UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS TX 75202-2733

NOV 08 2013

Mr. Jimmy Rabon
Plant Manager
CEMEX – Balcones Cement Plant
2580 Wald Road
New Braunfels, TX 78132

Dear Mr. Rabon:

We wish to inform you that the draft Prevention of Significant Deterioration (PSD) permit for greenhouse gas emissions and the permit statement of basis have been completed for the CEMEX – Balcones Cement Plant project. The public notice for the draft permit starts on Sunday, November 17, 2013 and will end on Tuesday, December 17, 2013. A copy of both the draft permit and statement of basis are enclosed, and also will be made available to the public for review at the New Braunfels Public Library and our website (http://yosemite.epa.gov/r6/Apermit.nsf/AirP.)

In the public notice we have planned for a public hearing on Tuesday, January 7, 2014 from 6:00 p.m. to 8:00 p.m. If the public hearing is held, the public comment period shall automatically be extended to the close of the public hearing. The public hearing is scheduled for the following location:

New Braunfels Public Library
Public Meeting Room
700 Commons Street
New Braunfels, TX 78130
(830) 221-4300

However, if no request for a public hearing is received by the end of the comment period, or we determine that there is not a significant interest, the hearing will be cancelled. If the hearing is cancelled, we will notify you and the public by Friday, December 20, 2013.

If you have any questions, please feel free to contact me or Jeff Robinson at (214) 665-6435.

Sincerely,

Wren Stenger
Director
Multimedia Planning and
Permitting Division

Enclosures

cc: Kim Bradley, Environmental Manager

*****PUBLIC NOTICE*****

CEMEX Construction Materials South, LLC
Balcones Cement Plant
New Braunfels, Comal County, Texas

ANNOUNCEMENT OF PROPOSED PERMIT AND PUBLIC HEARING, AND REQUEST FOR PUBLIC COMMENT OF PROPOSED CLEAN AIR ACT GREENHOUSE GAS PREVENTION OF SIGNIFICANT DETERIORATION PRECONSTRUCTION PERMIT

Public Comment Period November 17, 2013 to December 17, 2013

The United States Environmental Protection Agency (EPA) provides notice of and requests public comments on the EPA's proposed action relating to the Prevention of Significant Deterioration (PSD) permit application for the CEMEX Construction Materials South, LLC Balcones Cement Plant. If finalized, the permit would regulate greenhouse gas (GHG) pollutant emissions associated with the project to modify an existing cement manufacturing complex in accordance with the PSD regulation (40 CFR 52.21). The proposed modifications are to take place at 2580 Wald Road, New Braunfels, TX 78132 at the following coordinates: 29° 40' 22" N and 98° 10' 56" W.

EPA concludes that the CEMEX – Balcones Cement Plant is subject to PSD review for the pollutant GHGs, as the project will result in increased greenhouse gas emissions for a facility described at 40 CFR 52.21(b)(49)(iv). The proposed project consists of the increase in production of cement clinker associated with Kiln No. 2 and installation of new multi channel burners in the kilns of both existing cement kilns at the site. EPA Region 6 implements a Greenhouse Gas (GHG) PSD Federal Implementation Plan (FIP) for Texas under the provisions of 40 CFR 52.21 (except paragraph (a)(1)). *See 40 CFR 52.2305*.

Any interested individual may submit written comments on EPA's proposed PSD permit for the Balcones Cement Plant. All comments must be received in writing or be postmarked by December 17, 2013. Direct the comments to Mr. Brad Toups at one of the following addresses:

EPA Contact: Brad Toups

Phone Number: (214) 665-7258

E-mail: Toups.Brad@epa.gov

U.S. Mail: Brad Toups
Air Permits Section (6PD-R)
U.S. EPA, Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202

EPA will consider and respond to all comments in making the final decision regarding the issuing of the permit. Similar comments may be grouped together in the response, and the EPA will not respond to individual commenters directly.

