water can damage or kill vegetation, and soils and sediment can smother plants or coat leaves. As previously described, topography at the project area is relatively flat and located more than 1,300 feet from the Preserve boundary.

Mitigation that would reduce impacts to offsite vegetation would be similar to those measures listed for “Geology and Soils” and includes spill prevention and control planning, berms, erosion control measures, and self-contained systems. There would be a low potential for migration of contaminants into the Preserve; and if this were to occur, there would be ample time and space to respond to even a major release before there would be impacts on vegetation in the Preserve. For these reasons, and with the application of mitigation measures, potential adverse impacts to vegetation in the Preserve from development of the wells over the short-and long-term are expected to be negligible to minor.

Cumulative Impacts: Existing and future oil and gas operations outside the Unit, maintenance of transpark oil and gas pipelines, and especially forestry operations adjacent to the Unit would contribute to cumulative impacts on vegetation. An analysis of the cumulative effect of drilling and producing the up to 40 wells projected in the RFD scenario was performed in the Preserve’s *Oil and Gas Management Plan Environmental Impact Statement* (NPS, 2005), and up to moderate adverse impacts were identified from all actions that could affect vegetation in the cumulative impacts analysis area. The effects of the proposed action would not contribute more than negligible adverse impacts to the overall cumulative impact of all these actions in the region.

Conclusion: There would be no impacts on vegetation from in-park oil and gas operations associated with the wells. Impacts from connected actions would be negligible based on the low chance of a catastrophic release, mitigation to prevent releases and offsite contamination, and the relatively flat topography and low runoff potential. Therefore, the topic of vegetation both inside and outside of the Beaumont Unit was dismissed from further analysis in this EA.

1.4.9 Threatened and Endangered Species and Other Species of Management Concern

Under the Endangered Species Act of 1973 (ESA), the NPS has responsibility to address impacts to federally-listed, candidate, and proposed species. Also, NPS policy requires that State-listed species, and others identified as species of management concern by the park, are to be managed in parks in a manner similar to those that are federally-listed. The Preserve does not have any species of management concern identified. Thus, Federal and State-listed species will be addressed in this EA following Federal law and NPS policy.

Under NPS policy, the proposed wells would qualify for an exemption with no mitigation. Directional drilling of the wells is not considered a federal action. Under this scenario, actions by the NPS with respect to the Endangered Species Act (1973) are non-discretionary. The directional wellbores would originate on land located outside of the Unit, and would cross through the Unit at a sufficient depth to preclude any effect on surface resources (species or habitat). Therefore, the NPS has no Endangered Species Act Section 7 responsibility or authority associated with the proposed wells, other than assessing potential impacts to threatened and endangered species from connected actions outside the Preserve.

There are no federally-listed threatened, endangered, or candidate species in Orange County. Appendix B contains current listing by the Texas Parks and Wildlife Department (TPWD) of threatened, endangered, or state-identified rare species that may occur in Orange County. The state list includes a brief description of the habitats required by these species. There is no federally-designated critical habitat in or near the Preserve.

Impacts from In-Park Operations: Under NPS policy, the proposed wells would qualify for an exemption with no mitigation. The wellbores would originate on land located outside of the Unit, and would cross through the Unit at a sufficient depth to preclude any effect on surface resources. Therefore, the NPS has no Section 7 responsibility or authority associated with the

proposed well; however, an assessment of impacts from in-park operations shows that there would be no impacts on threatened or endangered species in the Unit from the subsurface oil and gas operations.

Impacts from Connected Actions: The Preserve has not documented any federally or state-listed threatened or endangered species in the area of the proposed well. Century retained Perennial Environmental Services, LLC (Perennial) to conduct an endangered species survey of the areas surrounding the existing well pad. In addition to their general habitat review, site reconnaissance was performed to determine if any listed species were observed at the proposed sites. Field investigations were conducted on February 27 and 28, and March 6, 2013. There were no indications of any state or federally-listed threatened or endangered species found on or in the vicinity of the project site.

The design of Century's proposal would avoid any surface disturbance of habitat in the Preserve. Thus, no federally-listed, candidate or proposed species, nor state-listed species, on or within the Preserve would be directly impacted by the proposal through removal or disturbance of soils or vegetation. Less direct, yet potential impacts to species occupying the Unit could occur through noise disturbance, loss and fragmentation of habitat on adjacent private lands, and potential for spills of oil and other produced fluids. However, as previously described, the potential for more than short-term disturbances from noise or contaminating substances is unlikely, based on site conditions and mitigation employed to reduce risk of runoff. Mitigation for potential oil spills which could affect habitat in the Unit is included in Century's SPCC Plan.

The NPS determined that the directional drilling of the well would have no effect on federally-listed threatened and endangered species or their habitat in or outside the Preserve, nor would there be an effect to the state-listed species that could occur within the Preserve. This determination is based upon a combination of several factors. First, the habitat in the areas surrounding the project area is marginal. Second, there is an absence of observations of any listed species documented in Appendix B or Preserve records based on site-specific surveys completed by the proponent. Lastly, mitigation measures would be implemented to reduce impacts to wildlife.

Cumulative Impacts: Vehicle uses, existing and future oil and gas operations in and outside the Preserve, maintenance of transpark oil and gas pipelines, routine park operations, recreational activities including hunting in and outside the Preserve, and forestry operations adjacent to the Preserve could impact threatened or endangered species, and other species of management concern. Over time, protection provided to species of management concern would maintain and improve habitat for those species in the Preserve, resulting in cumulative beneficial impacts. An analysis of the cumulative effect of drilling and producing the up to 40 wells projected in the RFD scenario was performed in the Preserve's *Oil and Gas Management Plan Environmental Impact Statement* (NPS, 2005), and up to moderate adverse impacts were identified from all actions that could affect threatened and endangered species in the cumulative impacts analysis area. Considering the lack of habitat for listed species at the proposed project location and the fact that the surveys conducted found no listed species, the effects of the proposed action would not contribute more than negligible adverse impacts on the overall cumulative impact on species of management concern.

Conclusion: The NPS, in consultation with the USFWS, has concluded that the impacts from in-park oil and gas operations and the connected actions would have no effect on federally-listed threatened and endangered species or their habitat in or outside the Unit, nor would there be an effect on any state-listed species within the Unit from connected actions, based on the lack

of habitat for these species at the sites, field survey results that indicate these species are not present, and mitigation that would minimize impacts to wildlife in general. Therefore, the topic of species of management concern in and outside the Unit was dismissed from further analysis in this EA.

1.4.10 Cultural Resources

Under § 106 of the National Historic Preservation Act of 1966, as amended, the NPS has a responsibility to consider the effects undertakings may have on cultural resources listed on or eligible for listing on the National Register of Historic Places. The law also requires that agencies discuss their actions, before taking them, with the State Historic Preservation Office or Tribal Historic Preservation Officer, the Advisory Council on Historic Preservation, if necessary, as well as other consulting parties, such as certified local governments.

As with the Endangered Species Act, the wells would be directionally drilled from a surface location outside of the Preserve and would cross the park boundary at sufficient depths as to not impact the surface or shallow subsurface areas within the Preserve that could contain cultural resources. Under this scenario, actions by the NPS with respect to the National Historic Preservation Act are non-discretionary. Impacts from in-park operations for the wells are dismissed from further analysis, along with impacts outside of the Preserve because the well pad is existing.

Impacts from In-Park Operations: There is no potential for surface or subsurface impacts within the Preserve from operations occurring inside the Preserve. Therefore, in-park operations would have no effect on cultural resources.

Impacts from Connected Actions: As part of the NEPA analysis, the NPS also considered the impacts of the connected actions on cultural resources in and outside the Preserve. The NPS has no authority under 36 CFR § 9B to require archaeological surveys on land adjacent to the Preserve; however, Century contracted Perennial to perform site-file reviews of the area to identify the likelihood of cultural resources being in the project area. Perennial archaeologists determined that due to the results of previous surveys in the area and the highly disturbed nature of the area resultant from timber harvesting, the project would not impact cultural resources on the land adjacent to the Preserve.

The possible impacts to the cultural resources inside the Preserve from all phases of development would be similar to those described above for “Geology and Soils” for the wells, with the primary concern being offsite migration of contaminants that could adversely affect cultural resources. Hydrocarbons, chemicals, and produced water could damage cultural artifacts. As previously described, the topography is relatively flat and more than 1,300 feet from the Preserve boundary.

Mitigation that would reduce impacts to offsite cultural resources would be similar to those measures listed for “Geology and Soils” and includes spill prevention and control planning, berms, erosion control measures, and self-contained systems (see Tables 6, 7, and 8). There would be a low potential for migration of contaminants into the Preserve; and if this were to occur, there would be ample time and space to respond to even a major release before there would be impacts on previously discovered cultural resources in the Preserve. It is possible that undiscovered cultural resource sites exist outside the Preserve, but the mitigation measures discussed above are expected to confine potentially adverse impacts to site. Therefore, adverse impacts to cultural resources in and outside the Preserve are not expected from the development of the wells.

Cumulative Impacts: Vehicle uses, existing and future oil and gas operations in and outside the Preserve, maintenance of transpark oil and gas pipelines, routine park operations, recreational activities including hunting in and outside the Preserve, and forestry operations adjacent to the Preserve could impact cultural resources in the analysis area; however, compliance with the National Historic Preservation Act is anticipated to result in projects undertaken within the Unit having no adverse effect. Over time, cultural resources outside the Unit could be incrementally lost, with cumulative adverse impacts on cultural resources and traditional cultural practices in the region. An analysis of the cumulative effect of drilling and producing the up to 40 wells projected in the RFD scenario was performed in the Preserve's *Oil and Gas Management Plan Environmental Impact Statement* (NPS, 2005), and up to moderate adverse impacts were identified from all actions that could affect cultural resources in the cumulative impacts analysis area. However, since no adverse impacts to cultural resources are expected in the Preserve and outside the Beaumont Unit, the effects of this part of proposed action represent a negligible and short-term contribution to the overall cumulative impact of all actions in the region.

