Environmental Consulting & Technology, Inc.

November 12, 2012
ECT No. 120468-0200

Mr. Jeff Robinson
Chief, Air Permits Section
U.S. Environmental Protection Agency, Region 6
Air Permits Section 6PD-R
1445 Ross Avenue
Dallas, Texas 75202-2733

Re: Guadalupe Power Partners LP
Guadalupe Generating Station; Guadalupe County, Marion, Texas

Dear Sir/Madam:

On behalf of Guadalupe Power Partners LP, Environmental Consulting & Technology, Inc. (ECT), is submitting one copy of a greenhouse gas (GHG) Prevention of Significant Deterioration (PSD) permit application for the proposed construction and operation of two simple-cycle combustion turbines at the existing Guadalupe Generating Station located in Marion, Texas. We have also included a compact disc containing an electronic copy of the application as a searchable pdf file.

A copy of this GHG PSD permit application has also been sent to Texas Commission on Environmental Quality (TCEQ) headquarters in Austin, Texas, and the TCEQ regional office in San Antonio.

Since Guadalupe Power Partners LP has previously submitted a PSD permit application to TCEQ for applicable non-GHG pollutants, we would appreciate your expeditious review of this GHG PSD permit application. Please call me at 352/248-3313 if you have any questions regarding this submittal or if there is anything that we can do to expedite the review process.

Sincerely,

ENVIRONMENTAL CONSULTING & TECHNOLOGY, INC.

William F. Karl, P.E.
Senior Engineer

WFK/dlm

cc: Texas Commission on Environmental Quality, Air Permits Division
Texas Commission on Environmental Quality, San Antonio District Office
F. Giacalone, GPP
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GUADALUPE GENERATING STATION

PREVENTION OF SIGNIFICANT DETERIORATION PERMIT APPLICATION FOR GREENHOUSE GAS EMISSIONS

Prepared for:

GUADALUPE POWER PARTNERS LP
Marion, Texas

Prepared by:

ECT Environmental Consulting & Technology, Inc.
3701 Northwest 98th Street
Gainesville, Florida 32606

ECT No. 120468-0200

November 2012

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1.0 INTRODUCTION AND SUMMARY

1.1 INTRODUCTION

Guadalupe Power Partners LP (GPP) currently owns the Guadalupe Generating Station (GGS) located in Guadalupe County, approximately 6 kilometers (km) north of Marion and 45 km northeast of San Antonio, Texas. GGS currently consists of four natural gas-fired, combined-cycle combustion turbine (CT) generator units capable of producing a nominal 1,000 megawatts (MW) of electricity. GGS is operated by NAES Corporation. GGS is currently a major stationary source of air emissions. This facility is permitted under Air Quality Permit No. 38659, PSD-TX-922, and Title V Operating Permit O-02071.

GPP is proposing to construct two natural gas-fired simple-cycle CTs within the existing GGS property. These units will be identified as CTG-7 and CTG-8. Since GGS is an existing major stationary source of air emissions, emissions from the proposed simple-cycle CTs must be compared to the significant emissions rates as defined in Chapter 40, Part 52.21(b)(23), Code of Federal Regulations (CFR), for all pollutants with the exception of greenhouse gas (GHG). Significant emissions rates for GHG emissions are listed in 40 CFR 52.21(b)(49) under the definition of *subject to regulation*. Potential emissions from the proposed natural gas-fired simple-cycle CTs will exceed the significant emissions rates for certain pollutants, including GHG emissions. Therefore, the proposed natural gas-fired simple-cycle CTs will constitute a major modification for GHG emissions as defined in 40 CFR 52.21(b)(2)(i).

The Texas Commission on Environmental Quality (TCEQ) has adopted the federal U.S. Environmental Protection Agency (EPA) rules pertaining to prevention of significant deterioration (PSD) as contained in 40 CFR 52.21, by reference (see Chapter 30, Section 116.160, Texas Administrative Code [TAC]) for all pollutants with the exception of GHGs. EPA Region 6 has assumed the responsibility of issuing PSD permits for GHG emissions for proposed facilities located in the state of Texas.

A PSD construction permit application was previously submitted to TCEQ on September 21, 2012, that addressed pollutants subject to PSD review with the exception of GHG emissions. An electronic copy of that PSD permit application for all non-GHG pollutants was also provided to EPA Region 6. This PSD permit application, which addresses only GHG emissions, is being submitted to EPA Region 6, because they are the regulatory authority for issuance of GHG PSD permits in Texas. A copy of this GHG PSD permit application is also being provided to TCEQ.

This report is organized as follows:

- Section 1.2 provides a project overview and a summary of the key regulatory determinations.
- Section 2.0 describes the proposed facility and associated GHG emissions.
- Section 3.0 describes state and federal regulatory requirements.
- Section 4.0 provides an analysis of best available control technology (BACT).
- Section 5.0 provides a review of other impacts.

Appendix A provides the TCEQ Form PI-1, General Application for Air Preconstruction Permit and Amendment, form. Appendix B contains the detailed GHG emissions calculations for the four CT manufacturer/model options. Appendix C presents the Texas professional engineer certification statement. Appendix D provides a current list of rare species in Guadalupe County, Texas.

1.2 SUMMARY

The proposed modification to GGS will consist of the addition of two F-class CTs operating in simple-cycle mode. At this time, GPP has not decided on the specific CT manufacturer or model number. The determination of the final CT manufacturer and model will be based on a variety of factors including, but not limited to, capital cost, availability of CTs to meet project schedule milestones, and consistency with the existing combined-cycle CTs at GGS. The CTs will be either General Electric (GE) Model 7FA.03, 7FA.04, or 7FA.05 or Siemens Westinghouse (SW) 5000F(5). GHG emissions for the four CT manufacturer/model options have been calculated based on a maximum annual operating schedule of 2,500 hours per year (hr/yr) of operation. Appendix B presents detailed GHG emissions calculations.

All four CT manufacturer/model options will exceed the PSD applicability threshold of 75,000 tons per year (tpy) for GHG emissions; therefore, a GHG BACT review will be conducted for each of the four CT manufacturer/model options. The proposed modification will also include one diesel-fired emergency firewater pump. The CTs will be fired exclusively with pipeline-quality natural gas containing no more than 0.5 grain of total sulfur per one hundred standard cubic feet (gr S/100 scf), and the emergency firewater pump will be fueled exclusively with ultra-low sulfur diesel (ULSD).

As to project schedule, the key milestones are financial closure, start of construction, and commercial operation. GPP will require financing for the addition of these two simple-cycle CTs. The permits needed to start construction, including the PSD permit issued by TCEQ for all non-GHG pollutants subject to PSD review and the GHG PSD permit issued by EPA Region 6, must be in hand before financial closure can occur. To complete the financing process and allow adequate time to conduct engineering studies prior to starting construction, GPP will need to have both the non-GHG and GHG PSD permits issued by September 2013. The planned construction start date for the addition of the two simple-cycle CTs is October 2013. The projected date for the facility to begin commercial operation is March 2014, following initial equipment startup and completion of required performance testing.

As presented in this report, the BACT analyses required for this air quality permit application resulted in the following conclusions:

- A combined-cycle CT was considered under the BACT review but was determined to fundamentally redefine the nature of a natural gas-fired simple-cycle peaker project.
- There are no postcombustion control technologies for GHG emissions that are technically feasible for a natural gas-fired simple-cycle CT facility. Carbon capture and sequestration (CCS) was considered as a potential control

technology under the BACT review but was determined to be technically infeasible for the proposed natural gas-fired simple-cycle peaker project.

- Energy efficient design and operation of the CTs and the emergency firewater pump was determined to be BACT for GHG emissions. GHG BACT emissions limits for the CTs and emergency firewater pump will include an annual GHG emissions limit in units of tpy. In addition, the GHG BACT emissions limit for the CTs will also include a heat rate limit measured in British thermal units per kilowatt-hour (Btu/kWh) for each of the four CT manufacturer/model options.

2.0 DESCRIPTION OF THE PROPOSED FACILITY

2.1 PROJECT DESCRIPTION, AREA MAP, AND PLOT PLAN

GPP owns GGS, which is located in south-central Texas approximately 6 km north of Marion and 45 km northeast of San Antonio, Texas. GGS currently consists of four natural gas-fired combined-cycle CT generator units capable of producing a nominal 1,000 MW of electricity. GPP proposes to construct two F-class simple-cycle CTs at GGS. GPP has not selected the specific CT manufacturer or model and will select from the following four CT options:

- GE 7FA.03.
- GE 7FA.04.
- GE 7FA.05.
- SW 5000F(5).

Figure 2-1 provides a site location map of GGS. The plant site is located in Guadalupe County south of County Road (CR) 374, Weil Road, and east of CR 359. Figure 2-2 provides a site layout that shows the location of the two proposed simple-cycle CTs in relation to the existing four combined-cycle CTs. The location and configuration of the two proposed simple-cycle CTs will not change based on the final selection of the specific CT manufacturer and model.

GPP proposes to operate each of the simple-cycle CTs for a maximum of 2,500 hr/yr, and annual GHG emissions will be calculated based on 2,500-hr/yr CT operation. GHG emissions from the emergency firewater pump will be based on operating a maximum of 500 hr/yr based on EPA guidance for emergency engines. The emergency firewater pump will be limited to 100 hr/yr of operation for maintenance and testing excluding emergency operation.

2.2 PROCESS DESCRIPTION AND PROCESS FLOW DIAGRAM

Figure 2-3 presents a process flow diagram for the two simple-cycle CTs at GGS. Depending on the final selection of the CT manufacturer and model, the power block will have the potential to generate between a nominal 383 MW of electricity (GE 7FA.03) and a nominal 454 MW of electricity (SW 5000F[5]).