Additionally, all comments will be included in the administrative record without change, and may be made available to the public, including any personal information provided, unless the comments includes Confidential Business Information (CBI) or other information whose disclosure is restricted by statue. Thus, CBI or other protected information should be clearly identified as such, and should not be submitted through email. Emails sent directly to the EPA will capture your email address automatically and will be included as part of the public comment. *Please note that an email or postal address must be provided with your comments if you wish to receive responses to comments submitted during the public comment period and direct notification of EPA's final decision regarding the permit.*

An extension of the 30-day comment period may be granted if the request for an extension adequately demonstrates why additional time is required to prepare comments.

Public Hearing: If EPA determines that there is a significant degree of public interest in the draft permit, the EPA has the right to hold a public hearing. Any request for a public hearing must be received by the EPA either by email or U.S. mail by December 17, 2013, and must state the nature of the issues proposed to be raised in the hearing. Attendance at the public hearing is not required in order to submit written comments. ***If the EPA determines that there is significant public interest***, a public hearing will be held on January 7, 2014 from 6:00 p.m. to 8:00 p.m. at the following location:

New Braunfels Public Library
Public Meeting Room
700 Commons St
New Braunfels, TX 78130
(830) 221-4300

If a public hearing is held, the public comment period shall automatically be extended to the close of the public hearing. The EPA maintains the right to cancel a public hearing if no request for a public hearing is received by December 17, 2013, or the EPA determines that there is not significant interest. ***If the public hearing is cancelled,*** notification of the cancellation will be posted by December 20, 2013 on the EPA's Website http://yosemite.epa.gov/r6/Apermit.nsf/AirP. Individuals may also call the EPA at the contact number listed above to determine if the public hearing has been cancelled.

Permit Documents: EPA's draft permit, EPA's preliminary determination and statement of basis, CEMEX- Balcones Cement Plant's permit application and supporting documentation, and comments received from the public, other government agencies, and the applicant during the public comment period become part of the administrative record for the permit. In addition, all data submitted by the applicant is available as a part of the administrative record. The public can access the administrative record at the following locations (Please call in advance for available viewing times):

New Braunfels Public Library
700 Commons St
New Braunfels, TX 78130
(830) 221-4300

EPA Region 6 Office
1445 Ross Avenue, Suite 1200
Dallas, TX 75202
Phone: (214) 665-7200

Final Determination: A final decision to issue a permit or to deny the application for the permit shall be made after all comments have been considered. Notice of the final decision shall be sent to each person who has submitted written comments or requested notice of the final permit decision, provided the EPA has adequate contact information.

Statement of Basis

Proposed Draft Greenhouse Gas Prevention of Significant Deterioration Preconstruction Permit for the CEMEX Construction Materials South, LLC, CEMEX- Balcones Cement Plant

Proposed Draft Permit Number: PSD-TX-74-GHG

This document serves as the statement of basis (SOB) for the above-referenced draft permit, as required by 40 CFR §124.7. This document sets forth the legal and factual basis for the draft permit conditions and provides references to the statutory or regulatory provisions, including provisions in 40 CFR §52.21, that would apply if the permit is finalized. This document is intended for use by all parties interested in the permit.

I. Executive Summary

On July 11, 2012, CEMEX Construction Materials South, LLC (CEMEX) submitted to EPA Region 6 a Prevention of Significant Deterioration (PSD) permit application for greenhouse gas (GHG) emissions from a proposed modification to a cement production plant in New Braunfels, Texas. The application was revised on February 6, 2013 and again on August 26, 2013 (hereinafter, referred to as "the application"). In connection with the same proposed project, CEMEX submitted a PSD New Source Review permit applications for non-GHG pollutants to the Texas Commission on Environmental Quality (TCEQ) dated December 29, 2011 and the non-GHG PSD permit (PSD-TX-74M2) was issued by the TCEQ on October 8, 2013.

The draft GHG permit would authorize a modification and increased GHG emissions at an existing major source (for PSD purposes and for pollutants other than GHGs). More specifically, the permit would authorize increased GHG emissions for both the kiln line No. 1 and kiln line No. 2. Each of these lines is comprised of an in-line raw mill, blending silos, preheaters, precalciners, a rotary kiln, a clinker cooler, and in-line solid fuel mills. Additional equipment at the site includes raw material handling systems, finish milling equipment, baghouses to capture product and to control particulate emissions, ancillary equipment and processes at the site including shipping systems, gaseous pollutant control systems and alternative fuel receiving, handling, and preparation systems, but none of the other systems result in the emission of GHG pollutants.