Conclusion: Because there would be no cultural resources affected in the Preserve from in-park operations or connected actions; and there would similarly be only short-term, negligible effects to cultural resources in the project area on lands adjacent to the Beaumont Unit, the topic of cultural resources was dismissed from further analysis in this EA.

1.4.11 Visitor Use and Experience

Few visitors would be expected in the Unit near the proposed surface location, since there are few visitor use developments or amenities within the areas of the Preserve adjacent to the well pad. The primary visitor use that would occur within the Beaumont Unit in the vicinity of the well pad would be canoeing.

Impacts from In-Park Operations: Under the proposed actions, the wells would be directionally drilled from a surface location 1,300 feet from the boundary of the Preserve. The wellbores would cross into the Preserve at considerable depths (see "Geology and Soils"). Therefore, there would be only short-term, negligible adverse impacts on visitor use and experience within the Preserve from the subsurface oil and gas operations in the Preserve.

Impacts from Connected Actions: It is unlikely that many visitors would be in the vicinity of the proposed drilling and production activities. The areas adjacent to the site are not located in high visitor use areas of the Preserve and construction and production activities would be more than 1,300 feet from the Preserve boundary. Impacts to Preserve visitors from connected actions could include the effects of releases of contaminants from the sites. The potential for contamination of offsite areas is very low, as described under "Geology and Soils", "Vegetation", and "Water Resources". The possibility of catastrophic release was dismissed, based on the frequency of recent occurrences in the area. Also, Century has included several mitigation measures to lessen potential impacts to Preserve visitors, primarily spill prevention and control planning. Regarding noise impacts to nearby visitors, the effects of connected actions on the natural soundscape which can indirectly affect visitor experience are addressed in detail in Section 4. Therefore, based on the low visitation in these areas, the distance of operations from the Preserve boundary, and the low potential for health and safety issues, impacts on visitor use and experience in the Preserve from connected actions are not anticipated.

Cumulative Impacts: Vehicle uses, existing and future oil and gas operations in and outside the Preserve, maintenance of transpark oil and gas pipelines, routine park operations, recreational activities including hunting in and outside the Unit, and forestry operations adjacent to the Unit

are anticipated to result in localized, short- to long-term, negligible to minor, adverse impacts on visitor use and experience. An analysis of the cumulative effect of drilling and producing the up to 40 wells projected in the RFD scenario was performed in the Preserve's *Oil and Gas Management Plan Environmental Impact Statement* (NPS, 2005), and negligible cumulative adverse impacts were identified for this impact topic. The effects of the proposed action would not contribute adverse impacts to overall cumulative impact of all actions in the region, as the project is not anticipated to affect visitor use and experience.

Conclusion: Based on the lack of visitors in these areas, the distance of the operations from the Preserve, the mitigation measures that would prevent releases of contaminants, and the low chance of a catastrophic release that would reach the Preserve, there would be only short-term, negligible adverse impacts on visitor use and experience in the Preserve from in-park oil and gas operations, or from the connected actions (noise). In addition, impacts to soundscapes were retained as an impact topic and are analyzed in Section 4, which further considers impacts to visitors from noise sources. Therefore, the topic of visitor use and experience in the Unit was dismissed from further analysis in this EA.

1.4.12 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 3). Mitigation strategies are identified, including restricting the use of artificial lighting only where necessary 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.

The existing lightscape surrounding the proposed project area represents an increase in artificial light of 900 to 26,999 percent from natural conditions between zenith and 45 degrees (Cinzano, et al. 2001; see Figure 4).

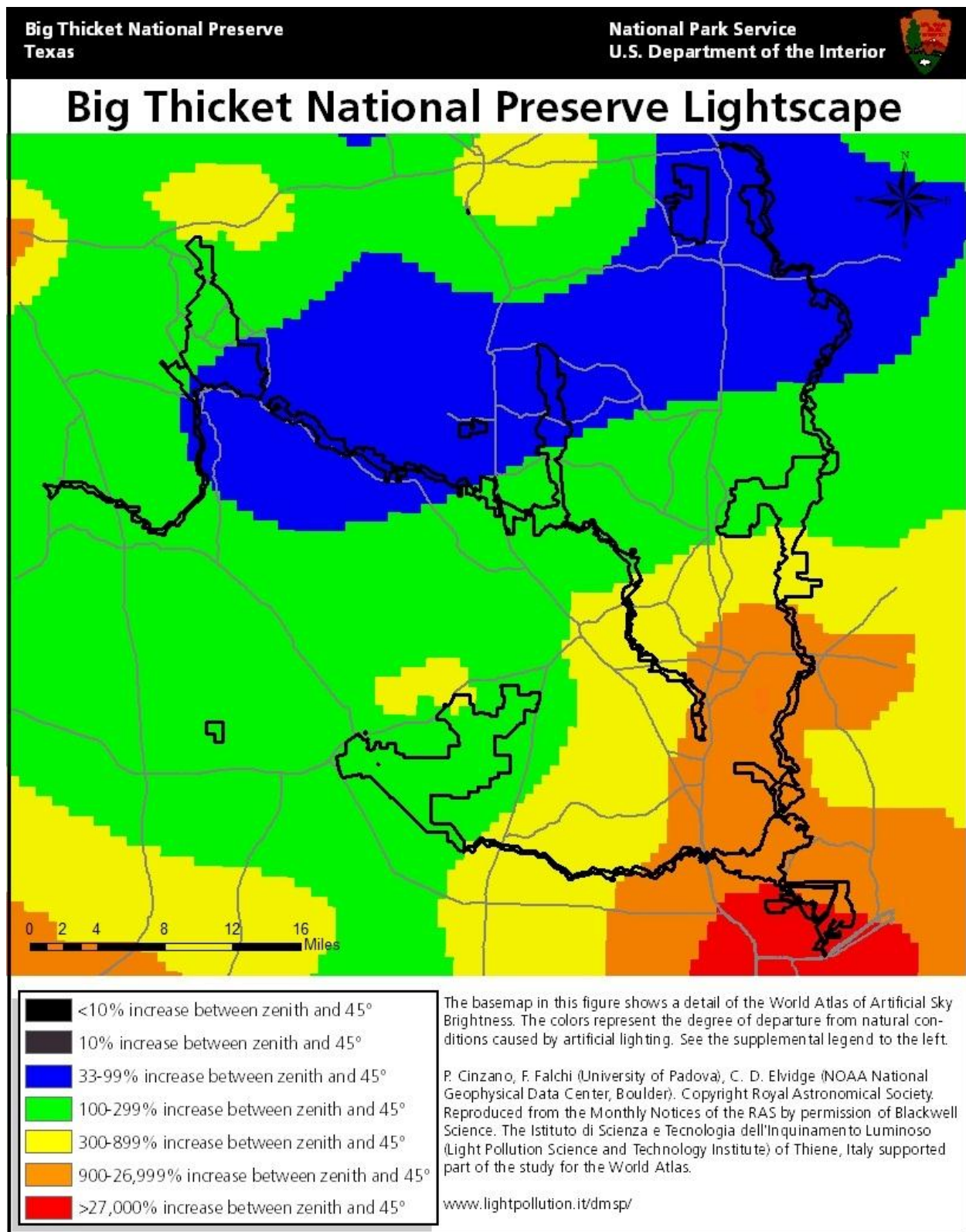
Impacts from In-Park Operations: Under the Proposed Action, all in-park operations would occur at substantial depths beneath the Unit. As a result there would be no impacts on the Unit's lightscapes from the subsurface operations in the Unit.

Impacts from Connected Actions: Impacts to the lightscapes within the Unit could occur from the use of lights, primarily during drilling operations, which require continuous operation until they are complete. Lights must be utilized during drilling for safety purposes; however, Century proposes to use hooded construction lights to minimize light pollution in the area. As a result of Century's proposed mitigation measures and the distance of the well drilling operations from the Unit, impacts to lightscapes in and outside the Unit would be short-term, minor, and adverse.

Cumulative Impacts: Cumulative impacts to lightscares would continue to result from a variety of light sources, including new development, commercial timber activities, roadway vehicle traffic outside the Unit, and existing oil and gas operations and industrial facilities outside the Unit. 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. An analysis of the cumulative effect of drilling and producing the up to 40 wells projected in the RFD scenario was performed in the Preserve's *Oil and Gas Management Plan Environmental Impact Statement* (NPS, 2005). No major adverse impacts were identified for this impact topic which was analyzed under the heading "Visitor Use and Experience." 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, and adverse due to the greatly degraded nature of the existing lightscape in the area.

Conclusion: Under the Proposed Action, there would be no impacts to lightscares from in-park operations and only short-term, minor, adverse impacts from connected actions. Additionally, due to the already degraded nature of the existing lightscares in the area, the intensity of the effects contributed to the cumulative impacts would be negligible. Therefore, the topic of lightscares in and outside the Unit was dismissed from further analysis in this EA.

Figure 3. Map of Lightscares in Big Thicket National Preserve



1.4.13 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 (SO₂), 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 (SO₂), nitrogen dioxide (NO₂), 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. None of the project areas are designated as nonattainment areas (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 In-Park Operations: In-park operations consist of the directionally drilled wells into the plane of the Unit at several thousand feet below the surface and extracting hydrocarbons and other fluids from beneath the Unit. These subsurface actions would have no impact on the surface air quality regardless of what methods and materials Century uses to drill, case, cement, or plug and abandon the section of the hole inside the Unit. Therefore, there would be no impact to the air quality in or outside the Unit from in-park operations.

Impacts from Connected Actions: The use of vehicles and other machinery used to drill the wells would result in increased particulates in the vicinity of the activities. Emissions of particulate matter, NO_x, CO, CO₂, and SO₂ would be greatest during the short-term (45 days) drilling operations due to increased use of vehicles and large gasoline and diesel engines used to power the drill rig, pumps, and auxiliary equipment during the entire period of drilling. Large diesel engines which are used to power the drill rig, pumps, and auxiliary equipment emit NO_x, and smaller amounts of CO and hydrocarbons. Some SO₂ would be emitted due to the burning of gasoline and diesel fuels (which contain minor amounts of sulfur). The amount of engine emissions would depend on the drill rig size, percent sulfur in the fuel used, gallons of fuel burned per hour, the hours per day, number of days the rig operates, and the use of any emissions control devices.