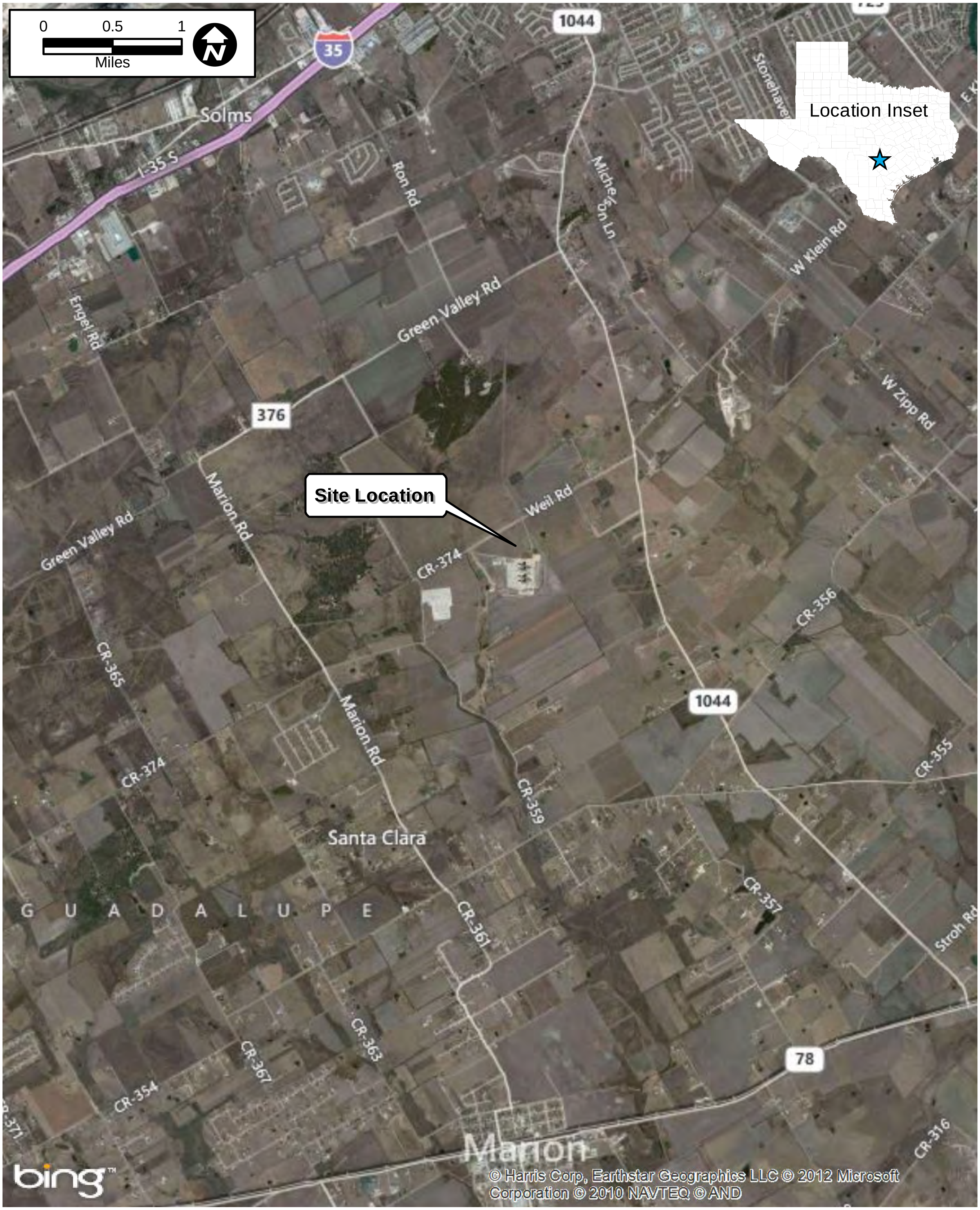

FIGURE 2-1.
SITE LOCATION MAP

Sources: ECT, 2012.

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FIGURE 2-2.
SITE LAYOUT

Sources: ECT, 2012.

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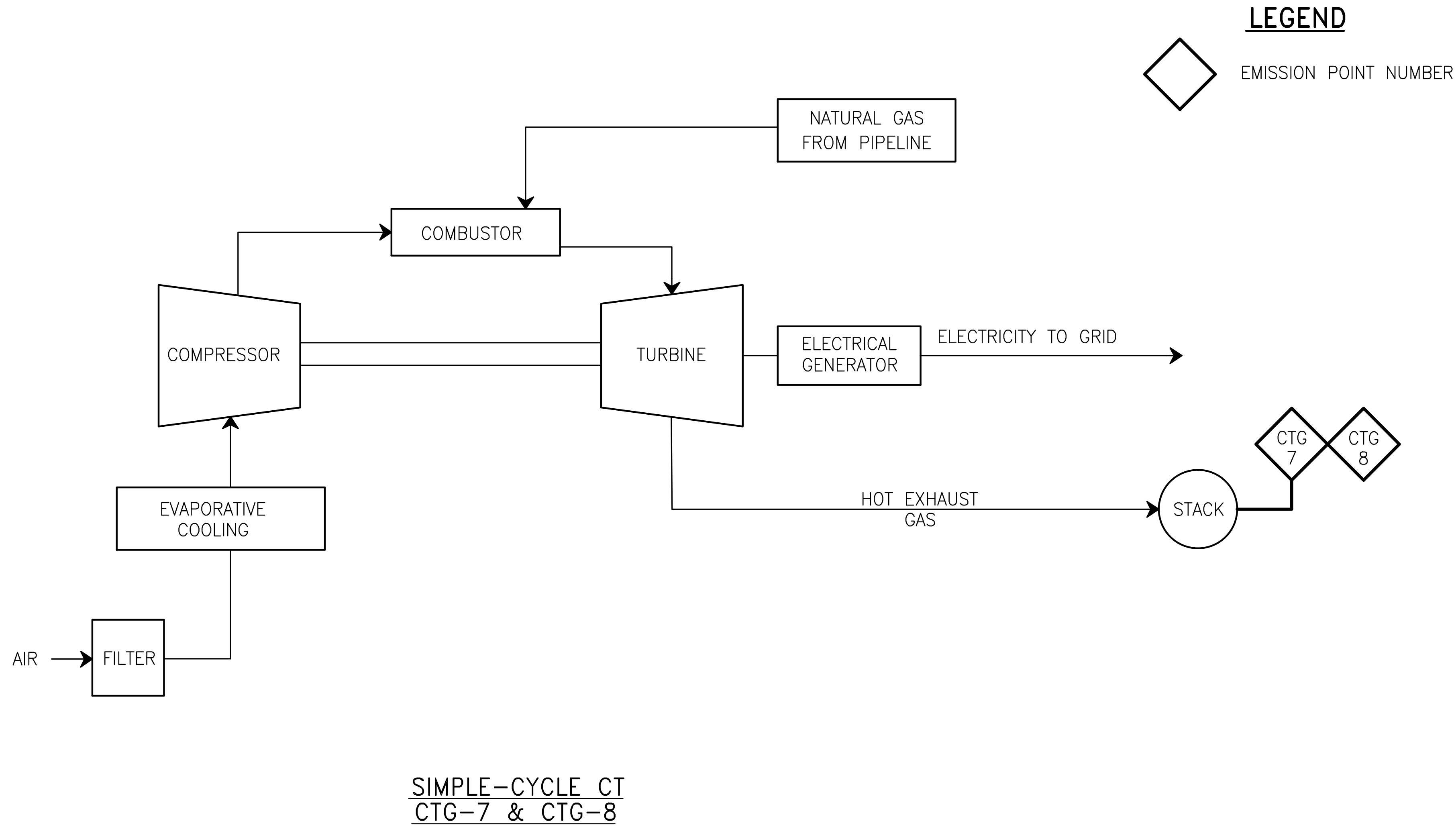

FIGURE 2-3.
SIMPLIFIED PROCESS FLOW DIAGRAM OF A BASIC SIMPLE-CYCLE CT

Source: ECT, 2012.

ECT Environmental Consulting & Technology, Inc.

CTs are heat engines that convert latent fuel energy into work using compressed hot gas as the working medium. CTs deliver mechanical output by means of a rotating shaft used to drive an electrical generator, thereby converting a portion of the engine's mechanical output to electrical energy. Ambient air is first filtered and then compressed by the CT compressor. The CT compressor increases the pressure of the combustion air stream and also raises its temperature. During warm days (typically 60 degrees Fahrenheit [°F] or greater), the turbine inlet ambient air can be cooled by evaporative cooling, thus providing denser air for combustion and improving the power output. In some cases, the temperature of the natural gas fuel will be raised by the use of an electric fuel heater to prevent condensation in the CT fuel system. The compressed combustion air is then combined with the natural gas fuel and burned in the CT's high-pressure combustor to produce hot exhaust gases. These high-pressure, hot gases next expand and turn the turbine to produce rotary shaft power, which is used to drive an electric generator as well as the CT air compressor. The CT exhaust gases will be discharged to the atmosphere after passing through the turbine.

2.3 ANNUAL GHG EMISSIONS

Table 2-1 presents the total annual GHG emissions, expressed as carbon dioxide equivalent (CO_2e), for the two proposed simple-cycle CTs for the two CT manufacturers and four models. The annual GHG emissions total includes GHG emissions from the simple-cycle CTs, GHG emission from the emergency firewater pump, fugitive GHG emissions from the natural gas piping components, and GHG emissions from the circuit breakers. Only those newly installed natural gas piping components and circuit breakers associated with the installation of the two simple-cycle CTs are addressed in this application. Appendix B provides detailed GHG emissions calculations for the four CT manufacturer/model options.

Table 2-1. Summary of Annual GHG Emissions

CT Manufacturer	CT Model	Annual GHG Emissions (tpy)				
		CTs	Emergency Firewater Pump	Fugitive Natural Gas Piping Components	Circuit Breakers	Total
GE	7FA.03	511,379	78	43	82	511,662
	7FA.04	522,722	78	43	82	523,004
	7FA.05	601,470	78	43	82	601,753
SW	5000F(5)	681,839	78	43	82	682,121

Note: Expressed as CO_2e.

Sources: GPP, 2012.
ECT, 2012.

3.0 STATE AND FEDERAL REGULATORY REQUIREMENTS

3.1 STATE REQUIREMENTS

TCEQ has not been delegated authority by EPA to issue air permits relating to GHG emissions. Accordingly, there are currently no relevant Texas regulations that specifically address GHG emissions.

3.2 FEDERAL REQUIREMENTS

On June 3, 2010, EPA published a final rule (effective August 2, 2010) in the Chapter 75, Part 106, of the Federal Register (FR), entitled Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, commonly referred to as the Tailoring Rule. For PSD/Title V purposes, GHGs are a single air pollutant defined as the aggregate group of carbon dioxide (CO_2), nitrous oxide (N_2O), methane, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). This final rule established specific applicability thresholds for GHG emissions for new major sources and modifications to existing major sources under the PSD and Title V programs. This was necessary, since applying the previous PSD and Title V applicability thresholds of 100 and 250 tpy to GHG emissions would have resulted in a large number of relatively small sources becoming subject to these regulatory programs.

On December 30, 2010, EPA promulgated a federal implementation plan (FIP) to provide authority for regulations of GHGs in compliance with the Clean Air Act (CAA). This FIP will apply in states, such as Texas, that do not have an approved SIP regulating GHGs or that have not received EPA delegation to implement the federal GHG regulations. Since TCEQ does not have authority to regulate GHGs, air permitting of GHG emissions for the proposed two simple-cycle CTs at GGS is the responsibility of EPA Region 6.

Effective January 2, 2011, a new source or modification, i.e., a new major stationary source for an NSR pollutant other than GHG, whose GHG emissions exceed 75,000 tpy CO_2e is subject to PSD review including a BACT analysis for GHG emissions. (CO_2e emissions are defined as the sum of the mass emissions of each individual GHG adjusted for its respective global warming potential using Table A-1 of the Greenhouse Gas Reporting Program [40 CFR 98, Subpart A]). Effective July 1, 2011, in addition to this major stationary source applicability criterion, any new stationary source that emits more than 100,000 tpy CO_2e or existing source that has the potential to emit 100,000 tpy CO_2e or greater and commences a modification that results in an emissions increase of 75,000 tpy CO_2e or greater is subject to PSD and Title V programs for GHG.

GHG emissions are quantified both in GHG mass units and in units of CO_2e based on the global warming potential (GWP) of each GHG. Under federal regulations, GHGs are a single air pollutant defined in 40 CFR 52.21(b)(49)(i) as the aggregate group of the following six GHGs:

GHG	GWP
CO_2	1
N_2O	310
Methane	21
HFC	Varies with specific HFC
PFC	Varies with specific PFC
SF_6	23,900

The determination of whether a source is emitting GHGs in an amount that triggers PSD applicability involves a calculation of the source's CO_2e emissions as well as its GHG mass emissions. Accordingly, the determination of whether a proposed project or modification will be subject to GHG new source review (NSR) is made using a two-step applicability process:

- Step 1—The sum of CO_2e emissions in tpy of the six GHGs is estimated to determine whether the source's emissions are a regulated NSR pollutant.
- Step 2—The sum of the mass emissions in tpy of the six GHGs is estimated to determine if the proposed project qualifies as a major source or major modification of GHGs.

For PSD air construction permits issued on or after July 1, 2011, PSD applies to GHG emissions from a proposed new source if either of the following is true:

- The source is subject to PSD review for another PSD pollutant, and the potential to emit GHGs is greater than or equal to 75,000 tpy on a CO_2e basis and greater than 100 or 250 tpy on a mass basis.
- Potential emissions of GHGs from the source is equal to or greater than 100,000 tpy on a CO_2e basis and equal to or greater than 100/250 tpy on a mass basis.