This project includes two distinct modifications at the site. The first change affects kiln line No.2 only, and authorizes increased emissions to raise an existing production limitation from 3,600 to 3,960 tons of clinker per day (30-day rolling average). Clinker production from the kiln No.1 system remains unchanged at 3,250 tons of clinker per day (30-day rolling average). The kiln No.2 production rate of 3,960 ton per 30- day rolling average requires no physical change to the kiln system to achieve but rather can be derived from the system as it was constructed in 2008.

The second change at the site addressed by this permit includes GHG emissions from the effect of upgrades to the main kiln burners in kiln line No. 1 and kiln line No. 2 systems to multipath adjustable units. The burner upgrades will not increase the maximum fuel firing rate for either kiln but will increase flexibility in the amount and kind of fuels (the fuel mix) that can be burned in the main kiln and result in potential energy efficiency improvements. The list of authorized fuels can be found in permit PSD-TX-74M1. That permit authorized the firing of natural gas, coal, and petroleum coke (pet coke) as primary fuels and also authorized multiple, specifically identified alternative fuels including wood products, carpet fibers, shingles, oil filter fluff, rice husks, and cotton gin residue. PSD-TX-74M2, among other things continues to govern the authorized and unchanged list of fuels that may be fired in either kiln line.

This SOB provides the information and analysis used to support EPA's decisions in drafting the air permit. It includes a description of the facility and proposed modification, the air permit requirements based on BACT analyses conducted on the proposed modified units, and the compliance terms of the permit.

EPA Region 6 concludes that CEMEX's application is complete and provides the necessary information to demonstrate that the proposed project meets the applicable air permit regulations. EPA's conclusions rely upon information provided in the permit application, supplemental information provided by CEMEX at EPA's request, and EPA's own technical analysis. EPA is making this information available as part of the public record.

II. Applicant

CEMEX Construction Materials South, LLC
CEMEX – Balcones Cement Plant
2580 Wald Road
New Braunfels, TX 78132

Physical Address:
2580 Wald Road
New Braunfels, TX 78132

Contact:
Jimmy Rabon
2580 Wald Road
New Braunfels, TX 78132
(210) 250-4009

III. Permitting Authority

On May 3, 2011, EPA published a federal implementation plan (FIP) that made EPA Region 6 the PSD permitting authority for the pollutant GHGs. See 75 FR 25178 (promulgating 40 CFR §52.2305).

The GHG PSD Permitting Authority for the State of Texas is:

EPA, Region 6
1445 Ross Avenue
Dallas, TX 75202

The EPA Region 6 Permit Writer is:
Brad Toups
Air Permitting Section (6PD-R)
(214) 665-7258