Hydrogen sulfide could be encountered and released during drilling operations. Past operations in the Preserve have not encountered H₂S bearing zones. Texas RRC Statewide Rule 36 applies to operations in H₂S areas. The rule does not apply where concentrations in the system are less than 100 ppm, and the amount projected is much less than this limit. For all wells, if zones containing H₂S under pressure are encountered, the drilling mud system is adjusted to prevent

the release of H₂S and drilling is discontinued until the pressure is stabilized and there is no gas entering the hole. The small amount of gas that could reach the surface is vented and flared.

Depending on atmospheric conditions, the effects to air quality from the proposed operation could travel beyond the analysis area and affect the air quality in the Unit or other surrounding areas. Therefore, the effects from drilling are expected to be short-term, localized, to widespread, negligible to minor, and adverse. These impacts are not expected to exceed NAAQS established under the Clean Air Act.

Cumulative Impacts: Impacts on air quality from other sources would continue as the result of vehicle use on lands in and outside of the Unit, recreational activities in and outside of the Unit (including use of all-terrain vehicles, and burning of campfires), park facility management, oil and gas activities in and outside the Unit, and commercial timber activities occurring adjacent to the Unit. The use of vehicles and other combustion engines, and fires would emit PM, NO_x, CO, CO₂, and SO₂. An analysis of the cumulative effect of drilling and producing the up to 40 wells projected in the RFD scenario was performed in the Preserve's *Oil and Gas Management Plan Environmental Impact Statement* (NPS, 2005). No "major" adverse impacts were identified for this impact topic. However, the primary source of cumulative impacts to air quality in the analysis area would be contaminants from the Beaumont/Port Arthur/Orange airshed, as well as from the Houston/Galveston and Lake Charles, Louisiana airsheds. Various industrial facilities, pipelines, and vehicular traffic in these airsheds are major sources of emissions. All of these sources would result in long-term, minor to moderate adverse cumulative impacts to air quality in the study area.

Conclusion: Under the Proposed Action there would be no impacts to air quality from in-park operations due to the depth at which those operations would occur. Impacts to the air quality in and outside of the Preserve would result primarily from well drilling operations. Additional impacts would result from emissions from other equipment utilized during production of the wells. Overall, impacts on air quality in and outside the Unit would be short-term, localized, to widespread, negligible to minor, and adverse. Due to the degraded nature of the airshed, the project activities would only contribute negligible adverse impacts to the overall cumulative impacts to air quality in the area. Therefore, the topic of air quality in and outside of the Unit was dismissed from further analysis in this EA.

1.4.14 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 CO₂ concentrations to increase dramatically and are likely to contribute to overall climatic changes, typically referred to as global warming. Increasing CO₂ 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 4 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

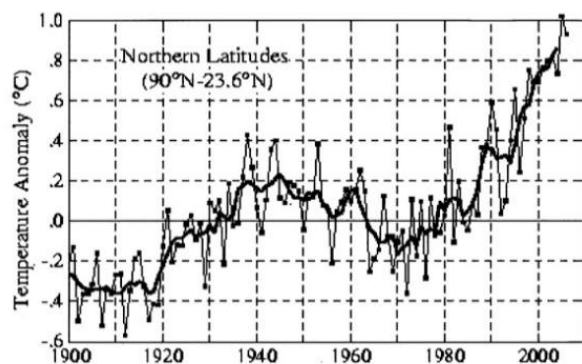
(1.8°F) increase since 1970. Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of these “greenhouse gases” are likely to accelerate the rate of climate change.

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



Source: Goddard Institute for Space Studies (2007)

NPS recognizes the importance of climate change and the potential effects it may have on the natural environment. The drilling for oil and gas process may generate emissions of climate changing pollutants. The two proposed wells contemplated in this assessment would involve the use of vehicles to access operations locations and the use of combustion engines to drill the wells. Park operations and recreational activities that involve the use of combustion engines would also generate CO₂ and methane. Wind erosion from disturbed areas and fugitive dust from roads along with entrained atmospheric dust has the potential to darken glacial surfaces and snow packs resulting in faster snowmelt. Other activities may help sequester carbon, such as managing vegetation to favor perennial grasses and increase vegetative cover, which may help

build organic carbon in soils and function as “carbon sinks”. Anticipated emissions from oil and gas operations as described above in 1.4.2 are anticipated to be low.

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 IPCC recently 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”. The lack of scientific tools designed to predict climate change on regional or local scales limits the ability to quantify potential future impacts. Currently, NPS does not have an established mechanism to accurately predict the effect of development activities in this assessment on global climate change (CCSP 2006). However, 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 and 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.

Because of the low emissions anticipated from drilling the proposed wells, it is reasonably expected that the effect on climate change would not have more than a negligible effect; therefore, this topic was dismissed from further analysis in this EA.

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). Two alternatives are described and evaluated in this EA, Alternative A, No Action, and Alternative B, Proposed Action, Application as Submitted. Alternatives considered but dismissed from further analysis are described and the reasons for dismissing them are given. Analyses for selecting the environmentally preferred alternative and the NPS preferred alternative are also provided.

2.1 Alternative A, No Action

The No Action Alternative is required under the National Environmental Policy Act (NEPA) and establishes a baseline for comparing the present management direction and environmental consequences of the action alternative. Under No Action, the two wells would not be developed.

2.2 Alternative B, Proposed Action, Application as Submitted

Under Alternative B, Century would directionally drill the wells as proposed in their application. Figure 2 shows the location in relation to the boundaries of the Preserve, local roads, and land features.

2.2.1 Locations of the Wells

The surface and bottomhole locations for the wells are provided in Table 5, below (U.S. State Plane Coordinate System, NAD 27, Texas Central Zone, given in UTM).

Table 5. Project Locations for the Two Wells

Project Component	Location	
	X	Y
Phineas/Ferb Surface Location	3,967,925.00	258,261.00
Phineas 3 Bottomhole	3,968,623.00	253,894.00
Wile E. Coyote Bottomhole	3,966,019.24	258,287.28

2.2.2 Access

The Phineas/Ferb well pad would also be accessed via an existing unpaved road off of Lakeview Road.

2.2.3 Construction

Phineas/Ferb: The Phineas/Ferb well pad is an existing well pad that is located in an area that was recently harvested for timber. This well pad measures 640 feet by 620 feet and is located approximately 1,301 feet from the Preserve at the nearest point.

2.2.4 Wellbores

Century's proposed production operations inside the Preserve for each wellbore (Wile E. Coyote and Phineas 3) would consist of drilling a 9 7/8-inch hole from approximately 3,225 feet to 10,470 feet TVD and a 6 1/2-inch hole from 10,470 feet to completion depth at 11,100 feet TVD. The well would then be completed or plugged and abandoned as a dry hole.

Per Texas Commission on Environmental Quality Form TCEQ-0051 (Depth of Usable Quality Ground Water to be Protected) usable-quality water occurs from the land surface to a depth of 1,600 feet. Century would comply with all provisions of the RRC's statewide oil and gas regulations to drill and eventually plug the well to ensure the protection of usable quality water zones. The proposed drilling period is approximately 45 days. All mud and cuttings would be contained in a closed system of aboveground storage tanks to recirculate drilling mud and aboveground tanks to contain drill cuttings prior to removal from the site. Earthen pits would not be utilized to store drilling mud or the cuttings, and all fluids and cuttings would be hauled offsite to a third-party disposal facility.

2.2.5 Flowlines

Should either of the wells be successfully completed as a producing oil and/or gas well, a 6-inch diameter (maximum) flowline would be installed. The flowline of wrapped and welded steel, would be buried to a minimum depth of 3 feet below surface. Any sensitive resource areas (wetlands) would be bored to minimize impacts and existing rights-of-way would be followed to the extent practicable.

2.2.6 Production Facilities

If oil and gas is discovered and the proposed wells are completed as producers, production facilities would be constructed on the existing well pad. Features could include the wellhead with a Christmas tree valve system, line heaters and separation devices, a glycol dehydration unit, a tank battery consisting of water tanks) and condensate/oil tank(s) constructed within the areas utilized to drill the wells outside of the Preserve, a flowline connecting the components, and a gas sales line and meter. The facility would be developed and maintained according to Century's SPCC Plan and 40 CFR 112.7.

The tank battery would have an earthen firewall (covered with rock to reduce erosion) surrounding the feature that provides secondary containment with a capacity of 1.5 times the capacity of the single largest tank. The approximate height of the firewall would be 2 feet. The off-load connection would have a safety drip device below it to catch any dripping fluid lost during hook-up and disconnection.

All oil and water lines from the production facilities to the tanks would be buried at a minimum depth of 1 foot below the surface. Depending on the rate of production, one to two compressors equipped with hospital-grade mufflers may be required at the well pad.

2.2.7 Reclamation Plans

Once drilling and completion operations are finished, or if a well is not productive, the portion of the drill site no longer needed would be reclaimed, and the washout/emergency and water pits would be filled with native soil in accordance with RRC Statewide Rule 8. Upon final abandonment, the equipment and all related materials would be removed, the area returned to its original contour, and the well plugged according to RRC Statewide Rules 13 and 14. The site would be reclaimed in conformance with the surface use agreement between the surface owner and Century. The disposal of excess drill fluids and water would occur offsite or downhole depending on Century obtaining the necessary permits and approvals.

Reclamation of the areas disturbed during installation of the flowline associated with the wells if they are produced would include restoration of preconstruction contours to promote revegetation in areas that were cleared.

2.2.8 Mitigation Measures

In order to reduce impacts on the human environment, Century has incorporated the following mitigation measures listed in Table 6 as part of their applications for the proposed operations. While many of the mitigation measures are required by other State and Federal requirements, the NPS does not have the regulatory authority under § 9.32(e) to require mitigation under option #1, Exemption with No Mitigation.