As a result of the CAA, EPA has enacted primary and secondary national ambient air quality standards (NAAQS) for six air pollutants (40 CFR 50). Primary NAAQS are intended to protect the public health, and secondary NAAQS are intended to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air. Areas of the country in violation of ambient air quality standards are designated as nonattainment areas, and new sources to be located in or near these areas may be subject to more stringent air permitting requirements; i.e., nonattainment area NSR. PSD NSR applies to major new facilities and major modifications that will be located in areas designated attainment with NAAQS. Since NAAQS have not been adopted for GHGs, nonattainment NSR is not applicable.

3.3 PSD APPLICABILITY

Potential GHG emissions for the proposed two simple-cycle CTs at GGS exceed 75,000 tpy on both a CO_2e and mass basis; therefore, the project qualifies as a major source subject to PSD GHG review. This is true for the four CT manufacturer/model options being considered for this project. Accordingly, the project will need to comply with applicable provisions of the PSD NSR requirements contained in 40 CFR 52.21 for each of the four CT manufacturer/model options.

3.4 PSD REQUIREMENTS

PSD NSR includes the following requirements:

- Ambient air quality monitoring.
- Ambient impact analysis.
- Additional impact analysis.
- Control technology review.

3.4.1 AMBIENT AIR QUALITY AND IMPACT ANALYSES

NAAQS have not been established for GHGs. Therefore, the PSD NSR requirements pertaining to ambient air quality monitoring (background ambient air quality monitoring) and ambient impact analysis (dispersion modeling) are not applicable.

PSD regulations require additional impact analyses for three areas: associated growth, soils and vegetation impact, and visibility impairment. Since GHG emissions will cause no visibility impairment or direct adverse impacts to soils or vegetation, these analyses are not required. Also, since NAAQS have not been established for GHGs, analysis of the effects of associated growth on air quality is not required.

The following subsections provide a discussion of the PSD NSR review requirements for control technology review (BACT).

3.4.2 CONTROL TECHNOLOGY REVIEW

An analysis of BACT is required for each pollutant proposed to be emitted in amounts equal to or greater than the PSD significant emissions rate levels. BACT is defined as:

> "[a]n emissions limitation, including a visible emissions standard, based on the maximum degree of reduction of each pollutant emitted which the Administrator, on a case by case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable…. through application of production processes or available methods, systems, and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of each such pollutant."

BACT determinations are made on a case-by-case basis as part of the PSD review process and apply to each pollutant that exceeds PSD significant emissions rate thresholds. Emissions units that emit or increase emissions of the applicable pollutants involved in a major modification or a new major source must undergo BACT analysis. Because each applicable pollutant must be analyzed, particular emissions units may undergo BACT analysis for more than one pollutant.

BACT is defined in terms of a numerical emissions limit. This numerical emissions limit can be based on the application of air pollution control equipment; specific production processes, methods, systems, or techniques; fuel cleaning; or combustion techniques. BACT limitations may not exceed any applicable federal new source performance standards (NSPS) as codified under 40 CFR 60, National Emissions Standard For Hazardous Air Pollutants (NESHAPs), as codified under 40 CFR 61 or 63, or any other emissions limitation established by state regulations.

BACT analyses must be conducted using the following five-step, top-down approach:

1. Available control technology alternatives are identified based on knowledge of the particular industry of the applicant, control technology vendors, technical journals and reports, and previous control technology permitting decisions for other identical or similar sources.
2. The identified available control technologies are evaluated for technical feasibility. If a control technology has been installed and operated successfully on the type of source under review, it is considered demonstrated and technically feasible. An undemonstrated control technology may be considered technically feasible if it is available and applicable. A control technology is considered available if it can be obtained commercially (i.e., the technology has reached the licensing and commercial sales phase of development). An available control technology is applicable if it can reasonably be installed and operated on the source type under consideration. Undemonstrated available control technologies determined to be technically infeasible, based on physical, chemical, and engineering principals, are eliminated from further consideration.
3. The technically feasible technology alternatives are ranked from the most stringent, i.e. provides the greatest amount of pollutant removal efficiency, to the least stringent.
4. The hierarchy is evaluated starting with the top, or most stringent alternative, to determine economic, environmental, and energy impacts and assess the feasibility or appropriateness of each alternative as BACT based on site-specific factors. If the top control alternative is accepted as BACT from an economic and energy standpoint, evaluation of energy and economic impacts is not required, since the only reason for conducting these assessments

is to document the rationale for rejecting a technically feasible control option as BACT. Instead, the applicant proceeds to evaluate the top case control technology for impacts of unregulated air pollutants or impacts in other media (i.e., collateral environmental impacts). If there are no issues regarding collateral environmental impacts, the BACT analysis is complete, and the top case control technology alternative is proposed as BACT. If the top control alternative is not applicable due to adverse energy, environmental, or economic impacts, it is rejected as BACT, and the next most stringent control alternative is then considered.

5. This evaluation process continues until an applicable control alternative is determined to be both technologically and economically feasible, thereby defining the emissions level corresponding to BACT for the evaluated pollutant.

Chapter B of EPA's Draft New Source Review Manual dated October 1990 describes this five-step procedure for conducting a BACT analysis. In March 2011, EPA published an updated version of its guidance document entitled PSD and Title V Permitting Guidance for Greenhouse Gases. This guidance document, which was originally published in November 2010, provides, among other issues, guidance on performing BACT analyses for GHG emissions. EPA's guidance reaffirms that a BACT analysis for GHG emissions must be conducted using the same five-step, top-down approach used for other NSR pollutants. GPP has followed this guidance document in conducting the BACT analysis provided in Section 4.0.

3.5 <u>OTHER FEDERAL REQUIREMENTS</u>

For federal EPA permitting, GHG PSD reviews must also include consideration of two other federal laws and programs: the Endangered Species Act and Environmental Justice. Each of these programs is discussed in the following subsections.

3.5.1 ENDANGERED SPECIES ACT

Section 7 of the Endangered Species Act of 1973, as amended (Chapter 16, Part 1531 *et seq.*, United States Code [U.S.C.]) directs federal agencies to use their existing authorities to conserve threatened and endangered species and, in consultation with the U.S. Fish and Wildlife Service and/or National Oceanic and Atmospheric Administration's National Marine Fisheries Service, ensure that their actions do not jeopardize listed species or destroy or adversely modify critical habitat. Section 7 applies to federal actions that may affect listed species, including federal approval of private activities through the issuance of federal permits, licenses, or other actions.

Section 5.0 of this permit application provides details concerning the impact of this proposed project on threatened and endangered species.

3.5.2 ENVIRONMENTAL JUSTICE

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Volume 59, Issue 7629, *Federal Register* [FR]), is intended to ensure that potential disproportionately high and adverse human health or environmental effects on minority and low-income populations do not occur as a result of a federal action. EPA recently established Plan EJ 2014 to guide the way EPA will integrate environmental justice into the agency's programs, policies, and activities.

Section 5.0 of this permit application provides details concerning environmental justice as it relates to this project.

4.0 BACT FOR GREENHOUSE GASES

On June 3, 2010, EPA published a final rule (effective August 2, 2010) in the Federal Register (75 FR 106) entitled Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule (the Tailoring Rule). For PSD/Title V purposes, GHGs are a single air pollutant defined as the aggregate group of CO_2, N_2O, methane, HFCs, PFCs, and SF_6. This final rule established specific applicability thresholds for GHG emissions for new major sources and modifications to existing major sources under the PSD and Title V programs.

Effective January 2, 2011, a new source or modification, i.e., a new major stationary source for an NSR pollutant other than GHG, whose GHG emissions exceed 75,000 tpy CO_2e, is subject to PSD review including a BACT analysis for GHG emissions. (CO_2e emissions are defined as the sum of the mass emissions of each individual GHG adjusted for its respective global warming potential using Table A-1 of the Greenhouse Gas Reporting Program [40 CFR 98, Subpart A]). Effective July 1, 2011, in addition to this major stationary source applicability criterion, any new stationary source that emits more than 100,000 tpy of CO_2e or any existing source that has the potential to emit 100,000 tpy of CO_2e or greater and commences a modification that results in an emissions increase of 75,000 tpy of CO_2e or greater is subject to PSD and Title V programs for GHG.

Since the proposed project is a new major stationary source for an NSR pollutant other than GHG and has CO_2e emissions greater than 75,000 tpy, the proposed project is subject to PSD review including a BACT analysis for GHGs.

In March 2011, EPA published an updated version of the guidance document entitled PSD and Title V Permitting Guidance for Greenhouse Gases (EPA, 2011). This guidance document, which was originally published in November 2010, provides, among other issues, guidance on performing BACT analyses for GHG emissions. EPA's guidance document reaffirms that a BACT analysis for GHG emissions must be conducted using the same five-step, top-down approach used for other NSR pollutants. These five steps are:

- Step 1—Identify available control technologies.
- Step 2—Eliminate technically infeasible options.
- Step 3—Rank remaining control technologies.
- Step 4—Evaluate most effective controls and document results.
- Step 5—Select BACT.

The following subsections provide the BACT analysis for GHG emissions required for this project. This BACT analysis reflects the guidance provided in EPA's updated guidance document entitled PSD and Title V Permitting Guidance for Greenhouse Gases, dated March 2011.

In addition to utilizing the aforementioned documents to complete the BACT analysis, GPP also evaluated the existing Reasonably Available Control Technology (RACT)/ BACT/Lowest Achievable Emissions Rate (LAER) Clearinghouse (RBLC) database, which did not have any results or permitting decisions for CTs under the classification of Large CTs, Simple-Cycle, Natural Gas, Process Code 15.110. GPP has also reviewed and evaluated the GHG PSD permit applications submitted to as well as draft and final permits issued by EPA Region 6 for applicability to this GHG BACT review.

4.1 COMBUSTION TURBINES

4.1.1 STEP 1—IDENTIFY AVAILABLE CONTROL TECHNOLOGIES

Step 1 of the top-down BACT analysis is the identification of available control technologies or techniques, including inherently lower-emitting processes/practices/designs, add-on controls, and a combination of inherently lower-emitting processes/practices and add-on controls, that have a practical application to the control of GHG emissions. These control technologies must include control technologies for the pollutant under evaluation, GHG, regardless of the source category type. For example, control technologies must be identified not only for those demonstrated on other combined-cycle CT facilities but also for control technologies determined through technology transfer that are applied to source categories with similar exhaust stream characteristics.

Technologies that formed the basis of an applicable NSPS should also be considered in the BACT analysis, since a BACT emissions limit cannot be less stringent than an applicable NSPS emissions limit. The two proposed simple-cycle CTs are subject to the NSPS for Stationary CTs, 40 CFR 60, Subpart KKKK.

It is important to note and must be emphasized that available control technologies should not include inherently lower-emitting processes, practices, or designs that would fundamentally redefine the nature of the proposed project or source. A BACT analysis should not consider those control technologies that would change or redefine that applicant's goal, objectives, purpose, or basic design. A BACT analysis may consider control technologies that change aspects of the proposed facility but do not redefine the nature of the proposed facility.

The project configuration consists of two simple-cycle F-class CTs. The EPA guidance document dated March 2011 states that, "combined-cycle CTs, which generally have higher efficiencies than simple-cycle turbines, should be listed as options when an applicant proposes to construct a natural gas-fired facility." In complying with this specific EPA guidance, GPP will list a combined-cycle power plant as an energy-efficient control technology in Step 1. This potential control option will then be further evaluated on the basis of technical feasibility in Step 2.

4.1.1.1 Combined-Cycle CT Power Plant

A simple-cycle CT power plant, also termed a peaker plant, consists of a CT fueled typically by either natural gas or fuel oil. The high-temperature, high-pressure combustion gases expand in a post-CT section, which drives an electrical generator. The high-temperature exhaust gases exiting the CT section are then exhausted directly to the atmosphere.