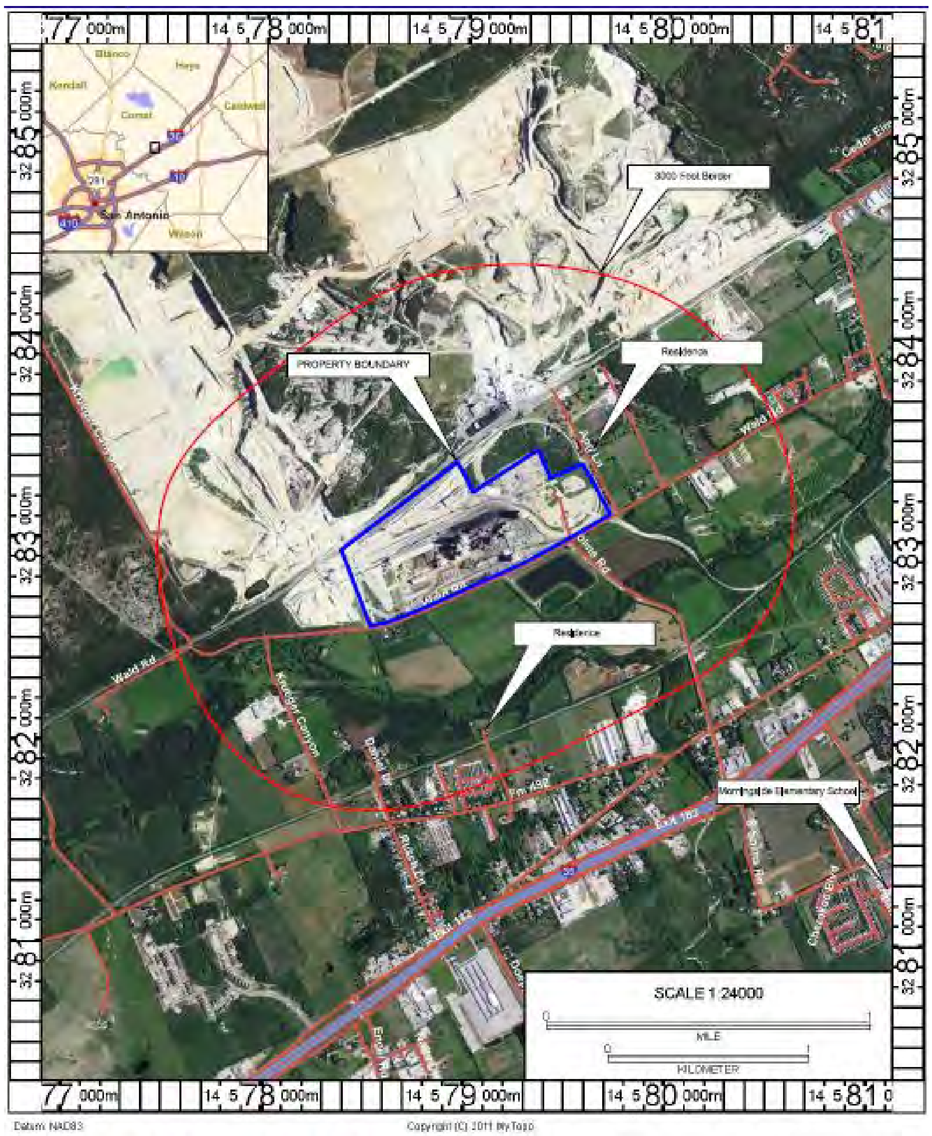
IV. Facility Location

The CEMEX- Balcones Cement Plant is located in Comal County, Texas, which is currently designated attainment/unclassified for all NAAQS pollutants. The nearest Class 1 areas are the Guadalupe Mountains National Park, Texas which is located over 400 miles west and Breton Sound Wildlife Refuge, Louisiana, located over 500 miles east of the site. The geographic coordinates for this facility are as follows:

Latitude: 29º 40’ 22” North
Longitude: - 99º 10’ 56” West

Below, Figure 1 illustrates the facility location for this draft permit.

Figure 1. CEMEX- Balcones Cement Plant, New Braunfels, Tx Plant Location



V. Applicability of Prevention of Significant Deterioration (PSD) Regulations

EPA concludes that CEMEX's application is subject to PSD review for GHGs because the project would lead to a net emissions increase of GHGs for a facility as described at 40 CFR § 52.21(b)(23) and (49)(iv). Under the project, GHG emissions are calculated to increase over zero tpy on a mass basis and to exceed the applicability threshold of 75,000 tpy CO_2e (CEMEX calculates an increase of 841,250 tpy CO_2e). EPA Region 6 implements a GHG PSD FIP for Texas under the provisions of 40 CFR § 52.21 (except paragraph (a)(1)). See 40 CFR § 52.2305.

As the permitting authority for regulated NSR pollutants other than GHGs, TCEQ has determined that the modification to an existing major source is subject to PSD review for CO. Accordingly, under the circumstances of the project, the State will issue the non-GHG portion of the PSD permit, and EPA will issue the GHG portion.TCEQ issued the required PSD permit – PSD-TX-72M2- on October 8, 2013for this proposed modification.[1]

EPA Region 6 applies the policies and practices reflected in the EPA document entitled "PSD and Title V Permitting Guidance for Greenhouse Gases"[2]. Consistent with this guidance, we have not required the applicant to model or conduct ambient monitoring for GHGs, and we have not required any assessment of impacts of GHGs in the context of the additional impacts analysis or Class I area provisions of 40 CFR § 52.21(o) and (p), respectively. Instead, EPA has determined that compliance with the selected Best Available Control Technology (BACT) is the best technique that can be employed at present to satisfy the additional impacts analysis and Class I area requirements of the rules with respect to emissions of GHGs. We note again, however, that the project has triggered review for regulated NSR pollutants that are non-GHG pollutants under the PSD permit amendment sought from TCEQ.