Table 6. Mitigation Measures for the Phineas/Ferb Wells under the Proposed Action (Alternative B)

No.	Mitigation Measures - Proposed Action (Alternative B)	Resource(s) Protected	Required or Voluntary
Project Planning and General Procedures			
1	Conduct a desktop archeological survey of the proposed project area	archeological resources	Voluntary
2	Prepare and comply with a Spill Prevention Control and Countermeasure (SPCC) Plan	all natural resources, and human health and safety	EPA requirement as per 40 CFR, Chapter 1, Subchapter D, Part 112 – Oil Pollution Prevention
3	Site both wells, flowline, and production facilities outside of the Preserve boundary	all natural resources and values	Required to qualify for NPS exemption under 36 CFR § 9.32€
4	Use existing openings to the extent possible and use existing roads to minimize construction of access road	soils, water resources, floodplains, wetlands, vegetation	Voluntary
5	Construct ditch and 1-foot' high ring levee around the well pad	water resources, vegetation, soils	Voluntary
6	Construct washout/emergency pit and line with plastic	water resources, soils, vegetation	Construction, design and maintenance of pit in conformance with RRC Statewide Rule 8, liner would be voluntary
7	Utilize hooded lights for well drilling activities	lightscares	Voluntary

No.	Mitigation Measures - Proposed Action (Alternative B)	Resource(s) Protected	Required or Voluntary
Well Drilling			
8	Directionally drill well so that wellbore intercepts useable quality groundwater outside of the Preserve	water resources	Required to qualify for NPS exemption with no mitigation measures
9	Use a closed-loop containerized mud system	water resources, soils, vegetation	Voluntary
10	Set surface casing according to State of Texas RRC requirements	water resources	RRC requirement as per Statewide Rule 13(b)(2)
11	Dispose of drilling mud and well cuttings offsite or downhole	all natural resources	Disposal in accordance with RRC Statewide Rule 8
Production			
12	Reduce size of well pad after drilling completion and fill in washout/emergency and water pits with native soil in accordance with Statewide Rule 8	soils, vegetation, water resources	Reduction in well pad size voluntary, fill in washout/emergency and water pits required by RRC Statewide Rule 8(d)(4)(G)
13	Construct a 2-foot earthen, rock covered firewall around the tank battery with a capacity 1.5 times the largest tank	water resources, soils, vegetation	EPA requirement as per 40 CFR, Chapter 1, Subchapter D, Part 112.9(c)(2) to construct secondary containment capable of holding the volume of largest tank plus sufficient freeboard to contain precipitation, voluntary to build capacity for holding 1.5 times volume of largest tank
14	Use mulching, seeding, silt fences, and hay bales	water resources, soils	Voluntary
15	Use compressors equipped with hospital-grade mufflers	soundscapes	Voluntary

No.	Mitigation Measures - Proposed Action (Alternative B)	Resource(s) Protected	Required or Voluntary
16	Notify regulatory authorities and Big Thicket Superintendent within 24 hours in the event of a release or spill of hydrocarbon condensate, crude oil, or other contaminating substance exceeding five barrels	all natural resources	RRC requirement to report well blowout/well control problems or spills exceeding 5 barrels as per Statewide Rules 20 and 91(e), in the event of any condensate spill, operator must consult with RRC as per Statewide Rule 91(b) and any spills of crude oil into water must be reported to the RRC as per Statewide Rule 91(e)(3), spills of other contaminating substances may require reporting to the TCEQ or EPA under a variety of laws and regulations depending on the substance released, the amount, whether or not the release was into soil, water or air, whether the release was ongoing, etc., notification to NPS voluntary
Well Plugging			
17	Consult RRC district office regarding well plugging, plug well to isolate each productive horizon and usable water quality strata according to RRC Statewide Rules 13 and 14 and Bureau of Land Management Onshore Oil and Gas Order No. 2, § III.G., Drilling Abandonment Requirements	all natural resources	RRC requirement as per Statewide Rule 14, compliance with Onshore Oil and Gas Order No. 2 voluntary
Reclamation			
18	If the wells are not produced, equipment and related materials would be removed and the area would be restored to original contours and/or as agreed to with the surface owner.	all natural resources	RRC requirements as per Statewide Rule 14(d)(12), this section of the Statewide Rules requires an operator to “contour the location to discourage pooling of surface water at or around the facility site,” restoration of original contour voluntary

No.	Mitigation Measures - Proposed Action (Alternative B)	Resource(s) Protected	Required or Voluntary
19	Reclamation in conformance with the Land Entry Permit or surface agreement between surface owner and Century	all natural resources	RRC requirements as per Statewide Rule 14(d)(12), required by landowner as per surface use agreement

2.3 Alternatives Considered but Dismissed from Further Analysis

During the scoping process, alternative locations were considered for siting the wells and flowlines. These alternative locations were discussed in consultation with Century, Perennial, and NPS staff at the Preserve, Regional and Washington Offices. NPS acquisition of the mineral rights that are part of Century's proposals was also considered. For the reasons described below, these alternatives were dismissed from further analysis.

2.3.1 Locate the Wells Inside the Preserve

Drilling two vertical wells from surface locations inside the Preserve directly over the bottomhole targets was considered. Also considered were directional wells from surface locations within the Preserve. This alternative would have required access into the Preserve and approved plans of operations. There are no existing roads inside the Preserve near the locations considered; therefore, new access roads would have been needed. Access through the Preserve would have required crossing and potential development in wetlands and floodplains. Although drilling wells from inside the Preserve is technically feasible, this alternative was judged to be unreasonable in terms of economics, logistics, degree of environmental impact, and time required to implement the proposals. Alternative locations for siting the wells within the Preserve were dismissed from further analysis because they would not meet the objectives to the extent that Proposed Action would.

2.3.2 NPS Acquisition of Mineral Rights that are Part of Century's Proposal

In the event that a proposed operation cannot be sufficiently modified to prevent the impairment of park resources and values, the NPS may seek to extinguish the associated mineral right through acquisition, subject to the appropriation of funds from Congress. With respect to Century's directional drilling proposals, mitigation measures were identified and applied, most notably directional drilling from surface locations outside the Preserve. These mitigation measures substantially reduced the potential for adverse impacts to the Preserve's resources and values, visitor use and experience, and public health and safety. As a result, the acquisition of mineral rights was dismissed from further consideration in this EA.

2.4 Environmentally Preferred 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 evaluation 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.”

The environmentally preferred alternative for drilling and producing the directional wells is based on these national environmental policy goals. Under Alternative A, No Action, the wells would not be drilled. Because there would be no new impacts, Alternative A would provide the greatest protection of area and the Preserve’s resources and values. Alternative A meets five of the six criteria (1 thru 4, and 6) and is, therefore, the environmentally preferred alternative.

Century’s Proposal, Alternative B, would have greater effects on the environment because of the drilling and production activities. Alternative B meets four of the six criteria (1, 2, 4, and 5). Although mitigating measures would reduce impacts on the Preserve’s resources and values, there would still be impacts, and, therefore, this alternative would not meet the Park Service’s environmental policy goals as well as the No Action Alternative.

2.5 National Park Service Preferred Alternative

The environmentally preferred alternative is Alternative A because it surpasses Alternative B in realizing the full range of national environmental policy goals as stated in § 101 of NEPA. However, the NPS preferred alternative is Alternative B, Proposed Action, because Century holds valid oil and gas lease rights which if developed, would not result in major impacts or an impairment of park resources and values. The NPS believes this alternative would fulfill its park protection mandates while allowing Century to exercise their property right interests.

2.6 Summary of Alternatives

The following table assesses the extent to which each alternative meets objectives in taking action.

Table 7. Extent that Each Alternative Meets Objectives

Objectives	Does Alternative A, No-Action, Meet Objective?	Does Alternative B, Proposed Action, Meet Objective?
Avoid or minimize impacts on the Preserve’s resources and values, visitor use and experience, and human health and safety.	Yes Without drilling the wells there would be no impacts.	Yes Directional drill from location outside Preserve would avoid or minimize impacts.
Prevent impairment of the Preserve’s resources and values.	Yes Without drilling the wells there would be no potential for the Preserve’s resources and values to be impaired.	Yes Directional drilling below usable quality groundwater would result in no impairment of the Preserve’s resources and values.

Objectives	Does Alternative A, No-Action, Meet Objective?	Does Alternative B, Proposed Action, Meet Objective?
Provide Century, as the lessee of nonfederal oil and gas mineral interests, access to explore for and develop oil and gas resources in a manner which will assure the natural and ecological integrity of the Preserve.	No¹ The wells would not be drilled, precluding Century access to develop their nonfederal oil and gas mineral interests.	Yes Century would be issued a § 9.32(e) exemption, enabling them to drill and produce the wells.

¹NoAction Alternative is required under NEPA to describe baseline conditions. It is acceptable for the no-action alternative to not meet all of the planning objectives.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section provides descriptions of the Preserve's resources that comprise the affected environment for the impact topics carried forward for detailed analysis in the EA. This section includes a discussion on impacts on soundscapes. Proposed Project impacts are discussed in the *Environmental Consequences* section of this EA.