In a combined-cycle CT power plant, the high-temperature exhaust gases exiting the CT section are routed to a heat recovery steam generator (HRSG). Steam is generated in the HRSG due to the high-temperature exhaust gases and, in some cases, the supplemental firing of duct burners. Steam generated in the HRSG is then sent to a steam turbine for additional electrical power generation. The combined-cycle process recovers some of the energy contained in the high-temperature exhaust gases to create additional electrical power and thus provides a higher overall process energy efficiency as compared to a simple-cycle CT process.

4.1.1.2 CT Energy Efficiency Design, Practices, and Procedures

CT Design

CO_2 is a product of combustion of fuel containing carbon, which is inherent in any power generation technology using fossil fuel. The basic theoretical combustion equation for methane (CH_4) is:

$$CH_4 + O_2 = CO_2 + 2H_2O$$

CO_2 emissions are the essential product of the chemical reaction between the fuel and the oxygen in which it burns and not a byproduct caused by imperfect combustion. Therefore, CO_2 emissions cannot be reduced by improving the combustion efficiency, and there is no technology available that can reduce CO_2 generation from the combustion of carbon-based fuels. The only effective means to minimize the amount of CO_2 generated by a fuel-burning power plant is through high-efficiency combustion and plant design resulting in the lowest heat rate in units of Btu/kWh. Minimizing the amount of fuel required (in units of million British thermal units) to produce a given amount of electrical power output (in units of kilowatt-hours) results in lowest amount of CO_2 generated during the combustion process.

As previously discussed, the most efficient means of generating electricity from a natural gas CT plant is through the use of a combined-cycle design. For fossil fuel technologies, efficiencies typically range between approximately 30 and 50 percent (higher heating value [HHV]). A typical coal-fired Rankine cycle power plant has a typical base load efficiency of approximately 30 percent (HHV), while an F-class natural gas-fired combined-cycle unit operating under optimal conditions has a base load efficiency of approximately 50 percent (HHV) or greater.

There are several other design features employed within the CT process that can improve the overall efficiency of the process. These additional features include those summarized in the following paragraphs.

Evaporative Inlet Air Cooling or Inlet Fogging

Evaporative inlet air cooling or inlet fogging is used during high ambient air temperature operating cases to lower the temperature of the inlet combustion air and thus increase the density of the combustion air. Increasing the density of the inlet combustion air increases the mass flow rate of the inlet combustion air, which allows more fuel to be combusted in the CT process. This provides greater electrical power output from the CT during certain operating cases and in cases of high electrical power demand. Increasing the electrical power output provides increased overall energy efficiency of the CT.

Periodic Burner Maintenance

F-class CTs have regularly scheduled maintenance programs. These maintenance programs are important for the reliable operation of the unit, as well as to maintain optimal efficiency. As the CT is operated, the unit experiences degradation and loss in performance. The CT maintenance program helps restore the recoverable lost performance. The maintenance program schedule is determined by the number of hours of operation and/or turbine starts. There are three basic maintenance levels: combustion inspections, hot gas path inspections, and major overhauls. Combustion inspections are the most frequent of the maintenance cycles. As part of this maintenance activity, the combustors are tuned to restore highly efficient low-emissions operation.

Reduction in Heat Loss

F-class CTs have high operating temperatures. The high operating temperatures are a result of the heat of compression in the compressor along with the fuel combustion in the burners. To minimize heat loss from the CT and protect personnel and equipment around the machine, insulation blankets are applied to the CT casing. These blankets minimize the heat loss through the CT shell and help improve the overall efficiency of the machine.

Instrumentation and Controls

F-class CTs have sophisticated instrumentation and controls to automatically control the operation of the CT. The control system is a digital type and is supplied with the CT. The distributed control system controls all aspects of the turbine's operation, including the fuel flow rate and burner operations, to achieve high efficiency, low-nitrogen oxides (NO_x) combustion. The control system monitors the operation of the unit and modulates the fuel flow and turbine operation to achieve optimal high-efficiency, low-emissions performance under all operating cases.

4.1.1.3 Plantwide Energy Efficiency Design, Practices, and Procedures

There are several other plantwide energy efficiency designs, practices, and procedures within a CT power plant that could potentially improve overall plant efficiency. These include clean fuels and fuel gas preheating.

Clean Fuels

The CAA includes clean fuels in the definition of BACT; therefore, clean fuels should be considered as a potential control technology for GHG emissions. Fuels that reduce GHG emissions of a new source should be considered in a BACT analysis, provided they do not fundamentally redefine the source. For example, a proposed new coal plant should not have to consider switching fuels from coal to natural gas, as that would fundamentally redefine the source. However, different types of coal may be considered to evaluate the benefits of combusting various types of coal in reducing GHG emissions.

Fuel Gas Preheating

The overall efficiency of the CT process is increased as the temperature of fuel is increased. Fuel gas preheating is commonly applied to F-class CT-based plants to maintain the fuel gas temperature above the dew point and prevent condensation in the fuel. Fuel gas preheating also provides a constant fuel gas temperature to the CT. Fuel gas preheating improves the efficiency of a CT-based power process.

The other available control technology for GHG emissions for the simple-cycle CT at GGS is CCS. EPA defines an available control option as, "those air pollution control technologies or techniques (including lower-emitting processes and practices) that have the potential for practical application to the emissions unit and the regulated pollutant under evaluation."

CCS technology does have the "potential" for practical application and therefore was considered an available control option.

4.1.1.4 Carbon Capture and Sequestration

CCS consists of the separation and capture of CO_2 from the flue gas, pressurization of the captured CO_2, transportation of the CO_2 as a fluid via pipeline, and injection and long-term geologic storage.

The capture technologies applicable for fossil fuel combustion include the following:

- Precombustion systems designed to separate CO_2 and hydrogen in the high-pressure syngas typically produced at integrated gasification combined-cycle power plants.
- Postcombustion systems designed to separate CO_2 from the flue gas produced by the combustion process.
- Oxy-combustion systems that use high-purity oxygen rather than air in the combustion process to produce a highly concentrated CO_2 stream.

Precombustion systems are not technically feasible for GGS, since they would fundamentally redefine the nature of the proposed source. Both post- and oxy-combustion systems would be considered an available control option, and both are currently in development as demonstration projects on much smaller exhaust slip streams at coal-fired power plants using amine and ammonia capture systems to remove the CO_2 from the flue gas. Oxy-combustion systems are limited by the parasitic power required for oxygen production in a conventional air separation unit. In addition, the oxy-combustion process also requires a portion of the exhaust CO_2 stream to be cooled and recycled in the combustion chamber for mass and temperature control. These capture systems are associated with high energy penalties.

Once CO_2 is separated and captured, it then can be compressed under high pressure for transport to an appropriate geological storage site. The process of transporting CO_2 is typically considered via pipeline and has substantial associated logistic hurdles and operational penalties. Transportation infrastructure issues include pipeline routing, acquisition of rights-of-way, and associated environmental impacts. In addition, additional energy must be expended to compress and transport the compressed CO_2. An alternative means of transporting the compressed CO_2 is via a ship, similar to transporting liquid natural gas. Again, there are similar logistic hurdles and operational penalties for transporting compressed CO_2 via ship that can be substantial.

CCS usually involves the injection of CO_2 into deep geological formations of porous rock that are capped by one or more nonporous layers of rock. Injected at high pressure, the CO_2 exists as a liquid that flows through the porous rock to fill the voids. Saline formations, exhausted oil and gas fields, and unmineable coal seams are candidates for CO_2 storage. Also, CO_2 injected for enhanced oil recovery projects can result in long-term sequestration depending on the geologic conditions. Other schemes include liquid storage in the ocean, solid storage by reactions leading to the creation of carbonates, and terrestrial sequestration.

4.1.2 STEP 2—ELIMINATE TECHNICALLY INFEASIBLE OPTIONS

Step 2 of the top-down BACT analysis is the elimination of technically infeasible options. EPA considers a technology to be technically feasible if, one, it has been demonstrated and operated successfully on the same type of source under review, or two, it is available and applicable to the source type under review. A control technology should also be considered technically available or applicable if it has been demonstrated on an exhaust stream with similar physical and chemical characteristics.

4.1.2.1 Combined-Cycle CT Power Plant

In accordance with EPA guidance, a natural gas-fired combined-cycle CT power plant was considered as a potential control option. A combined-cycle CT power plant is typically more energy efficient than a comparable simple-cycle CT power plant due to the fact that a portion of the thermal energy contained in the high-temperature CT exhaust gas is recovered in the HRSG. This thermal energy is used to generate steam in the HRSG, which is then used to drive a steam turbine generator creating additional electrical power output.

A combined-cycle power plant typically takes a longer period of time to start up as compared to a simple-cycle power plant. This is due in part to the fact that the temperature of the HRSG must be gradually increased to its operating temperature to minimize thermal stress effects to the HRSG components. There are other factors that contribute to the increased startup time for a combined-cycle plant. For this reason, combined-cycle plants are typically considered intermediate load or baseload power plants, which operate for longer periods of time after startup. Note that there are some combined-cycle CT power plant designs that propose the use of fast or rapid start CT. These designs allow the CT to operate in simple-cycle mode and produce some electrical power, while the HRSG and other equipment associated with combined-cycle operation are allowed time to become operational. Operation of a combined-cycle plant in this manner, to produce electrical power in simple-cycle mode, is not economical on an extended basis and, therefore, cannot be comparable to a simple-cycle CT operating as a peaker plant.

The primary function of a peaker plant is to provide immediate electrical power to the electric grid in response to an immediate increase in electrical demand. To meet this function, a peaker plant must be able to reach full load operations in an extremely quick and responsive manner. It is estimated that the two proposed simple-cycle CTs for GGS can start up in less than 15 minutes. A peaker plant must also be able to shut down quickly and be able to restart in response to the electrical demand. It is not uncommon for a peaker plant to start multiple times in a single day.

A combined-cycle CT power plant, even if the CTs are operated in simple-cycle mode, is simply not designed to operate as a peaker plant. A combined-cycle power plant cannot respond to the quick and immediate electrical demands required for a peaker plant.

The two proposed simple-cycle CTs will be limited to 2,500 hr/yr of operation and are therefore considered peaker plants. A combined-cycle CT power plant is not designed for peaker operation and would fundamentally redefine the nature of the source. A combined-cycle CT power plant is not further considered in this BACT analysis.

4.1.2.2 CT Energy Efficiency Design, Practices, and Procedures

All CT energy efficiency designs, practices and procedures including the CT design itself, evaporative inlet air cooling, CT tuning, reduction in heat loss, and instrumentation and controls are all technically feasible and will be considered further in this BACT analysis

4.1.2.3 Plantwide Energy Efficiency Design, Practices, and Procedures

The use of clean fuels and fuel gas heating, which minimize the facility's GHG emissions, are technically feasible and will be considered further in this BACT review.

4.1.2.4 Carbon Capture And Sequestration

EPA considers a technology to be technically feasible if it, one, has been demonstrated and operated successfully on the same type of sources under review, or two, is available and applicable to the source type under review.

CCS has not been demonstrated on a full-scale power generation facility. There are several CCS demonstration projects or research and development projects, but these projects are on a significantly smaller scale and are only applied to a slipstream of the total exhaust gas stream. CCS technology is not currently commercially available for a full-scale power generation facility. CCS technology has not been demonstrated on a similar exhaust gas stream that could be considered an equivalent scale as a full-scale power generation facility.

CCS technology is currently in various stages of development and is not commercially available. There have been no CCS demonstration projects to date (and none planned) for natural gas-fired simple-cycle CT facilities. Priorities with respect to federal funding of CCS demonstration projects have focused on developing cost-effective CCS technology for large fossil fuel-fired combustion sources such as coal-fired power plants. Since CO_2 emissions from natural gas-fired simple-cycle CT facilities are significantly lower than coal-fired power plants, it is unlikely the limited federal funds available for CCS development will be applied to natural gas-fired CT facilities.