VI. Project Description

The process of cement making involves three basic steps: raw material grinding and mixing to produce a raw meal, pyroprocessing of the raw meal to produce cement clinker, and then grinding the clinker together with other additives to produce powdered cement. Over 75% of the raw material is limestone, typically mined on site to minimize transportation costs. The other raw materials include sand, clay, and other minerals.

This project's physical changes and the change in method of operation (increased production from kiln line No. 2) directly affects only the pyroprocessing step of cement production- the two kiln lines at the site where the production of clinker occurs. While there will be increased raw material fed to kiln line 2 and more clinker that will need grinding and processing downstream, the only source of GHG emissions at this site are located in the pyroprocessing step and involve the kiln lines.

Within the kiln lines, the process of making cement clinker may be subdivided into three successive phases. In the first phase, the raw meal is heated to about 1112° F. (600° C) in order to dehydrate the meal. The second process phase is supplying the additional heat energy needed to calcine the limestone component (calcium carbonate, $CaCO_3$) of the dried raw meal. Calcining, or deacidification, of limestone results when limestone is heated sufficiently to

[1] *See* EPA, Question and Answer Document: Issuing Permits for Sources with Dual PSD Permitting Authorities, April 19, 2011, http://www.epa.gov/nsr/ghgdocs/ghgissuedualpermitting.pdf
[2] EPA, *PSD and Title V Permitting Guidance for Greenhouse Gases* EPA-457/B-11-001, March 2011

efficiently chemically change the $CaCO_3$ into lime (CaO) and liberate CO_2 in the process, which takes place within the kiln line at temperatures typically between 1200 to 1742°F (650 to 950° C) The third process phase comprises further heating of the material within the main kiln to sintering temperature when 'clinker' formation occurs, usually from 2500 to 3000°F (1370 to 1650° C). Immediately after the clinker exits the kiln, the clinker is rapidly cooled to optimize clinker quality using ambient air passing thru the clinker as it traverses a reciprocating grate cooler.

GHG are generated from cement production from two sources within the kiln lines: from the calcination of limestone which forms lime and liberates CO_2 and from combustion of the various fuels needed for the energy intensive clinker production process. Minimizing the amount of fuel needed to efficiently produce quality clinker in the kiln lines while maximizing the utilization of combustion derived energy are the keys to reducing GHG in cement clinker production. Making the best use of the fuel derived heat energy means that the clinker cooler heated air is used to dry the coal (or coke) prior to firing and to pre-heat combustion air used in the preheater/precalciner. It also means making use of the kiln exhaust stream to dry the raw meal prior to entering the main kiln proper. Other design and process methods, such as the use of energy efficient motors, material handling methods and variable frequency fans are additional methods of increasing energy efficiency and result in less electricity use, thus lowering GHG emissions associated with cement production.

The primary fuels used in clinker production typically include coal and petroleum coke due to the cost effectiveness and stable supply stream of these fuels, and to a lesser extent, natural gas. Alternative fuels are many, and often include various materials ranging from tires to carpenter shop wood waste, to just about any cost effective material with adequate heating value. The solid fossil fuels are typically dried with a slip stream of air heated in the clinker cooler and ground in a coal mill. The dried and ground fuel can be introduced into the main kiln burner or at the pre-heater or pre-heater/pre-calciner. The primary combustion air to the kiln is ambient air while secondary combustion air is supplied from the clinker cooler. Exhaust gases from fuel combustion in the kiln and pre-heater (or pre-heater/pre-calciner) are used in the raw mill for heating and drying the material. All products of combustion are eventually exhausted to atmosphere at the main kiln baghouse (Emission Point Numbers, EPNs, PS-16 for kiln line 1 and PS-77 for kiln line 2).