3.1 Methodology

Based on project scoping and expected impacts, it was determined that the following topics in Table 8 would be carried forward for analysis:

Table 8. Summary of Impacts

Impact Topic	Alternative A No-Action	Alternative B Proposed Action
Natural Soundscapes in and outside the Unit	Under Alternative A, No-Action, the two wells would not be drilled; therefore, there would be no new impacts on the natural soundscape in the Unit. Cumulative impacts on the natural soundscape in and contiguous to the Unit from recreational activities in and outside the Unit, park management functions within the Unit, oil and gas activities in and outside the Unit, and timber management activities adjacent to the Unit's boundaries, would result in long-term but intermittent, negligible to moderate, adverse impacts, localized near sources.	Under Alternative B, Proposed Action, cumulative impacts on the natural soundscape in the Unit would be similar to those described under No Action, with vehicle uses, existing and future oil and gas operations in and outside the Unit, maintenance of transpark oil and gas pipelines, routine park operations, recreational activities including hunting in and outside the Unit, and forestry operations adjacent to the Unit. The impacts from these sources, added to the intermittent, short-term, negligible to moderate, adverse impacts from the operations (including construction, drilling, and production activities), would result in localized, short- to long-term, negligible to moderate, adverse cumulative impacts to natural soundscapes in the analysis area.
Adjacent Landowners, Resources and Uses	Under Alternative A, No-Action, the wells would not be drilled; therefore, there would be no new impacts on adjacent land uses and resources outside the subject Unit. It is expected that existing and reasonably foreseeable uses, including timber harvesting and oil and gas development, in the analysis area would continue with short- to long-term, negligible to moderate, adverse cumulative impacts on geology and soils.	Under Alternative B, Proposed Action, the two wells would be drilled and may be produced. Drilling and producing the wells, and eventual plugging and reclamation activities would result in adverse impacts ranging from short- to long-term, and negligible to moderate on adjacent landowners, resources, and uses outside the Unit. The expected effects on geology and soils on adjacent lands from installation of the flowline outside of the Preserve are the only impacts expected

Impact Topic	Alternative A No-Action	Alternative B Proposed Action
		exceed minor levels. These impacts are expected to be confined to the direct area of impact by the application of mitigation measures at each site. Therefore, the adverse impacts on these adjacent resources are expected to be localized, short-term and moderate, with impacts only occurring during installation of the flowline outside the Preserve and lasting until site reclamation restores the geology and soils. There would be no impacts on geology and soils from in-park oil and gas operations. Cumulative impacts to these adjacent resources and uses would continue, with long-term, localized, moderate, adverse cumulative impacts to geology and soils outside the Unit.

This section is organized by impact topic. Under each impact topic, the affected environment is described, the methodology for assessing impacts is presented, the impacts under each alternative are described, a cumulative impact analysis is provided, and a conclusion is stated. The conclusion section summarizes all major findings. This section describes direct, indirect, and cumulative impacts under the two alternatives. Impacts are described in terms of context and duration. The context or extent of the impact may be localized (generally, the footprint and workspaces, including immediately adjacent lands) or widespread (affecting other areas of the Preserve and/or the project area). The duration of impacts could be short-term, ranging from days to three years in duration, or long-term, extending up to 20 years or longer. Generally, short-term impacts would apply to construction activities and long-term impacts would apply to production operations. The intensity and type of impact is described as negligible, minor, moderate, or major, and as beneficial or adverse. Impact intensity threshold definitions are provided for negligible, minor, moderate, and major. Where the intensity of an impact can be described quantitatively, numerical data are presented. However, most impact analyses are qualitative.

The impact analysis under the action alternative (Alternative B, Proposed Action) for each Preserve resource or value describes “in-park operations” and “connected actions”. The analysis of impacts from in-park operations contains the analysis and documentation required under § 9 subpart B. The analysis of impacts from connected actions satisfies a broader NEPA requirement to assess impacts on the human environment.

- In-park Operations would consist of the wellbores crossing into the Preserve at substantial depths so as to not cross usable quality groundwater to reach bottomhole targets beneath the Unit to extract hydrocarbons and other associated fluids from beneath the Unit.
- Connected Actions would consist of activities associated with access road maintenance; production facilities, drilling and completion, hydrocarbon production and transportation, and well plugging and surface reclamation outside the Preserve.

3.2 Cumulative Impacts

This section also assesses cumulative impacts. Cumulative impacts are defined 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 non-federal) or person undertakes such other actions" (40 CFR 1508.7).

The following descriptions of park development and operations, and adjacent land uses provide the basis for analyzing cumulative impacts in this EA.

Adjacent Land Uses: Of the land uses immediately adjacent to the Preserve, commercial and private forestry account for approximately 95 percent of the land area. Additional uses related to timberlands include encroachment onto Preserve lands, public safety concerns regarding hunting clubs on adjacent timberlands, and public use of timber company roads to access the Preserve (Harcombe and Callaway, 1997).

Residential development on lands adjacent to the Preserve is generally rural. Cumulative adjacent uses near the Beaumont Unit include: the communities of Lumberton, Pine Forest, and Lakeview, and their proposed community development projects; and farming and grazing operations on ownerships adjacent to the Preserve.

Visitor Uses and Developments: Approximately 140,489 people visited the Preserve in 2011 (NPS Public Use Statistics Office, 2011). Spring and fall are the primary visitor use seasons. High temperatures limit visitor use during the summer. In creating the Preserve, Congress limited the construction of roads, vehicular campgrounds, employee housing, and other public and administrative facilities in the interest of maintaining the ecological integrity of the Preserve. Therefore, development is limited. There are 26 day-use areas located in 9 Units, 9 hiking trails in 5 Units, 4 canoe routes, and 8 birding hot spots. Hunting is allowed during specific seasons in a total of about 47,400 acres in the Beaumont, Beech Creek, Big Sandy Creek, Lance Rosier, and Neches Bottom and Jack Gore Baygall Units. Trapping is permitted in a total of about 35,000 acres in the Beaumont, Lance Rosier, and Neches Bottom and Jack Gore Baygall Units. Backcountry camping is light (approximately 1,315 overnight stays per year over the last seven years), and must be conducted in designated areas. In addition to visitor uses and developments, there are three cemeteries and two inholding homesites located in the Preserve.

3.3 Impacts on Natural Soundscapes in and outside the Beaumont Unit

3.3.1 Background

The natural soundscape is defined as the aggregate of all natural sounds that occur in parks, absent human-caused noise, together with the physical capacity for transmitting the natural sounds (NPS *Management Policies* 2006). It includes all of the sounds of nature, including such "non-quiet" sounds as birds calling, waterfalls, thunder, and waves breaking against the shore. Some natural sounds are also part of the biological or other physical resource components of parks (e.g., noise and sounds made by natural processes such as wind in trees, thunder, running water). It is important to distinguish between the intrinsic value of the soundscape as part of wildlife habitat and as part of cultural (i.e., historic, ethnographic) resources.

In accordance with soundscape policy from NPS mandates, the NPS will preserve to the greatest extent possible, natural soundscapes. Natural sounds occur within and beyond the range of sounds that humans can perceive, and can be transmitted through water, air or solid material. The NPS will restore degraded soundscapes to the natural condition wherever possible, and will protect natural soundscapes from degradation due to noise or inappropriate noise.

Inappropriate sound can adversely impact wildlife in a variety of ways by interfering with or masking sounds important for animal communication, including territory establishment, courtship, nurturing, predation, avoiding predators, migration, and foraging functions. When noise interferes with hearing natural sounds, the noise is said to mask the natural sounds, and this affects the extent of the listening area. Listening area can be defined as the area in which an organism can hear sounds (i.e. the area in which an owl can hear a mouse scurrying across a forest floor). For example, if the ambient sound pressure level is 30 decibels (dB), and a noise source raises the ambient to 33 dB (a 3 dB increase), the listening area or auditory horizon for humans (and many birds and mammals) would be reduced by 50%. Increasing the ambient sound pressure level an additional 3 dB (to 36 dB) would reduce the listening area by half again, to 25% of the initial area.

Certain types and levels of noise can cause animals to use avoidance mechanisms. Avoidance, initiated as it may be by annoyance or stress, can cause individual animals to alter normal behavior, move to less preferred habitats, and to unduly use energy during critical times of the year.

Inappropriate noise can adversely impact park visitor experiences. Managing parks for “visitor experience” provides the opportunity for visitors to enjoy a park's resources and values in a manner appropriate to the park's purpose and significance, and supports the Park's resource protection goals. Visitors usually have expectations about the experience being offered in National Park System units. The impacts of inappropriate noise on visitor experience can be especially evident when visitor expectations include solitude, serenity, tranquility, contemplation, or a completely natural or historic environment. Many visitors have great expectations for national parks in this regard, since daily life for many people consists of high and constant levels of noise in urban/suburban settings.

Another value that can be adversely impacted by noise is any resource, location, or structure having cultural, historic, or religious significance. In the same way that visitor experience or natural resources can be affected, cultural, historic or religious sites are impacted by noise out of character for the resource. Maintaining the context also benefits the visitor who wishes to engage in and appreciate these resources.

3.3.2 Guiding Laws, Regulations, and Policies

A variety of laws, regulations and policies direct and guide the management of natural soundscapes as an inherent value of national parks to be conserved, and as a resource to be enjoyed. Some of the laws are explicit to sound, or noise, as an impact to national parks or to specific sources of noise. Similarly, some regulations are specific to sources and levels of noise, and they provide a regulatory standard. Two statements of policy are directed at noise and the natural soundscape: NPS Management Policies 2006, Section 4.9, and NPS Director's Order #47, Soundscape Preservation and Noise Management.

NPS Management Policies 2006, Section 4.9, states that the NPS will preserve to the greatest extent possible the natural soundscapes of parks and restore to the natural condition wherever possible those park soundscapes that have become degraded by unnatural sounds. It also requires NPS to protect natural soundscapes from unacceptable impacts and prevent or minimize all noise that adversely affects the natural soundscape.

Director's Order #47 emphasizes policy and requires “to the fullest extent practicable, the protection, maintenance, or restoration of the 81 natural soundscape resources in a condition unimpaired by inappropriate or excessive noise sources... The fundamental principle

underlying the establishment of soundscape preservation objectives is the obligation to protect or restore the natural soundscape to the level consistent with park purposes, taking into account other applicable laws”.

3.3.3 Affected Environment

The Preserve is crossed by, or adjacent to, many roads, pipelines, and power lines of varying size. The lands adjacent to the Preserve are mostly commercial timberlands, but residences and some commercial development are also located near the Preserve boundary. There are also a few residences inside the boundary or surrounded by NPS lands. Improvements inside the Preserve related to visitor experience are limited, for the most part, to trails, parking and picnic areas, information kiosks, and boat ramps. There are two cemeteries located within the Preserve boundary or surrounded by NPS lands. Hunting and trapping are allowed within some units of the Preserve. Improvements related to Preserve administration within the Preserve consist of seasonal employee housing and several radio tower installations. The main visitor contact and administrative facilities are located outside of the Preserve proper. The Preserve management involves the use of on and off-road vehicles, boats, aircraft, heavy equipment and prescribed fire, and potentially involves firearms. Several oil and gas production facilities exist within the Preserve, and many more are located just outside the boundary.