EPA recognizes the significant technical and logistical issues associated with the installation and operation of a CCS control system that do not allow CCS technology to be evaluated in the same fashion as demonstrated add-on control technologies typically used to reduce emissions of other regulated pollutants. In contrast to CCS technology, demonstrated add-on control technologies for other regulated pollutants have a proven track record of performance and an existing reasonably accessible infrastructure in place to address waste disposal and other offsite needs.

Additionally, EPA does allow site-specific considerations in evaluating whether an available control option should be considered technically infeasible including physical space for CO_2 capture equipment and postcapture CO_2 compression equipment at an existing facility. GGS is an existing power plant located on a relatively small piece of land area. There is extremely limited physical space available to install CCS equipment, even if it were commercially available.

Therefore, although CCS was identified as an available control option in Step 1, CCS technology is not considered technically feasible for the two proposed natural gas-fired simple-cycle CTs at GGS and is not further considered in this BACT analysis.

4.1.3 STEP 3—RANK REMAINING CONTROL TECHNOLOGIES

Step 3 of the top-down BACT analysis is the ranking of technically feasible options.

Since it has been determined that CCS is not technically feasible, the remaining technically feasible options include high thermal or energy efficiency, fuel gas heating, and the exclusive use of clean fuels. The energy efficiency must look at the high thermal efficiency design of the CTs system as well as various energy efficiency improvements throughout the process.

4.1.4 STEP 4—EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS

Step 4 of the top-down BACT analysis is the consideration of economic, energy, and environmental impacts.

The two proposed simple-cycle CTs will use high thermal efficiency CT design, fuel gas heating, and exclusive use of clean fuel; i.e., pipeline-quality natural gas. Since there are no other technically feasible available options for reducing GHG emissions, no further analysis of economic, energy, or environmental impacts is necessary.

4.1.5 STEP 5—SELECT BACT

Step 5 of the top-down BACT analysis is the selection of BACT.

GPP proposes as BACT for GHG the following energy efficiency designs, practices, and procedures for the proposed simple-cycle power generation technology:

- CT energy efficiency design, practices, and procedures:
  - Efficient CT design.
  - CT inlet air cooling.
  - Periodic CT burner maintenance and tuning.
  - Reduction in heat loss, i.e., insulation of the CT.
  - Instrumentation and controls.
- Plantwide energy efficiency design, practices, and procedures:
  - Exclusive use of clean fuels, i.e., pipeline-quality natural gas for the CTs and ULSD for the new emergency firewater pump.
  - Electric heating of the fuel gas prior to combustion.

GPP proposes an annual GHG BACT emissions for each of the four CT manufacturer/model options. These annual GHG BACT emissions limits include GHG emissions from the two simple-cycle CTs, GHG emissions from the emergency firewater pump, fugitive GHG emissions from newly installed natural gas piping components, and GHG emissions from estimated SF_6 insulating gas leakage from newly installed circuit breakers (see Table 4-1).

Compliance with this numerical annual GHG BACT emissions limit will be demonstrated by measuring and recording the total heat input to the CTs and monitoring CO_2 emissions with continuous emissions monitoring systems. Methane and N_2O emissions will be calculated using emissions factors as defined in the Mandatory Greenhouse Gas Reporting Rule, Table C-2. CO_2e emissions will then be calculated using each GHG pollutant's respective GWP as defined in the Mandatory Greenhouse Gas Reporting Rule, Table A-1.

To ensure the inherent efficiency of the two proposed simple-cycle CTs remains high, GPP also proposes a numerical limit on the simple-cycle CT gross heat rate, expressed in units of Btu/kWh (HHV).

The proposed simple-cycle CT gross heat rate is based on operating at base load and International Organization for Standardization (ISO) conditions. The following margins were used to adjust base load heat rates for each of the CT manufacturer/model options:

- 3.3 percent to account for the potential difference between the design CT heat rate and the actual tested CT heat rate.
- 6 percent for CT efficiency losses due to degradation prior to CT overhaul.

Table 4-2 presents the proposed simple-cycle gross heat rates for each of the CT manufacturer/model options.

GPP proposes to demonstrate compliance with the annual GHG emissions limit by monitoring the fuel usage to the CTs on a 12-month rolling basis. GHG emissions from the CTs will be calculated using emissions factors from the Mandatory Reporting of Greenhouse Gases, Final Rule; Federal Register, Vol. 74, No. 209, October 30, 2009, Tables C-1 and C-2, to Subpart C of Part 98.

GPP proposes to demonstrate compliance with the gross heat rate by conducting an annual thermal efficiency test at base load and corrected to ISO conditions. Demonstrating

Table 4-1. Proposed GHG BACT Emissions Limits

CT Manufacturer and Model	Annual GHG Emission Limit* (tpy)
GE 7FA.03	511,429
GE 7FA.04	522,772
GE 7FA.05	601,520
SW 5000F(5)	681,839

*Expressed as CO_2e.

Sources: GPP, 2012.
ECT, 2012.

Table 4-2. Proposed Simple-Cycle Gross Heat Rates

CT Manufacturer/Model	Gross Heat Rate (Btu/kWh) (HHV)
GE 7FA.03	11,121
GE 7FA.04	10,826
GE 7FA.05	10,673
SW 5000F(5)	11,456

Sources: GPP, 2012.
ECT, 2012.

compliance on an annual basis will ensure that the CT is operating efficiently not only at base load and ISO conditions but at all other ambient temperatures and loads.

A review of GHG BACT heat rate determinations for large simple-cycle CTs was performed. Federal and state agency Websites and databases reviewed include EPA's RBLC database, EPA Regional Office Website including Region 6, and state environmental regulatory agency Websites. To date, there have been very few simple-cycle CTs that have been subject to BACT review for GHG emissions.

A search of EPA's RBLC database for GHG BACT determinations over the past 10 years for large (more than 25 MW) natural gas-fired simple-cycle CTs yielded only one facility, Sabine Pass liquefied natural gas (LNG) terminal located in Cameron County, Louisiana. The CTs were GE LM2500 units, which are not comparable to the proposed F-class CTs proposed for GGS. Good combustion/operating practices and use of natural gas were listed as the control methodology for the LM2500 units.

A final GHG PSD permit was issued by EPA Region 8 on September 27, 2012, for the Cheyenne Light, Fuel, and Power/Black Hills Power, Inc., Cheyenne Prairie Generating Station located in Laramie County, Wyoming. This proposed facility consists of two GE LM6000 PF SPRINT CTs operating in a two-on-one combined-cycle configuration and three GE LM6000 PF SPRINT CTs operating in simple-cycle mode. The CTs are all fired exclusively with pipeline-quality natural gas. The GE LM6000 CT is an aero-derivative CT and is not comparable to the F-class CTs proposed for GGS.

4.2 EMERGENCY FIREWATER PUMP

4.2.1 STEP 1—IDENTIFY AVAILABLE CONTROL TECHNOLOGIES

The available GHG control technologies that could be potentially applicable to a diesel-fueld firewater pump include:

- CCS.
- Efficient engine design.
- Clean fuels.
- Good combustion practices.

4.2.2 STEP 2—ELIMINATE TECHNICALLY INFEASIBLE OPTIONS

As previously discussed, CCS is currently being considered for larger fossil fuel-fired power plants with higher exhaust mass flow rates and CO_2 concentrations as compared to a diesel-fired compression ignition (CI) internal combustion engine (ICE). CCS is not technically feasible for an emergency diesel-fired firewater pump, which will operate infrequently and only during emergencies except for periods of testing and maintenance.

4.2.3 STEP 3—RANK REMAINING CONTROL TECHNOLOGIES

Since it has been determined that CCS is technically infeasible, the other remaining control technologies are efficient engine design, clean fuels, and good combustion practices.

4.2.4 STEP 4—EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS

The emergency firewater pump will incorporate the technically feasible control technologies, i.e. efficient engine design, use of clean fuels, and good combustion practices.

4.2.5 STEP 5—SELECT BACT

GPP proposes a maximum annual GHG emissions limit of 79 tpy for the emergency firewater pump based on a maximum operation of 500 hr/yr.

The diesel-fired engine will meet the applicable standards of NSPS for Stationary Compression Ignition Internal Combustion Engines, 40 CFR 60, Subpart IIII, and will be limited to 100 hours of operation for testing and maintenance purposes excluding operation during an emergency. Compliance with NSPS Subpart IIII will demonstrate efficient engine design. The emergency firewater pump will use clean fuels by the exclusive use of ULSD. Good combustion practices will include complying with manufacturers recommended operation and maintenance procedures.

Compliance with the maximum annual GHG emissions limit will be demonstrated by monitoring the hours of operation on a 12-month rolling basis. Annual ULSD fuel consumption will be calculated based on the hours of operation and engine hourly fuel consumption. GHG emissions from the emergency firewater pump will be calculated using emissions factors from the Mandatory Reporting of Greenhouse Gases, Final Rule; Federal Register Vol. 74, No. 209, October 30, 2009, Tables C-1 and C-2, to Subpart C of Part 98.

4.3 FUGITIVE GHG EMISSIONS FROM NATURAL GAS PIPING COMPONENTS

Fugitive GHG emissions will be calculated for all newly installed natural gas piping components on an annual basis to demonstrate compliance with the annual GHG BACT emissions limit. Only those natural gas piping components under GPP control and outside the CT enclosure have been considered. The CT enclosure is maintained under negative pressure, and any natural gas leaks from piping components within the CT enclosure will be captured and not emitted to atmosphere. GHG emissions will be calculated using emissions factors contained in EPA's Mandatory Reporting of Greenhouse Gas Rule, 40 CFR 98, Table W-1A, Default Whole Gas Emission Factors for Onshore Petroleum and Natural Gas Production. GHG emissions from natural gas piping components will be calculated on an annual basis.

4.4 SULFUR HEXAFLUORIDE

SF_6 is one of the six pollutants that comprise GHGs. SF_6 is a synthetic gas that possesses excellent electrical insulating properties. Because of this, SF_6 is used as an insulating gas in many electrical circuit breakers. The newly installed circuit breakers for the two proposed simple-cycle CTs will contain a quantity of SF_6 for the purpose of acting as an electrical insulator. Because of the size required for the circuit breakers, SF_6 circuit breakers are the only feasible alternative for this application, i.e., compressed air and dielectric oil circuit breakers would not safely handle the design voltages.

There may potentially be some small, nonroutine emissions of SF_6 during the operation, i.e. opening and closing, of the circuit breaker. To minimize the emissions of SF_6, GPP proposes to use state-of-the-art enclosed pressure SF_6 circuit breakers as BACT for SF_6. The circuit breakers will be equipped with SF_6 pressure monitors and a low SF_6 alarm. In comparison to older circuit breakers containing SF_6, modern circuit breakers are designed as totally enclosed-pressure systems with a far lower potential for SF_6 emissions.

4.5 BACT DURING STARTUP AND SHUTDOWN

BACT must be met at all times including during periods of startup and shutdown. Pollutants subject to BACT analysis and review must address BACT emissions limits not only during normal operation but also during startup and shutdown.

GHG emissions are lower during startup and shutdown, as these emissions are directly proportional to the amount of fuel combusted. Since fuel flow rates are lower during startup and shutdown compared to normal operation, emissions of GHGs during startup and shutdown will also be lower compared to normal operation. Therefore, the proposed annual GHG BACT CO_2e emissions limits proposed for the simple-cycle CTs will apply during periods of startup and shutdown, as well as during periods of normal operation.

5.0 OTHER IMPACTS

5.1 THREATENED AND ENDANGERED SPECIES

Thirty-two rare species have been identified as potentially occurring in Guadalupe County by the Texas Parks and Wildlife Department. Appendix D contains the complete list.