This project includes two modifications to the existing facility, as follows:

Modification 1: Kiln line 2 production increase. In this change in the method of operation, the kiln will not require any equipment modifications in order to increase the production to the proposed rate of 3,960 tons of clinker per day (30-day average) and 1,386,000 tons of clinker per year. This kiln has been in operation for less than five years and has demonstrated an ability to reach a higher production capacity than what was originally estimated and permitted. Increasing the existing federally enforceable limitation to the production capacity constitutes a change in the method of operation.

Modification 2: Upgrades to the burners on kiln 1 and kiln 2. CEMEX is proposing to upgrade both kiln line kiln burners to multichannel adjustable units. This upgrade will allow for better flame control, reduce primary air by up to 12% and handle authorized alternative fuels in distinct and separate fuel lines. This change constitutes a physical change to both kiln lines.

Overall, the project will increase kiln line 2's nominal clinker production capacity from 1.260 MM tons clinker per year to 1.3860 MM tons clinker/year, a 10% increase in total annual clinker production. from kiln line 2, while the production rate of kiln line 1 remains unchanged at 1.1375MM tons clinker per year.

Project subject to PSD review Because of the physical changes and the changes in method of operation that result in a mass emissions rate increase above 0 tpy and a significant net increase in CO_2e emissions above 75,000 tpy, this project constitutes a major modification as defined in 40 CFR§52.21b(2)(i), and thus triggers PSD review for GHG. It should be noted that this same project was evaluated for PSD applicability by the TCEQ, who determined that the project is also subject to PSD review as a major modification for the criteria pollutant CO. The TCEQ reviewed the project and issued permit PSD-TX-72M2 to authorize the changes for criteria pollutants.

Both kiln lines combust solid fossil fuels and natural gas as primary fuels and a wide variety of alternative fuels as well. Both kiln lines are equipped with various design and process operating practices to maximize energy efficiency while producing the needed quality and quantity of clinker, and add-on controls to reduce particulate and criteria pollutant and HAP emissions.

The kiln lines are equipped with automated kiln control systems help maximize energy efficiency. Low $NO_{x,}$ burners, and selective non catalytic reduction (SNCR) systems are in place to control NO_x emissions. SO_2 emissions are limited by the inherently low sulfur content of the limestone raw material. The list of control requirements to assure compliance with the NAAQS and other criteria and HAP pollutant limitations are listed in the state issued PSD permit for the site. Both kiln systems are fitted with continuous monitoring systems for CO_2 (required by 40 CFR 98 Subpart C), NO_x, SO_2, and opacity as required by state authorizations for the source.

VII. General Format of the BACT Analysis

The BACT analyses for this draft permit were conducted in accordance with EPA's *PSD and Title V Permitting Guidance for Greenhouse Gases* (March 2011), which outlines the steps for conducting a "top-down" BACT analysis. Those steps are listed below.

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

As part of the PSD review, CEMEX provided in their GHG permit application a 5-step top-down BACT analysis for the project's emission units and processes that are subject to PSD review for GHG emissions. EPA has reviewed CEMEX's BACT analysis for the kiln lines, which has been incorporated into this Statement of Basis. CEMEX relied upon the 2010 published EPA document entitled "Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Portland Cement Industry"[3] [*hereinafter*, "CI GHG Control White Paper" or "White Paper"] which provides GHG BACT guidance specific to the industry as there are only three other cement kiln projects that have completed GHG PSD review to date in the United States. Consequently, all of the recommended relevant control techniques for the scope of this

[3] EPA 2010, *Available and Emerging Technologies for Reducing Greenhouse Gas Emissions From the Portland Cement Industry*, http://www.epa.gov/nsr/ghgpermitting.html Accessed July 29, 2013.

project covered in the white paper and measures to mitigate greenhouse gas emissions have been incorporated into this review.

VIII. Applicable Emission Units for BACT

The CEMEX Balcones Cement Plant modification involves installing multipath burners on each of the two kilns. Further, kiln 2 clinker production capacity is being increased by 10% over the existing PSD permit authorized levels being accomplished without further physical modifications to kiln line 2.

With this project, the projected actual emissions of GHG will increase over baseline actual emissions (accounting for emissions that could have been accommodated) by approximately 841,295 short tons CO_2e/year to a total sitewide annual allowable emissions of 2,397,328 short tons of GHGs (as CO_2e) . Approximately 45% of the GHG emissions are from the operation of kiln line 1 and 55% from kiln line 2.