A reasonable amount of noise from the proposed operations is considered to be appropriate to the operations area, as the exercise of nonfederal mineral rights is provided for in the enabling legislation of the Preserve. Following the Preserve’s *General Management Plan* (1980), areas within the Unit boundaries that could be affected by elevated noise generated by the proposed drilling and production of the directional wells would be part of the exploration/mining subzone for the duration of operations. Park managers recognize that soundscapes in the exploration/mining subzone could be affected by continuous noise during drilling operations and well production.

The primary reason for the discussion of noise impacts is the potential effects of noise on visitor use and experience and wildlife. A study of the desired experiences of Preserve visitors determined that the desire to “escape the crowd/noise” was very important (Gulley, 1999).

Sources of noise within the Preserve are generally localized and/or seasonal in duration and include maintenance vehicles and equipment, firearms (during hunting season), hikers, and other visitors. Noise in surrounding areas includes trucks and automobiles, aircraft, boat motors, motorcycles, all-terrain vehicles, various types of equipment (e.g., tractors, log skidders and feller bunchers, chainsaws, lawn mowers, oil and gas separation and treatment vessels, compressors, etc.), power lines/transformers and firearms.

Sound levels are measured in decibels, and most noise levels are weighted based on thresholds of human hearing (dBA). L90 is a percentile representing the sound level where sounds exceed the value 90 percent of the time. This number is usually considered to be analogous to the natural ambient sound level. The natural ambient is the sound level generated only by natural sound sources in the absence of human caused noise. According to NPS Management Policies, “the natural ambient sound level- that is, the environment of sound that exists in the absence of human-caused noise- is the baseline condition, and the standard against which current conditions in a soundscape will be measured and evaluated”.

The natural soundscape of the Preserve was studied in the spring of 1998 by Foch (1999) to determine ambient sound levels. Sound levels were measured at 11 locations across the Preserve, and both short- and long-term data were collected. Sound measurements were also

collected by Preserve staff during the summer of 2011 in the Beaumont Unit. The measurements included the L_{90} , L_{50} , and L_{10} values measured for night and day during a 30-day period. The measurements also included frequency calculations for sound pressure levels by hour, including a truncation to frequencies that are commonly known to show transportation noise. The range of sound levels was between 36.5 and 55.0 dBA, 80 percent of the time (NPS 2012). **Table 9** compares sound levels recorded in various Units of the Preserve by the Foch (1999) study with other common sounds.

Table 9. Sound Level Comparison Chart

Equivalent Sounds	Decibels	Sound Levels at Various Locations in the Preserve
Large caliber rifles	140-160	
.22 caliber weapon	130-140	
Air compressor at 20 feet		
Garbage trucks and city buses	100	
Power lawnmower		
Steady flow of freeway traffic	90	
10 HP outboard motor		
Bulldozer or grader at 50 feet		
Near drilling rig	80	
Automatic dish washer		
Muffled jet ski at 50 feet		
Vacuum cleaner		
Window air conditioner outside at 2 feet	70	
Window air conditioner in room	60	
Normal conversation	50	
Quiet home in evening		
Bird calls	40	Big Sandy Creek along Big Sandy Horse
Trail	40	Neches Bottom and Jack Gore Baygall Unit
Library Road	40	End of Church House in Lance Rosier Unit
Trail	40	Turkey Creek Unit on Turkey Creek Trail at NPS Ranch House
Ranch House	40	Beech Creek Unit along Beech Woods
Soft whisper	30	
Quiet house at midnight	30	
Leaves rustling	20	

¹Modified from Final Environmental Impact Statement, Miccosukee 3-1 Exploratory Well, Broward County, Florida (U.S. Department of the Interior).

For the comparison, Table 10 summarizes sound level values that relate to human health and speech, as documented in the scientific literature. Human responses can serve as a proxy for potential impacts to other vertebrates because humans have more sensitive hearing at low frequencies than most species (Dooling and Popper, 2007, p. 5).

Table 10. Explanation of Sound Level Values

Sound Levels (dBA)	Relevance
35	Blood pressure and heart rate increase in sleeping humans (Haralabidis <i>et al.</i> 2008)
45	World Health Organization's recommendation for maximum noise levels inside bedrooms (Berglund, Lindvall, and Schwela 1999)
52	Speech interference for interpretive programs (U.S. Environmental Protection Agency 1974)
60	Speech interruption for normal conversation (U.S. Environmental Protection Agency 1974)

Exceedence levels (L_x) are metrics used to describe acoustical data. They represent the level of sound exceeded x percent of the time during the given measurement period (e.g. L₉₀ is the level that has been exceeded 90 percent of the time). Table 11 reports the Daytime (700-1900) and Nighttime (1900-700) L₉₀, L₅₀, and L₁₀ values for the site(s) measured in the Beaumont Unit.

Table 11. Exceedence Levels for Existing Conditions in the Beaumont Unit

Period of Day	L ₉₀ (dBA)	L ₅₀ (dBA)	L ₁₀ (dBA)
700-1900	36.5	42.9	55.0
1900-700	48.5	49.9	53.0

In July, 2008 the Natural Sounds Program monitored a gas production site (Ergon Energy Partners LP's Mason 1 site) and an operating drilling rig (Unit Texas Drilling Company Rig #237). The Mason #1 site is a production site, without a drilling rig (post-platform). There were high and low-pressure separators, a dehydrator, and heater treator. A compressor was the main noise source. Production specifications for this site were 700 barrels of oil per day, 100 million cubic feet of natural gas per day, and 400 barrels each per holding tank. Unit Texas Drilling Company Rig #237 was drilling the Bluff #1 well. There were a large number of noise sources, but noise levels were dominated by 3 diesel powered generator packages, which operate concurrently. Using the resulting data, noise models were produced to estimate the impact of the above listed oil and gas equipment within the Preserve boundary.

The proposed project site is located in areas where there are several other existing oil and gas operations within 2 miles. It are also located in an area where there are several industrial sites, railroads, high traffic highways and residential roadways within 2 miles.

3.3.4 Environmental Consequences

Area of Analysis: The area of analysis for soundscapes is defined as the well operations area plus the area within 2,000 feet, since drilling noise is expected to decrease to about the background level recorded for quiet areas in similar areas of the Preserve at that distance.

Methodology and Assumptions: After reviewing all of the results of the Foch study, the NPS Natural Sounds Program study, and considering adjacent land uses, Preserve visitor use and

management activity, as well as the existing legislative, regulatory and policy framework for the Preserve, the NPS developed the following impact intensity thresholds for soundscapes:

- Negligible:** Impacts on natural soundscapes would result in a negligible change, but natural sounds would prevail; unnatural noise would be very infrequent or absent.
- Minor:** Natural sounds would predominate in areas where management objectives call for natural processes to predominate, with infrequent noise. In areas where noise is consistent with park purpose and objectives, noise could be heard frequently throughout the day and natural sounds could be heard occasionally. Mitigation measures if needed to offset adverse effects, would be simple and successful.
- Moderate:** In areas where management objectives call for natural processes to predominate, natural sounds would predominate, but noise could occasionally be present. In areas where noise is consistent with park purpose and objectives, noise would predominate and natural sounds could still be heard occasionally. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful.
- Major:** In areas where noise is inconsistent with park purpose and objective, noise would persistently dominate the soundscape. Extensive mitigation measures would be needed to offset any adverse effects, and their success would not be guaranteed.

Impacts on Natural Soundscapes in and outside the Preserve under Alternative A, No Action

Under Alternative A, Century would not drill the Phineas/Ferb wells, resulting in no new impacts on natural soundscapes.

Cumulative Impacts under Alternative A, No Action

Under Alternative A, cumulative impacts to natural soundscapes would result from vehicle traffic in and outside the Preserve, development (including oil and gas activity) in and outside the Preserve, recreational activities, including ORV use outside the Preserve and motorized boat use in the Preserve, and commercial timber activities outside the Preserve boundary.

Elevated noise from existing activities would include the use of vehicles, chainsaws, log skidders, tractors, and prescribed fires used as part of commercial timber activities, as well as aircraft and firearms. The use of chainsaws during clear-cutting of the timber and the discharge of firearms in the land adjacent to the Preserve would introduce elevated noise levels that could potentially reach up to 140 dBA within the analysis area (see Table 9). Firearm discharge is also expected within the Preserve during the winter months due to hunting activities.

Noise levels from all the sources of noise mentioned above would range from 41 dBA up to 160 dBA (for gunfire). As a result of these various existing and future activities, cumulative impacts on natural soundscape within and adjacent to the Preserve are anticipated to result in long-term but intermittent, negligible to moderate, adverse impacts on the natural soundscape in and outside the Preserve, localized near sources.

Conclusion for Alternative A, No Action

Under Alternative A, No Action, the wells would not be drilled, resulting in no new impacts on natural soundscapes. Existing vehicle use, park maintenance activities, recreational uses (including hunting), oil and gas activities in and outside the Preserve, and timber management activities adjacent to the Preserve would result in localized, short-term, negligible to moderate,

adverse impacts. Cumulative impacts to natural soundscapes to the Preserve from recreational uses (including boating), park maintenance activities, oil and gas activities in and outside the Preserve, and timber management activities adjacent to the Unit would be short- to long-term, localized to widespread, negligible to moderate, adverse impacts.

Impacts on Natural Soundscapes in and outside the Preserve under Alternative B, Proposed Action

Under Alternative B, both the Phineas/Ferb wells would be drilled. Existing impacts on natural soundscapes within the Unit would be similar to Alternative A, No Action, with localized, short-term, negligible to moderate, adverse impacts.

Impacts from In-Park Operations: In-park operations would consist of extracting hydrocarbons and associated fluids from beneath the Unit. There would be no impact to the natural soundscape in the Unit from in-park operations.

Impacts from Connected Actions: Elevated noise would be generated by the connected actions, which would consist of maintenance of the well pad, the drilling and completion of the wells, hydrocarbon production and transportation, and well plugging and reclamation outside the Unit. These activities would result in localized and short-term increases in noise associated with vehicle traffic, heavy equipment, drilling, and ground-disturbing activities. Elevated noise would be greatest during the short-term (approximately 45 days for each well) drilling period.