The proposed addition of the two simple-cycle CTs to the existing GGS does not represent the construction and operation of a new greenfields power generation facility. GGS is an existing power generation facility, and the addition of the proposed simple-cycle CTs will be located on property already owned and under the control of GPP.

The addition of the proposed simple-cycle CTs is expected to have little to no impact on threatened and endangered species due to the fact that the proposed location of these CTs is within the existing GGS plant boundary. The specific area for the proposed project facilities has been previously impacted and disturbed by construction and operation of the existing power facilities. The previous environmental licensing studies for the initial development and subsequent expansions of the GGS included detailed surveys and assessments for wetlands, vegetation, and protected wildlife and plant species. This immediate area contains no wetlands or suitable wildlife habitat. The proposed project would have no additional impacts on biological resources.

5.2 ENVIRONMENTAL JUSTICE

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, requires federal agencies to identify and address disproportionately high adverse human health or environmental effects of their programs and policies on minority and low-income communities and Native American tribes.

The proposed addition of the two simple-cycle CTs to the existing GGS does not represent construction and operation of a new greenfields power generation facility. GGS is an existing power generation facility, and the addition of the proposed simple-cycle CTs will be located on property already owned and under the control of GPP. This GHG PSD permit application provides the following analysis addressing environmental justice.

Table 5-1 provides information regarding the total population and racial makeup levels in Guadalupe County and the state of Texas. This information demonstrates that Guadalupe County, in general, does not contain a significantly great amount of minorities as compared to the entire state of Texas.

Table 5-2 provides information regarding the median household income and poverty levels in Guadalupe County and the state of Texas. This information demonstrates that Guadalupe County, in general, does not contain a significantly great amount of lower income households as compared to the entire state of Texas.

Therefore, no disproportionately high or adverse impacts to minority or low-income communities are expected due to the proposed project.

Table 5-1. Population by Race—2010

Area	Total Population	Race (%)				
		White	African American	Asian	Other	Identified by Two or More
Guadalupe County	131,533	79.8	6.5	1.4	9.2	3.1
State of Texas	25,145,561	70.4	11.9	3.8	11.2	2.7

Source: U.S. Census Bureau, 2012.

Table 5-2. Income and Poverty Level—2010

Area	Median Household Income	Per Capita Income	Persons Below Poverty Level (%)
Guadalupe County	$58,799	$25,218	11.4
State of Texas	$48,622	$24,870	17.9

Source: U.S. Census Bureau, 2012.

APPENDIX A

GENERAL APPLICATION

Texas Commission on Environmental Quality
Form PI-1 General Application for
Air Preconstruction Permit and Amendment

Important Note: The agency **requires** that a Core Data Form be submitted on all incoming applications unless a Regulated Entity and Customer Reference Number have been issued *and* no core data information has changed. For more information regarding the Core Data Form, call (512) 239-5175 or go to www.tceq.texas.gov/permitting/central_registry/guidance.html.

I. Applicant Information		
A. Company or Other Legal Name: Guadalupe Power Partners LP		
Texas Secretary of State Charter/Registration Number (*if applicable*):		
B. Company Official Contact Name: Mr. John Walsh		
Title: Director of Operations		
Mailing Address: 5740 Weil Road		
City: Marion	State: Texas	ZIP Code: 78124
Telephone No.: 707- 327-8883	Fax No.: 832-442-3259	E-mail Address: jwalsh@wayzpartners.com
C. Technical Contact Name: Mr. Bill Skinner		
Title: Director of Engineering		
Company Name: Navasota Energy		
Mailing Address: 403 Corporate Woods		
City: Magnolia	State: Texas	ZIP Code: 77354
Telephone No.: 281-252-5221	Fax No.: 832-442-3259	E-mail Address: bskinner@navasotaenergy.com
D. Site Name: Guadalupe Generating Station		
E. Area Name/Type of Facility: Combustion Turbines CTG-7 and CTG-8		☒ Permanent ☐ Portable
F. Principal Company Product or Business: Electrical Power Generation		
Principal Standard Industrial Classification Code (SIC): 4911		
Principal North American Industry Classification System (NAICS): 221112		
G. Projected Start of Construction Date: October 2013		
Projected Start of Operation Date: March 2014		
H. Facility and Site Location Information (If no street address, provide clear driving directions to the site in writing.):		
Street Address: 5740 Weil Road		
City/Town: Marion	County: Guadalupe	ZIP Code: 78124
Latitude (nearest second): 29.625517	Longitude (nearest second): 98.145064	

I. Applicant Information (continued)	
I. Account Identification Number (leave blank if new site or facility):	
J. Core Data Form.	
Is the Core Data Form (Form 10400) attached? If *No*, provide customer reference number and regulated entity number (complete K and L).	☐ YES ☒ NO
K. Customer Reference Number (CN): 600132120	
L. Regulated Entity Number (RN):100225820	
II. General Information	
A. Is confidential information submitted with this application? If *Yes*, mark each **confidential** page **confidential** in large red letters at the bottom of each page.	☐ YES ☒ NO
B. Is this application in response to an investigation or enforcement action? If *Yes*, attach a copy of any correspondence from the agency.	☐ YES ☒ NO
C. Number of New Jobs:	
D. Provide the name of the State Senator and State Representative and district numbers for this facility site:	
Senator: Jeff Wentworth	District No.: 25
Representative: John Kuempel	District No.: 44
III. Type of Permit Action Requested	
A. Mark the appropriate box indicating what type of action is requested. Initial ☒ Amendment ☐ Revision (30 TAC 116.116(e)) ☐ Change of Location ☐ Relocation ☐	
B. Permit Number (if existing):	
C. Permit Type: Mark the appropriate box indicating what type of permit is requested. *(check all that apply, skip for change of location)* Construction ☒ Flexible ☐ Multiple Plant ☐ Nonattainment ☐ Prevention of Significant Deterioration ☒ Hazardous Air Pollutant Major Source ☐ Plant-Wide Applicability Limit ☐ Other:______	
D. Is a permit renewal application being submitted in conjunction with this amendment in accordance with 30 TAC 116.315(c).	☐ YES ☒ NO

TCEQ

III. Type of Permit Action Requested (continued)		
E. Is this application for a change of location of previously permitted facilities? If Yes, complete III.E.1 - III.E.4.		☐ YES ☒ NO
1. Current Location of Facility (If no street address, provide clear driving directions to the site in writing.):		
Street Address:		
City:	County:	ZIP Code:
2. Proposed Location of Facility (If no street address, provide clear driving directions to the site in writing.):		
Street Address:		
City:	County:	ZIP Code:
3. Will the proposed facility, site, and plot plan meet all current technical requirements of the permit special conditions? If *No*, attach detailed information.		☐ YES ☐ NO
4. Is the site where the facility is moving considered a major source of criteria pollutants or HAPs?		☐ YES ☐ NO
F. Consolidation into this Permit: List any standard permits, exemptions or permits by rule to be consolidated into this permit including those for planned maintenance, startup, and shutdown.		
List:		
G. Are you permitting planned maintenance, startup, and shutdown emissions? If *Yes*, attach information on any changes to emissions under this application as specified in VII and VIII.		☐ YES ☒ NO
H. Federal Operating Permit Requirements (30 TAC Chapter 122 Applicability)		
Is this facility located at a site required to obtain a federal operating permit? If *Yes*, list all associated permit number(s), attach pages as needed).		☒ YES ☐ NO ☐ To be determined
Associated Permit No (s.): O-02071		
1. Identify the requirements of 30 TAC Chapter 122 that will be triggered if this application is approved. FOP Significant Revision ☒ FOP Minor ☐ Application for an FOP Revision ☐ To Be Determined ☐ Operational Flexibility/Off-Permit Notification ☐ Streamlined Revision for GOP ☐ None ☐		

III. Type of Permit Action Requested (continued)	
H. Federal Operating Permit Requirements (30 TAC Chapter 122 Applicability) *(continued)*	
2. Identify the type(s) of FOP(s) issued and/or FOP application(s) submitted/pending for the site. (check all that apply)	
GOP Issued ☐	GOP application/revision application submitted or under APD review ☐
SOP Issued ☒	SOP application/revision application submitted or under APD review ☐

IV. Public Notice Applicability	
A. Is this a new permit application or a change of location application?	☒ YES ☐ NO
B. Is this application for a concrete batch plant? If Yes, complete V.C.1 – V.C.2.	☐ YES ☒ NO
C. Is this an application for a major modification of a PSD, nonattainment, FCAA 112(g) permit, or exceedance of a PAL permit?	☐ YES ☒ NO
D. Is this application for a PSD or major modification of a PSD located within 100 kilometers or less of an affected state or Class I Area?	☐ YES ☒ NO
If *Yes*, list the affected state(s) and/or Class I Area(s).	
E. Is this a state permit amendment application? If Yes, complete IV.E.1. – IV.E.3. **No**	
1. Is there any change in character of emissions in this application?	☐ YES ☐ NO
2. Is there a new air contaminant in this application?	☐ YES ☐ NO
3. Do the facilities handle, load, unload, dry, manufacture, or process grain, seed, legumes, or vegetables fibers (agricultural facilities)?	☐ YES ☐ NO
F. List the total annual emission increases associated with the application (*list* **all** *that apply and attach additional sheets as needed*): **(maximum emissions of all four CT manufacturers and models)**	
Volatile Organic Compounds (VOC): 25.9 tons per year	
Sulfur Dioxide (SO_2): 6.8 tons per year	
Carbon Monoxide (CO): 198.0 tons per year	
Nitrogen Oxides (NO_x): 171.9 tons per year	
Particulate Matter (PM): 11.8 tons per year (filterable only)	
PM $_{10}$ microns or less (PM_{10}): 23.3 tons per year (filterable and condensable)	
PM $_{2.5}$ microns or less ($PM_{2.5}$): 23.3 tons per year (filterable and condensable)	
Lead (Pb): Negligible	
Hazardous Air Pollutants (HAPs): 3.2 tons per year (Total HAPs)	
Other speciated air contaminants **not** listed above: GHG (as CO_2e) – 682,065 tons per year	

V. Public Notice Information (complete if applicable)		
A. Public Notice Contact Name: Mr. Bill Skinner		
Title: Director of Engineering		
Mailing Address: 403 Corporate Woods Drive		
City: Magnolia	State: Texas	ZIP Code: 77354
Telephone No.: 281-252-5221		
B. Name of the Public Place: Seguin-Guadalupe County Public Library		
Physical Address (No P.O. Boxes): 707 East College Street		
City: Seguin	County: Guadalupe	ZIP Code: 78155
The public place has granted authorization to place the application for public viewing and copying.		☒ YES ☐ NO
The public place has internet access available for the public.		☒ YES ☐ NO
C. Concrete Batch Plants, PSD, and Nonattainment Permits		
1. County Judge Information (For Concrete Batch Plants and PSD and/or Nonattainment Permits) for this facility site.		
The Honorable: Charles Willmann		
Mailing Address: 211 West Court Street		
City: Seguin	State: Texas	ZIP Code: 78155
2. Is the facility located in a municipality or an extraterritorial jurisdiction of a municipality? *(For Concrete Batch Plants)*		☐ YES ☐ NO
Presiding Officers Name(s):		
Title:		
Mailing Address:		
City:	State:	ZIP Code:
3. Provide the name, mailing address of the chief executive of the city for the location where the facility is or will be located. **Not Applicable**		
Chief Executive:		
Mailing Address:		
City:	State:	ZIP Code:

V. Public Notice Information (complete if applicable) (continued)		
3. Provide the name, mailing address of the Indian Governing Body for the location where the facility is or will be located. *(continued)* **Not Applicable**		
Name of the Indian Governing Body:		
Title:		
Mailing Address:		
City:	State:	ZIP Code:
D. Bilingual Notice		
Is a bilingual program **required** by the Texas Education Code in the School District?		☒ YES ☐ NO
Are the children who attend either the elementary school or the middle school closest to your facility eligible to be enrolled in a bilingual program provided by the district?		☒ YES ☐ NO
If *Yes*, list which languages are required by the bilingual program? Spanish		
VI. Small Business Classification (Required)		
A. Does this company (including parent companies and subsidiary companies) have fewer than 100 employees or less than $6 million in annual gross receipts?		☐ YES ☒ NO
B. Is the site a major stationary source for federal air quality permitting?		☒ YES ☐ NO
C. Are the site emissions of any regulated air pollutant greater than or equal to 50 tpy?		☒ YES ☐ NO
D. Are the site emissions of all regulated air pollutants combined less than 75 tpy?		☐ YES ☒ NO
VII. Technical Information		
A. The following information must be submitted with your Form PI-1 (this is just a checklist to make sure you have included everything)		
1. Current Area Map ☒		
2. Plot Plan ☒		
3. Existing Authorizations ☐		
4. Process Flow Diagram ☒		
5. Process Description ☒		
6. Maximum Emissions Data and Calculations ☒		
7. Air Permit Application Tables ☐		
a. Table 1(a) (Form 10153) entitled, Emission Point Summary ☐		
b. Table 2 (Form 10155) entitled, Material Balance ☐		
c. Other equipment, process or control device tables ☐		

VII. Technical Information	
B. Are any schools located within 3,000 feet of this facility?	☐ YES ☒ NO
C. Maximum Operating Schedule:	

Hours: 2,500 per year	Day(s): 7 per week	Week(s): 52 per year	Year(s):[Life of Plant or blank??]