As previously stated, GHG emissions originate from two distinct chemical processes that take place in each kiln line: calcination process CO_2 and fuel combustion CO_2, CH_4, and N_2O emissions,[4] Process related GHG emissions account for 57% of the CO_2e GHG emissions at the site. This source of CO_2 emissions is dependent upon the raw material used, which is obtained from the nearby limestone quarry at the site. The remaining 43% of the CO_2e GHG emissions originate from combustion of fuels as the heat source needed by pyroprocessing to produce clinker from the limestone and other raw materials. The site has some *de minimis* fugitive emissions from piping components associated with the existing and unmodified natural gas supply to the kilns, one of the authorized fuels for use in both kiln lines. Nitrous oxide (N_2O) and methane (CH_4) emissions from fuel combustion within each kiln line contribute a combined 0.7% of the total annual GHG CO_2e emissions at the site. Therefore, the scope of the BACT analysis is limited to the two kiln lines, in accordance with the control technology review requirements of 40 CFR§52.21(j)(3). These two lines are:

- Kiln Line 1 (EPN: PS-16)
- Kiln Line 2 (EPN: PS-77)

[4] Based on 2001 US cement industry data, Hanle, *et. al*, reported that calcining process CO_2 emissions accounted for approximately 54% of the CO_2 emissions from cement production while the remaining 46% was from fuel firing. Hanle, L. and K. Jayaraman *CO_2 Emissions profile of the U.S. Cement Industry*, paper presented at the13th International Emission Inventory Conference "Working for Clean Air in Clearwater", Clearwater, FL, June 8 - 10, 2004

IX. BACT Analysis for the kiln lines (EPNs: PS-16 and PS-77)

Potential control technologies relevant to the kiln lines fall into three categories: 1) kiln line energy efficiency measures, 2) the use of low emitting GHG fuels, and 3) add-on control measures. This analysis has identified 16 kiln line efficiency measures that could be employed in the project, an evaluation of fuels that might be used to reduce GHG emissions, and an evaluation of 4 means of CO_2 capture for subsequent sequestration and an evaluation of transportation and sequestration of the captured CO_2. These measures (some of which are already implemented or present in existing operations) are discussed below.

A. BACT Analysis Step 1 -Identification of Potential Control Technologies for GHGs

Efficiency Measures

Kiln Line Energy Efficiency Measure 1: Process control and management systems
The CI GHG Control White Paper recommends using automated control systems to maintain operating conditions in the kiln at optimum levels. The Balcones plant has automated control systems for both kiln 1 and kiln 2 which are integrated into a central control room. The kilns have an indirect firing system with the main characteristics of low amount of primary air, flame adjustment control and fuel rate control by the dosing equipment. Process gas analyzers are used by control room operators to monitor CO and O_2 levels to insure efficient combustion. The calciner fuel rate is automatically controlled based on the temperature of the gasses immediately prior to the partially calcined raw material entering the kiln, and the kiln main burner is adjusted by the operator depending of the oxygen levels, kiln burning zone temperature and clinker quality.

Kiln Line Energy Efficiency Measure 2: Kiln seal maintenance program. The CI GHG Control White Paper recommends that all facilities should have a regular maintenance plan for the kiln seals. Leaking seals can result in increased heat loss which increases fuel use. The CEMEX Balcones Plant has a maintenance routine to inspect the kiln seals weekly and during the major outages. Components of the kiln seals are replaced as needed based on inspections during kiln stops.

Kiln Line Energy Efficiency Measure 3: Kiln combustion system optimization. The CI GHG ControlWhite Paper recommends incorporating available technologies to optimize kiln combustion into kiln designs. Incomplete fuel burning, poor mixing of fuel with combustion air, and poorly adjusted firing can lead to increased fuel usage (as well as increased NOx and CO emissions).

The combustion system process for kilns 1 and 2 are designed to provide for efficient use of fuel. Kilns 1 and 2 have an indirect firing system with the main characteristics of low amount of primary air, flame adjustment control, and fuel rate control by the dosing equipment. The primary air accounts for 10 to 40% of the total air needed depending on the type of firing system. The additional 90 or 60% of the air is called secondary air and consists of hot air from the clinker cooler. The higher the secondary air the more efficient the combustion system.