Drilling is a 24-hour, 7-day a week operation, so noise would be continuous during the drilling periods. The drilling rig generates noise levels reaching approximately 96 dBA (NPS 2009), while some diesel trucks have been reported at 88 dBA at 50 feet from the source (FHWA 2007). Sound dissipates with distance from the source, with noise levels reaching near background levels at 2,000 feet. Elevated noise during the drilling phase would result in localized, short-term, minor to moderate, adverse impacts on natural soundscapes within 2,000 feet of the drilling rig. Utilizing data from studies performed in similar areas of the Preserve (NPS 2009), noise levels are expected to be less than 50 dBA at the Preserve boundary during drilling operations. This increased sound level would result in short-term moderate adverse impacts to the natural soundscape of the Preserve. If the wells were productive, production operations would result in noise levels of approximately less than 50 dBA at the nearest preserve boundary if an unmitigated compressor is used; however, Century proposes to utilize compressors equipped with hospital-grade mufflers during production, if necessary. This would result in long-term, minor, adverse impacts on the natural soundscapes.

Cumulative Impacts under Alternative B, Proposed Action: Under Alternative B, cumulative impacts to natural soundscapes in the Unit would be similar to those described for Alternative A. Noise sources would include existing and future oil and gas operations in and outside the Unit, routine park maintenance operations, recreational activities including hunting in and outside the Unit, and forestry operations adjacent to the Unit, which would result in localized, short- to long-term, moderate, adverse cumulative impacts to natural soundscapes.

Conclusion for Alternative B, Proposed Action: Under Alternative B, Proposed Action, the Phineas/Ferb wells would be drilled and may be produced. Use and maintenance of the well pad, drilling and producing the wells, and eventual plugging and reclamation activities would result in short- to long-term, localized negligible to moderate adverse impacts on natural soundscapes in the Unit. Cumulative impacts would be similar to those described for Alternative A, with short- to long-term, moderate, adverse impacts

3.4 Impacts on Adjacent Landowners, Resources, and Uses

3.4.1 Background

This section addresses impacts on adjacent landowner and resources, with emphasis on certain resources on the property outside of the Unit that could be affected by the proposed operations at noticeable levels (more than minor). Those resources include soils and geology.

3.4.2 Affected Environment

Surface Owners and Land Uses: The surface location outside of the Preserve is timber company-owned land. The Phineas/Ferb well pad is within a ½-mile of the town of Lakeview with a population of 107. The existing well pad is considered an industrial use area surrounded by timberland that has been clear-cut in the last three years. The likelihood of future residential development in close proximity to any of the Project locations is low.

Geology and Soils: The soils located within and adjacent to the Project area are the same as those described in Section 1.4.5 of this EA.

Environmental Consequences

Area of Analysis: the area of analysis for this topic is limited to the private adjacent lands outside the Unit in the immediate vicinity of project activities.

Methodology and Assumptions: The assessment of potential impacts on adjacent land uses and resources was based on best professional judgment and was developed through discussions with staff from the NPS, review of relevant literature, and field observations. Thresholds of change of the intensity of impacts to adjacent landowners, resources, and uses are defined as follows:

- Negligible:** Impacts would result in a change to land uses or resources, but the change would be so slight that it would not be of any measurable or perceptible consequence.
- Minor:** Operations would cause limited localized change to land uses or resources. Mitigation measures, if needed to offset adverse effects, would be simple and successful.
- Moderate:** Impacts would have measurable impacts to adjacent land uses or resources that would be consequential, but would be relatively local. Mitigation measures, if needed, to offset adverse effects occurring outside the Preserve, would likely succeed.
- Major:** Operations would cause substantial alteration to land uses or resources on a regional scale. Extensive mitigation measures would be needed to offset any adverse effects, and their success would not be guaranteed.

Impacts on Adjacent Landowners, Resources, and Uses under Alternative A, No Action

Under Alternative A, No Action, the wells would not be drilled or produced so the flowline would not be installed, resulting in no new impacts on adjacent land uses and resources outside the Unit.

Cumulative Impacts: Cumulative impacts on geology and soils outside the Unit would result primarily from land development, including oil and gas operations, as well as from leaks and spills from oil and gas operations and transpark pipelines, timber management, and use of vehicles off of roadways. These activities could increase surface runoff; increase soil erosion, rutting and compaction; affect the permeability of soils (and other soil characteristics); and

could directly and indirectly affect the growth and regeneration of vegetation. It is expected that existing and reasonably foreseeable uses in the analysis area would continue with long-term, moderate, adverse cumulative impacts on geology and soils, localized near these uses.

Conclusion: Under Alternative A, No-Action, the wells would not be drilled and no associated flowline would be installed; therefore, there would be no new impacts on adjacent land uses and resources outside the Unit. It is expected that existing and reasonably foreseeable uses in the analysis area would continue with short- to long-term, moderate, adverse cumulative impacts on geology and soils.

Impacts on Adjacent Landowners, Resources, and Uses under Alternative B, Proposed Action

Impacts from In-Park Operations: Under the Proposed Action, the wells would be directionally drilled into the Preserve at substantial depths under the land surface. Therefore, there would be no impacts on adjacent landowners, resources, or uses outside the Unit from the proposed in-park subsurface oil and gas operations.

Impacts from Connected Actions: Drilling and production of the two wells would not have any direct impact on soils, as they would be drilled from existing well pads. However, there is potential for contamination of soils surrounding the well pads in the event of a spill or well blowout, as well as disturbance of soils from installation of a small diameter flowline if the wells are produced. Due to Century's proposed mitigation measures discussed in Table 6, impacts to soils from activities at the well pad would result in short-term, moderate adverse impacts to soils.

Throughout all earth disturbing activities, best management practices (BMPs) would be utilized to minimize impacts to the soil. BMPs that would be implemented include the use of silt fence around disturbed areas to prevent soil from leaving the site, the boring of wetlands crossed by the flowline, and restoration of contours to preconstruction conditions following the completion of construction activities.

Cumulative Impacts: Cumulative impacts would be similar to those described for Alternative A. Land development, including existing and future oil and gas operations, maintenance of transpark oil and gas pipelines, and forestry operations adjacent to the Unit could contribute to cumulative impacts on soils and vegetation. Considering the small amount of acreage that would be directly impacted, the type of vegetation loss, and the reclamation/replanting that would occur after the site is no longer used, the effects of the proposed action would not contribute more than moderate adverse impacts to the overall cumulative impact of all these actions in the region.

Conclusion: Under Alternative B, Proposed Action, the wells would be drilled and may be produced, requiring installation of a flowline. Drilling and producing the wells, installation of the flowline, and eventual plugging and reclamation activities would result in adverse short-term, moderate adverse impacts on adjacent landowners, resources, and uses outside the Unit. The expected effects on geology and soils on adjacent lands are expected to be confined to the direct area of impact by the application of mitigation measures at the site. Therefore, the adverse impacts on these adjacent resources are expected to be localized. There would be no impacts on geology and soils from in-park oil and gas operations. Cumulative impacts to these adjacent resources and uses would continue, with long-term, localized, negligible to moderate, adverse cumulative impacts to geology and soils outside the Unit.

4.0 CONSULTATION AND COORDINATION

Following the 30-day public review and comment period, NPS will consider written comments received. Copies of the decision document will be sent to those who comment on the EA during the public review period, or request a copy.

4.1 Internal Scoping

Internal scoping was conducted by an interdisciplinary team of professionals from the Preserve and representative from Century and Perennial. Interdisciplinary team members on March 25, 2013 to discuss the purpose and need for the project; various alternatives; potential environmental impacts; past, present, and reasonably foreseeable projects that may have cumulative effects; and possible mitigation measures. Over the course of project planning, team members from the Preserve have conducted a site visit to view and evaluate the proposed project site.

4.2 External Scoping

A scoping brochure was sent out to several federal and state agencies, the Alabama Coushatta Tribe of Texas and other interested parties on May 24, 2013 which ended on June 25, 2013. Comments in response to the scoping brochure were received from the Sierra Club. Substantive scoping comments focused on analyzing cumulative effects, acquisition of mineral rights, analysis of alternatives, and enforceability of mitigation measures.

Persons and agencies contacted for information, or that assisted in identifying important issues, developing alternatives, or analyzing impacts are listed below:

Century Exploration Houston, LLC

Chris Lipari, Land Manager

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

Stephanie Burgess, Biologist/Oil and Gas Program Manager

4.3 Agency Consultation

Under NPS policy, the proposed directional well operations would qualify for an exemption with no mitigation. No other agencies were consulted for this action.

4.4 Native American Consultation

A scoping notice was sent to the Alabama Coushatta Tribe of Texas on May 24, 2013.

4.5 Environmental Assessment and List of Recipients

During the 30-day public review period, the public is encouraged to submit their written comments to NPS, as described in the instructions 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. The National Park Service will issue responses to substantive comments received during the public comment period, and will make appropriate changes to the EA, as needed.

During the public review and comment period, a copy of this environmental assessment will be sent to each of the following agencies, organizations, and businesses.

Tribal Government

Bryant Celestine, Alabama-Coushatta Tribe of Texas

Federal Government

National Park Service

Linda Dansby, Regional Minerals Coordinator, Intermountain Region, Santa Fe, NM

Laurie Domler, Planner, NEPA Specialist, Intermountain Region, Denver, CO

Lisa Norby, Chief, Branch of Planning, Evaluation and Permits, Geologic Resources Division, Lakewood, CO

Bruce Bennett, North Evaluation Unit Leader, U.S. Army Corps of Engineers, Galveston District, Galveston, TX

Charrish Stevens, Fish and Wildlife Biologist, U. S. Fish and Wildlife Service, Clear Lake Field Office, Houston, TX

State Government

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

Jeff Durst, Archeologist, State Historic Preservation Office, Austin, TX

Amy Turner, Texas Parks and Wildlife Department

Oil and Gas Industry and Consultants

Chris Lipari, Land Manager Century Exploration Houston, LLC

Amy Williams, Perennial Environmental Services, LLC.