Seasonal Operation? If Yes, please describe in the space provide below.	☐ YES ☒ NO
D. Have the planned MSS emissions been previously submitted as part of an emissions inventory?	☐ YES ☒ NO
Provide a list of each planned MSS facility or related activity and indicate which years the MSS activities have been included in the emissions inventories. Attach pages as needed.	
E. Does this application involve any air contaminants for which a *disaster review* is required?	☐ YES ☒ NO
F. Does this application include a pollutant of concern on the *Air Pollutant Watch List (APWL)*?	☐ YES ☒ NO
VIII. State Regulatory Requirements **Applicants must demonstrate compliance with all applicable state regulations to obtain a permit or amendment**. *The application must contain detailed attachments addressing applicability or non applicability; identify state regulations; show how requirements are met; and include compliance demonstrations.*	
A. Will the emissions from the proposed facility protect public health and welfare, and comply with all rules and regulations of the TCEQ?	☒ YES ☐ NO
B. Will emissions of significant air contaminants from the facility be measured?	☒ YES ☐ NO
C. Is the Best Available Control Technology (BACT) demonstration attached?	☒ YES ☐ NO
D. Will the proposed facilities achieve the performance represented in the permit application as demonstrated through recordkeeping, monitoring, stack testing, or other applicable methods?	☒ YES ☐ NO
IX. Federal Regulatory Requirements **Applicants must demonstrate compliance with all applicable federal regulations to obtain a permit or amendment** *The application must contain detailed attachments addressing applicability or non applicability; identify federal regulation subparts; show how requirements are met; and include compliance demonstrations.*	
A. Does Title 40 Code of Federal Regulations Part 60, (40 CFR Part 60) New Source Performance Standard (NSPS) apply to a facility in this application?	☒ YES ☐ NO
B. Does 40 CFR Part 61, National Emissions Standard for Hazardous Air Pollutants (NESHAP) apply to a facility in this application?	☐ YES ☒ NO
C. Does 40 CFR Part 63, Maximum Achievable Control Technology (MACT) standard apply to a facility in this application?	☐ YES ☒ NO

Texas Commission on Environmental Quality
Form PI-1 General Application for
Air Preconstruction Permit and Amendment

IX. Federal Regulatory Requirements **Applicants must demonstrate compliance with all applicable federal regulations to obtain a permit or amendment** ***The application must contain detailed attachments addressing applicability or non applicability; identify federal regulation subparts; show how requirements are met; and include compliance demonstrations.***		
D. Do nonattainment permitting requirements apply to this application?		☐ YES ☒ NO
E. Do prevention of significant deterioration permitting requirements apply to this application?		☒ YES ☐ NO
F. Do Hazardous Air Pollutant Major Source [FCAA 112(g)] requirements apply to this application?		☐ YES ☒ NO
G. Is a Plant-wide Applicability Limit permit being requested?		☐ YES ☒ NO
X. Professional Engineer (P.E.) Seal		
Is the estimated capital cost of the project greater than $2 million dollars?		☒ YES ☐ NO
If *Yes*, submit the application under the seal of a Texas licensed P.E.		
XI. Permit Fee Information		
Check, Money Order, Transaction Number ,ePay Voucher Number:	Fee Amount: Not Applicable	
Company name on check: Guadalupe Power Partners LP	Paid online?: ☐ YES ☐ NO	
Is a copy of the check or money order attached to the original submittal of this application?	☐ YES ☐ NO ☒ N/A	
Is a Table 30 (Form 10196) entitled, Estimated Capital Cost and Fee Verification, attached?	☐ YES ☐ NO ☒ N/A	

Texas Commission on Environmental Quality
Form PI-1 General Application for
Air Preconstruction Permit and Amendment

TCEQ

XII. Delinquent Fees and Penalties
This form **will not be processed** until all delinquent fees and/or penalties owed to the TCEQ or the Office of the Attorney General on behalf of the TCEQ is paid in accordance with the Delinquent Fee and Penalty Protocol. For more information regarding Delinquent Fees and Penalties, go to the TCEQ Web site at: www.tceq.texas.gov/agency/delin/index.html.
XIII. Signature
The signature below confirms that I have knowledge of the facts included in this application and that these facts are true and correct to the best of my knowledge and belief. I further state that to the best of my knowledge and belief, the project for which application is made will not in any way violate any provision of the Texas Water Code (TWC), Chapter 7, Texas Clean Air Act (TCAA), as amended, or any of the air quality rules and regulations of the Texas Commission on Environmental Quality or any local governmental ordinance or resolution enacted pursuant to the TCAA I further state that I understand my signature indicates that this application meets all applicable nonattainment, prevention of significant deterioration, or major source of hazardous air pollutant permitting requirements. The signature further signifies awareness that intentionally or knowingly making or causing to be made false material statements or representations in the application is a criminal offense subject to criminal penalties.
Name: John Walsh
Signature: John Walsh *Original Signature Required*
Date: 11/9/2012

APPENDIX B

EMISSIONS CALCULATIONS

Table B-1. Potential Greenhouse Gas (GHG) Emissions: Navasota Guadalupe - GE 7FA.03 CTs

Potential Carbon Dioxide Equivalent (CO_2e) Emissions from the Combustion Sources

Emissions Source	Heat Input (MMBtu/hr) LHV *	Heat Input (MMBtu/hr) HHV †	Maximum Annual Operating Hours (hr/yr)	Maximum Annual Potential Heat Input (MMBtu/yr)	CO_2 Emissions Factor‡ (kg/MMBtu)	CO_2 Potential Emissions (short tpy) CO_2	CO_2 Potential Emissions (short tpy) CO_2e ¥	CH_4 Emissions Factor § (kg/MMBtu)	CH_4 Potential Emissions (short tpy) CH_4	CH_4 Potential Emissions (short tpy) CO_2e ¥	N_2O Emissions Factor § (kg/MMBtu)	N_2O Potential Emissions (short tpy) N_2O	N_2O Potential Emissions (short tpy) CO_2e ¥	CO_2e Potential Emissions (short tpy)
CTG-7	1,578	1,748	2,500	4,369,877	53.02	255,439	255,439	1.0E-03	5	101	1.0E-04	0	149	**255,690**
CTG-8	1,578	1,748	2,500	4,369,877	53.02	255,439	255,439	1.0E-03	5	101	1.0E-04	0	149	**255,690**
FWP-2	NA	1.92	500	960	73.96	78.3	78.3	3.0E-03	0.0	0.1	6.0E-04	0.0	0.2	**78.5**
									Total CO_2e Potential Annual Emissions					**511,458**

Potential CO_2e Emissions from Natural Gas Piping Components

Component	Number of Components	Emissions Factor per Component (scf/hr) £	Annual Emissions (tpy) CO_2 ∂	Annual Emissions (tpy) CH_4 ∂	Annual Emissions (tpy) CO_2e ¥
Valve	50	0.121	0.03	1.08	22.7
Flange	200	0.017	0.02	0.61	12.8
Relief valve	10	0.193	0.01	0.34	7.2
				Total	**42.7**

Potential CO_2e Emissions from Circuit Breakers

Number of Circuit Breakers	Quantity SF_6 Insulating Gas Per Component (lb)	Quantity SF_6 Insulating Gas Total (lb)	Annual Leak Rate (%)	Annual Emissions SF_6 lb/yr	Annual Emissions SF_6 tpy	Annual Emissions CO_2e ¥ tpy
2	690	1380.00	0.50	6.9	0.00345	82.5
					Total	**82.5**

Total Facility Potential CO_2e Emissions

	Annual ¥ (tpy)
CTs	511,458
FWP-2	79
NG piping	43
Circuit breakers	82
Total	**511,662**

*Based on 100-percent load at 59°F.
†HHV based on HHV/LHV ratio of 1.1077.
‡Mandatory Reporting of Greenhouse Gases, Final Rule; Federal Register Vol. 74, No. 209, October 30, 2009, Table C-1 to Subpart C of Part 98.
§Mandatory Reporting of Greenhouse Gases, Final Rule; Federal Register Vol. 74, No. 209, October 30, 2009, Table C-2 to Subpart C of Part 98.
¥Based on global warming potential of 1 for CO_2, 21 for CH_4, 310 for N_2O, and 23,900 for SF_6.
£Based on 40 CFR 98, Table W-1a for Western United States.
∂Based on natural gas composition of 98-percent CH_4 and 1-percent CO_2.

Sources: GPP, 2012.
ECT, 2012.