Organizations and Businesses

Bruce Drury, President, Big Thicket Association

Kevin Cronin, Cronin Appraisal Services, Beaumont, TX

Phyllis Dunham, Regional Director, Sierra Club, Austin, TX

Brandt Mannchen, Chair, Big Thicket Committee, Sierra Club, Lone Star Chapter and Houston Regional Group, Houston, TX

Janice Benzanson, Executive Director, Texas Conservation Alliance

5.0 LIST OF PREPARERS

Perennial Environmental Services, LLC

- Leslie Yoo, Principle Biologist, Project Manager
- Amy Williams, Staff Biologist

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

- Stephanie Burgess, Preserve Biologist, Oil and Gas Program Manager

6.0 REFERENCES

- Cinzano, P., F. Falchi and C.D. Elvidge. 2001. 'The First World Atlas of Night Sky Brightness.' *Monthly Notices of the Royal Astronomical Society*. Vol. 328, pp. 689-707.
- Comstock Oil and Gas, Inc. 2004. *Application to Directionally Drill and Produce the Collins #3 Well from a Surface Location outside of the Big Sandy Creek Unit to a Bottomhole Target Beneath the Unit, Big Thicket National Preserve, Polk County, Texas.*
- Comstock Oil and Gas, Inc. 2004. *Application to Directionally Drill and Produce the Black Stone B1 and D1 Wells from Surface Locations outside of the Big Sandy Creek Unit to Bottomhole Targets Beneath the Unit, Big Thicket National Preserve, Polk County, Texas.*
- Cooper, Robert J., Cederbaum, Sandra B., and Gannon, Jill J. 2004. *Natural Resources Summary for Big Thicket National Preserve (BITH) Final Report.*
- Council on Environmental Quality. 1997. *Environmental Justice Guidance Under the National Environmental Policy Act.*
- Federal Highway Administration (FHWA). 2007. *Effective Noise Control During Nighttime Construction.*
- Foch, James D. 1999. *Ambient Sound Levels at Big Thicket National Preserve during March-June 1998.* Prepared for the National Park Service, Big Thicket National Preserve.
- Frasier Group, Inc. 1998. *Plan of Operations and Environmental Assessment of a Proposed Three Dimensional Seismic Survey within the Big Thicket National Preserve in Hardin and Jasper Counties, Texas.*
- Gulley, Gerald Lynn. 1999. *Characteristics, Desired Experiences, and Knowledge of Visitors and Potential Visitors to Big Thicket National Preserve.*
- Harcombe, P. A. and Glenda Callaway. 1997. *Management Assessment of the Water Corridor Units of the Big Thicket National Preserve.* Prepared for the National Park Service, Big Thicket National Preserve, under Cooperative Agreement with Rice University, Houston, Texas.
- Railroad Commission of Texas. 2010 and 2011. Accessed March 2013.
<http://www.rrc.state.tx.us/data/wells/wellcount/index.php>
<http://www.rrc.state.tx.us/environmental/spills/h8s/index.php>
<http://www.rrc.state.tx.us/data/drilling/blowouts/index.php>
- Schenk, C.J., R. Charpentier and J.W. Schmoker. 1999. *Remaining Oil and Gas Resources Beneath Big Thicket National Preserve Assessment Methodology.*
- Schmidly, D.J., B.R. Barnett, and J.A. Read. 1979. *The Mammals of Big Thicket National Preserve and East Texas.*
- Stynes, Daniel J. 2006. *National Park Visitor Spending and Payroll Impacts Fiscal Year 2005.*
- U.S. Department of Agriculture, Natural Resources Conservation Service. 2013. *Web Soil Survey.*
<http://websoilsurvey.nrcs.usda.gov> Accessed March 2013
- U.S. Department of the Interior, National Park Service. 1980. *General Management Plan, Big Thicket National Preserve.*

- U.S. Department of the Interior, National Park Service. 2004. *Draft Oil and Gas Management Plan Environmental Impact Statement for Big Thicket National Preserve*.
- U.S. Department of the Interior, National Park Service. 2005. *Final Oil and Gas Management Plan Environmental Impact Statement for Big Thicket National Preserve*.
- U.S. Department of the Interior, National Park Service. 2006. *Management Policies*.
- U.S. Department of the Interior, National Park Service, Air Resources Division (NPS, ARD). 2007. *Ozone Precursor Emissions Summary for Point and Area Sources, Hardin and Polk Counties, Texas*.
- U.S. Department of the Interior, National Park Service, Natural Resources Program Center (NPS, NRPC). 2003. *Interim Final Guidance on Assessing Impacts and Impairment to Natural Resources*.
- United States Department of the Interior, National Park Service, Social Science Program, Public Use Statistics Office (NPS, Public Use Statistics Office). 2012. *Statistical Abstract 2011*.

APPENDIX A – State-listed threatened and endangered species in Orange County Texas.

ORANGE COUNTY STATE LISTED SPECIES				
Common Name	Scientific Name	Group	Description	State Status
American peregrine falcon	<i>Falco peregrinus anatum</i>	Bird	Found in bays, vegetated wetlands, lagoons, rivers, along cliffs in wooded areas with conifers, hardwood or a mixture of both.	T
Bald eagle	<i>Haliaeetus leucocephalus</i>	Bird	Breeds and winters in areas close to a coast, river or lake. Prefers conifers for nesting and roosting and tends to avoid areas with high human traffic.	T
Peregrine falcon	<i>Falco peregrinus</i>	Bird	Prefers areas where suitable nesting is available along cliffs, woodlands, and vegetated wetlands. When not breeding can be found in areas that it can find its prey; farms, cities, and along rivers and beaches.	T
Piping plover	<i>Charadrius melodus</i>	Bird	Nest on open beaches covered with less than 25% vegetation and scattered with tufts of grass. Prefer beaches near shallow lakes, ponds and rivers during breeding season and ocean shoreline during non-breeding season.	T
Sooty tern	<i>Sterna fuscata</i>	Bird	Primarily pelagic with nesting occurring on islets, beaches, or bare ground with patches of grasses or bushes present.	T
Swallow-tailed kite	<i>Elanoides forficatus</i>	Bird	Nest in tall, easily accessible trees, preferably pines. Forage in open areas, pine forests, savannas, cypress swamps, narrow riparian forests and marshes.	T

White-faced ibis	<i>Plegadis chihi</i>	Bird	Mostly found in freshwater habitats, nests in bulrushes or low trees and forages in emergent vegetation.	T
Wood stork	<i>Mycteria Americana</i>	Bird	Forages in predominantly freshwater situations such as swamps, wetlands, lagoons and depressions in marshes during droughts. Nests in the tops of cypress trees, or dead hardwoods overhanging water.	T
Black bear	<i>Ursus americanus</i>	Mammal	Prefer mature, mixed deciduous and conifer forests with thick understories. Forested wetlands and treed swamps are also of importance. Hollow logs, large, low tree cavities and cave-dwellings may be used for denning.	T
Louisiana black bear	<i>Ursus americanus luteolus</i>	Mammal	Depends on productive bottomland forest in remote areas with little to no human activity. Hollow trees and ground nest are used as shelter for den sites.	T
Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	Mammal	Typically roost in large, hollow trees, dilapidated buildings and occasionally caves. In southern states, hibernation may not occur and the bat may remain active year round. Suitable habitat for foraging can include mature bottomland forest, upland forests or pine stands. Breeding occurs in autumn or winter and young are born between May and late June.	T
Red wolf	<i>Canis rufus</i>	Mammal	Occupies uplands and lowland forests, marshes, and coastal prairies with heavy vegetation. Uses hollow logs or burrows as a den and to keep their young.	E

Louisiana pigtoe	<i>Pleurobema riddellii</i>	Mollusk	Found in streams and moderate-sized rivers in flowing water on mud, sand and gravel at depths of 20 feet or less.	T
Sandbank pocketbook	<i>Lampsilis satura</i>	Mollusk	Inhabits small to large rivers with moderate flow on gravel or sand bottoms.	T
Southern hickorynut	<i>Obovaria jacksoniana</i>	Mollusk	Prefers low to moderate currents in small to large rivers with medium gradient.	T
Texas heelsplitter	<i>Potamilus amphichaenus</i>	Mollusk	Found in small to medium rivers with mud or sand bottoms, can also be found in reservoirs. Prefers shallow, flowing water, but not necessarily riffles or shoals.	T
Texas pigtoe	<i>Fusconaia askewi</i>	Mollusk	Inhabits medium to large rivers with mud, sand, and fine gravel bottoms in protected areas.	T
Alligator snapping turtle	<i>Macrochelys temminckii</i>	Reptile	Typically inhabit very slow moving deep rivers, canals, swamps, bayous or lakes associated with rivers. Prefer a muddy bottom and some aquatic vegetation. Nesting occurs anytime between April and June and oviposition takes place on land. Aside from nesting, this species is almost entirely aquatic.	T

Northern scarlet snake	<i>Cernophor coccinea copei</i>	Reptile	<p>This nocturnal species typically occurs in pine flatwoods, dry prairies, hardwood hammocks and sandhills.</p> <p>Egg laying occurs from May to August, and both young and adult snakes are often found burrowed into tree bark, hiding in hollow logs or under a shallow layer of substrate.</p>	T
Texas horned lizard	<i>Phrynosoma cornutum</i>	Reptile	<p>Occupies open arid and semiarid regions with limited vegetation.</p> <p>When active it will find or make burrows or hide under rocks where it will also lay its eggs. If soil is wet it will seek shelter in trees 1-2 meters tall.</p>	T
Timber/canebrake rattlesnake	<i>Crotalus horridus</i>	Reptile	<p>In south prefers hardwood bottom forest, swamp areas, floodplains and wet pine flatwoods and hill country during the active spring, summer and fall months. Hibernacula generally comprise rocky areas such as cliffs with ledges, outcroppings or crevices in which to overwinter.</p> <p>Mating and egg laying takes place during the summer and autumn months, respectively.</p>	T