Table B-2. Potential Greenhouse Gas (GHG) Emissions: Navasota Guadalupe - GE 7FA.04 CTs

Potential Carbon Dioxide Equivalent (CO_2e) Emissions from the Combustion Sources

Emissions Source	Heat Input (MMBtu/hr) LHV *	Heat Input (MMBtu/hr) HHV †	Maximum Annual Operating Hours (hr/yr)	Maximum Annual Potential Heat Input (MMBtu/yr)	CO_2 Emissions Factor‡ (kg/MMBtu)	CO_2 Potential Emissions (short tpy) CO_2	CO_2 Potential Emissions (short tpy) CO_2e ¥	CH_4 Emissions Factor § (kg/MMBtu)	CH_4 Potential Emissions (short tpy) CH_4	CH_4 Potential Emissions (short tpy) CO_2e ¥	N_2O Emissions Factor § (kg/MMBtu)	N_2O Potential Emissions (short tpy) N_2O	N_2O Potential Emissions (short tpy) CO_2e ¥	CO_2e Potential Emissions (short tpy)
CTG-7	1,613	1,787	2,500	4,466,800	53.02	261,105	261,105	1.0E-03	5	103	1.0E-04	0	153	**261,361**
CTG-8	1,613	1,787	2,500	4,466,800	53.02	261,105	261,105	1.0E-03	5	103	1.0E-04	0	153	**261,361**
FWP-2	NA	1.92	500	960	73.96	78.3	78.3	3.0E-03	0.0	0.1	6.0E-04	0.0	0.2	**78.5**
									Total CO_2e Potential Annual Emissions					**522,800**

Potential CO_2e Emissions from Natural Gas Piping Components

Component	Number of Components	Emissions Factor per Component (scf/hr) £	Annual Emissions (tpy) CO_2 ∂	Annual Emissions (tpy) CH_4 ∂	Annual Emissions (tpy) CO_2e ¥
Valve	50	0.121	0.03	1.08	22.7
Flange	200	0.017	0.02	0.61	12.8
Relief valve	10	0.193	0.01	0.34	7.2
				Total	**42.7**

Potential CO_2e Emissions from Circuit Breakers

Number of Circuit Breakers	Quantity SF_6 Insulating Gas Per Component (lb)	Quantity SF_6 Insulating Gas Total (lb)	Annual Leak Rate (%)	Annual Emissions SF_6 lb/yr	Annual Emissions SF_6 tpy	Annual Emissions CO_2e ¥ tpy
2	690	1380.00	0.50	6.9	0.00345	82.5
					Total	**82.5**

Total Facility Potential CO_2e Emissions

	Annual ¥ (tpy)
CTs	522,800
FWP-2	79
NG piping	43
Circuit breakers	82
Total	**523,004**

*Based on 100-percent load at 59°F.
†HHV based on HHV/LHV ratio of 1.1077.
‡Mandatory Reporting of Greenhouse Gases, Final Rule; Federal Register Vol. 74, No. 209, October 30, 2009, Table C-1 to Subpart C of Part 98.
§Mandatory Reporting of Greenhouse Gases, Final Rule; Federal Register Vol. 74, No. 209, October 30, 2009, Table C-2 to Subpart C of Part 98.
¥Based on global warming potential of 1 for CO_2, 21 for CH_4, 310 for N_2O, and 23,900 for SF_6.
£Based on 40 CFR 98, Table W-1a for Western United States.
∂Based on natural gas composition of 98-percent CH_4 and 1-percent CO_2.

Sources: GPP, 2012.
ECT, 2012.

Table B-3. Potential Greenhouse Gas (GHG) Emissions: Navasota Guadalupe - GE 7FA.05 CTs

Potential Carbon Dioxide Equivalent (CO_2e) Emissions from the Combustion Sources														
			Maximum Annual		CO_2			CH_4			N_2O			CO_2e
Emissions Source	Heat Input (MMBtu/hr)		Operating Hours	Potential Heat Input	Emissions Factor‡	Potential Emissions (short tpy)		Emissions Factor §	Potential Emissions (short tpy)		Emissions Factor §	Potential Emissions (short tpy)		Potential Emissions
	LHV *	HHV †	(hr/yr)	(MMBtu/yr)	(kg/MMBtu)	CO_2	CO_2e ¥	(kg/MMBtu)	CH_4	CO_2e ¥	(kg/MMBtu)	N_2O	CO_2e ¥	(short tpy)
CTG-7	1,856	2,056	2,500	5,139,728	53.02	300,440	300,440	1.0E-03	6	119	1.0E-04	1	176	**300,735**
CTG-8	1,856	2,056	2,500	5,139,728	53.02	300,440	300,440	1.0E-03	6	119	1.0E-04	1	176	**300,735**
FWP-2	NA	1.92	500	960	73.96	78.3	78.3	3.0E-03	0.0	0.1	6.0E-04	0.0	0.2	**78.5**
									Total CO_2e Potential Annual Emissions					**601,549**

Potential CO_2e Emissions from Natural Gas Piping Components					
Component	Number of Components	Emissions Factor per Component (scf/hr) £	Annual Emissions (tpy)		
			CO_2 ∂	CH_4 ∂	CO_2e ¥
Valve	50	0.121	0.03	1.08	22.7
Flange	200	0.017	0.02	0.61	12.8
Relief valve	10	0.193	0.01	0.34	7.2
				Total	**42.7**

Potential CO_2e Emissions from Circuit Breakers						
Number of Circuit Breakers	Quantity SF_6 Insulating Gas		Annual Leak Rate	Annual Emissions		
	Per Component	Total		SF_6		CO_2e ¥
	(lb)	(lb)	(%)	lb/yr	tpy	tpy
2	690	1380.00	0.50	6.9	0.00345	82.5
					Total	**82.5**

Total Facility Potential CO_2e Emissions	
	Annual ¥ (tpy)
CTs	601,549
FWP-2	79
NG piping	43
Circuit breakers	82
Total	**601,753**

*Based on 100-percent load at 59°F.
†HHV based on HHV/LHV ratio of 1.1077.
‡Mandatory Reporting of Greenhouse Gases, Final Rule; Federal Register Vol. 74, No. 209, October 30, 2009, Table C-1 to Subpart C of Part 98.
§Mandatory Reporting of Greenhouse Gases, Final Rule; Federal Register Vol. 74, No. 209, October 30, 2009, Table C-2 to Subpart C of Part 98.
¥Based on global warming potential of 1 for CO_2, 21 for CH_4, 310 for N_2O, and 23,900 for SF_6.
£Based on 40 CFR 98, Table W-1a for Western United States.
∂Based on natural gas composition of 98-percent CH_4 and 1-percent CO_2.

Sources: GPP, 2012.
ECT, 2012.

Table B-4. Potential Greenhouse Gas (GHG) Emissions: Navasota Guadalupe - SW 5000F(5) CTs

Potential Carbon Dioxide Equivalent (CO_2e) Emissions from the Combustion Sources

Emissions Source	Heat Input (MMBtu/hr) LHV *	Heat Input (MMBtu/hr) HHV †	Maximum Annual Operating Hours (hr/yr)	Maximum Annual Potential Heat Input (MMBtu/yr)	CO_2 Emissions Factor‡ (kg/MMBtu)	CO_2 Potential Emissions (short tpy) CO_2	CO_2 Potential Emissions (short tpy) CO_2e ¥	CH_4 Emissions Factor § (kg/MMBtu)	CH_4 Potential Emissions (short tpy) CH_4	CH_4 Potential Emissions (short tpy) CO_2e ¥	N_2O Emissions Factor § (kg/MMBtu)	N_2O Potential Emissions (short tpy) N_2O	N_2O Potential Emissions (short tpy) CO_2e ¥	CO_2e Potential Emissions (short tpy)
CTG-7	2,104	2,331	2,500	5,826,502	53.02	340,586	340,586	1.0E-03	6	135	1.0E-04	1	199	**340,920**
CTG-8	2,104	2,331	2,500	5,826,502	53.02	340,586	340,586	1.0E-03	6	135	1.0E-04	1	199	**340,920**
FWP-2	NA	1.92	500	960	73.96	78.3	78.3	3.0E-03	0.0	0.1	6.0E-04	0.0	0.2	**78.5**
									Total CO_2e Potential Annual Emissions					**681,918**

Potential CO_2e Emissions from Natural Gas Piping Components

Component	Number of Components	Emissions Factor per Component (scf/hr) £	Annual Emissions (tpy) CO_2 ∂	Annual Emissions (tpy) CH_4 ∂	Annual Emissions (tpy) CO_2e ¥
Valve	50	0.121	0.03	1.08	22.7
Flange	200	0.017	0.02	0.61	12.8
Relief valve	10	0.193	0.01	0.34	7.2
				Total	**42.7**

Potential CO_2e Emissions from Circuit Breakers

Number of Circuit Breakers	Quantity SF_6 Insulating Gas Per Component (lb)	Quantity SF_6 Insulating Gas Total (lb)	Annual Leak Rate (%)	Annual Emissions SF_6 lb/yr	Annual Emissions SF_6 tpy	Annual Emissions CO_2e ¥ tpy
2	690	1380.00	0.50	6.9	0.00345	82.5
					Total	**82.5**

Total Facility Potential CO_2e Emissions

	Annual ¥ (tpy)
CTs	681,918
FWP-2	79
NG piping	43
Circuit breakers	82
Total	**682,121**

*Based on 100-percent load at 59°F.
†HHV based on HHV/LHV ratio of 1.1077.
‡Mandatory Reporting of Greenhouse Gases, Final Rule; Federal Register Vol. 74, No. 209, October 30, 2009, Table C-1 to Subpart C of Part 98.
§Mandatory Reporting of Greenhouse Gases, Final Rule; Federal Register Vol. 74, No. 209, October 30, 2009, Table C-2 to Subpart C of Part 98.
¥Based on global warming potential of 1 for CO_2, 21 for CH_4, 310 for N_2O, and 23,900 for SF_6.
£Based on 40 CFR 98, Table W-1a for Western United States.
∂Based on natural gas composition of 98-percent CH_4 and 1-percent CO_2.

Sources: GPP, 2012.
ECT, 2012.

APPENDIX C

TEXAS PROFESSIONAL ENGINEER CERTIFICATION

TEXAS PROFESSIONAL ENGINEER CERTIFICATION

I, the undersigned, hereby certify that, to the best of my knowledge, any greenhouse gas emissions estimates reported or relied upon in this application are true, accurate, and complete and are based on reasonable techniques available for calculating greenhouse gas emissions.

Signature: Jeffrey L. Meling — Date: 11/7/2012

Signature

Date

Jeffrey L. Meling, P.E.
Senior Vice President
Environmental Consulting & Technology, Inc.

APPENDIX D

GUADALUPE COUNTY LIST OF RARE SPECIES

APPENDIX D

Guadalupe County List of Rare Species (Continued, Page 1 of 2)

Common Name	Scientific Name	USFWS Status	TPWD Status
Birds			
American peregrine falcon	*Falco peregrinus anatum*	DL	T
Arctic peregrine falcon	*Falco peregrinus tundrius*	DL	—
Bald eagle	*Haliaeetus leucocephalus*	DL	T
Interior least tern	*Sterna antillarum athalassos*	E	E
Mountain plover	*Charadrius montanus*	—	—
Peregrine falcon	*Falco peregrinus*	DL	T
Sprague's pipit	*Anthus spragueii*	C	
Western burrowing owl	*Athene cunicularia hypugaea*	—	—
Whooping crane	*Grus americana*	E	E
Wood stork	*Mycteria americana*		T
Fishes			
Guadalupe bass	*Micropterus treculii*	—	—
Guadalupe darter	*Percina sciera apristis*	—	—
Insects			
Mayfly	*Campsurus decoloratus*	—	—
Mammals			
Cave myotis bat	*Myotis velifer*	—	—
Plains spotted skunk	*Spilogale putorius interrupta*	—	—
Red wolf	*Canis rufus*	E	E
Mollusks			
Creeper (squawfoot)	*Strophitus undulatus*	—	—
False spike mussel	*Quadrula mitchelli*	—	T
Golden orb	*Quadrula aurea*	C	T
Texas fatmucket	*Lampsilis bracteata*	C	T
Texas pimpleback	*Quadrula petrina*	C	T
Reptiles			
Cagle's map turtle	*Graptemys caglei*	—	T
Spot-tailed earless lizard	*Holbrookia lacerata*	—	—
Texas garter snake	*Thamnophis sirtalis annectens*	—	—
Texas horned lizard	*Phrynosoma cornutum*	—	T
Texas tortoise	*Gopherus berlandieri*	—	T
Timber/Canebrake rattlesnake	*Crotalus horridus*	—	T

APPENDIX D

Guadalupe County List of Rare Species (Continued, Page 2 of 2)

Common Name	Scientific Name	USFWS Status	TPWD Status
Plants			
Big red sage	*Salvia pentstemonoides*	—	—
Elmendorf's onion	*Allium elmendorfii*	—	—
Green beebalm	*Monarda viridissima*	—	—
Parks' jointweed	*Polygonella parksii*	—	—
Sandhill woollywhite	*Hymenopappus carrizoanus*	—	—

Note: DL = delisted.
T = threatened.
E = endangered.
C = candidate for listing.

Source: http://www.tpwd.state.tx.us/gis/ris/es/ES_Reports.aspx?county=Guadalupe, 2012.