Precalciner kilns like the Balcones Kiln 1 and Kiln 2 are designed to maximize the heat input to the calciner and typically 60% of fuel is fed to the calciner. Most of the air required by the combustion at the calciner is hot air from the clinker cooler. This air is known as tertiary air.

Mixing and heat transfer at the calciner has proven calcination levels above 90% and significantly reduces the thermal load at the kiln.

Kiln Line Energy Efficiency Measure 4: Use of fluxes and mineralizers to reduce energy demand. The CI GHG ControlWhite Paper recommends considering the use of fluxes and mineralizers to reduce the temperature at which the clinker melt begins to form in the kiln, promote formation of clinker compounds, and reduce the lower temperature limit of the tricalcium silicate stability range. The White Paper (pg. 20) states: "Fluorides are often used as a mineralizer and can reduce the sintering temperature by 190°F. Although there is a fuel savings, that savings may be offset by the high cost of the fluxing agent or mineralizer. CEMEX conducted a test using fluoride in a kiln at one of its other U.S. cement plants. Based on the test results, CEMEX evaluated the use of fluoride in kilns and determined the benefit in fuel savings does not offset the cost of the fluoride. There were also negative effects in quality of cement and concrete physical properties that prohibited the use at some plants. Therefore, CEMEX does not use fluxes and mineralizers in Kilns 1 and 2.

Kiln Line Energy Efficiency Measure 5: Kiln/preheater insulation inspection program. The CI GHG Control White Paper recommends proper insulation to keep heat loss through the kiln shell at a minimum. Kilns 1 and 2 are insulated with refractory brick and the preheaters are insulated with a combination of brick and castable over a light-weight insulating material. The kiln refractory is inspected during every major outage and portions of the refractory are replaced, as needed, depending on the condition.

Kiln Line Energy Efficiency Measure 6: Refractory material selection that maximizes long life and insulation efficiency. The CI GHG Control White Paper states: "The refractory bricks lining the combustion zone of the kiln protect the outer shell from the high combustion temperatures, as well as chemical and mechanical stresses. Although the choice of refractory materials is highly dependent on fuels, raw materials, and operating conditions, consideration should be given to refractory materials that provide the highest insulating capacity and have the longest life."

The kiln refractory for Kilns 1 and 2 is very standard for the cement industry and was selected based on the conditions of each zone (mainly thermal and chemical conditions). The refractory is inspected every major outage and it is replaced depending on the condition.

Kiln Line Energy Efficiency Measure 7: Grate cooler conversion. The CI GHG ControlWhite Paper recommends replacing planetary and travelling grate coolers with a more energy efficient reciprocating grate coolers as an option for improving energy efficiency. Kilns 1 and 2 are equipped with reciprocating grate coolers which recuperate heat back to the kiln. The secondary air coming from the coolers provide oxygen for combustion and heat recuperated from the clinker improving the overall kiln energy efficiency.

Kiln Line Energy Efficiency Measure 8: Heat recovery from kiln and clinker cooler exhausts. The CI GHG Control White Paper states: "There are several exhaust streams in the cement manufacturing operation that contain significant amounts of heat energy, including the clinker cooler exhause, and kiln preheater and precalciner exhaust. Generally only long dry kilns produce exhaust gases with temperatures high enough to make heat recovery for power economical….Heat recovery for power may not be possible at facilities with in-line raw mills where the waste heat is used to extensively dry the raw materials…" Kilns 1 and 2 have in-line raw mills, where the waste heat from the kiln and precalciners are used to dry and preheat the raw materials. The exhaust from the clinker coolers is used partly as secondary air which provide oxygen and heat to the kilns and also to provide heat for drying the coal and petroleum coke.

Kiln Line Energy Efficiency Measure 9: Suspension preheater low pressure drop cyclones. The CI GHG Control White Paper recommends the use of low pressure drop cyclones as a method of improving energy efficiency. The preheater cyclones and duct areas associated with Kilns 1 and 2 are designed to minimize pressure drop and to minimize the dust lost in the preheater. These cyclones are used to allow intimate contact between hot kiln exhaust gases and the raw material passing thru the cyclones, thus efficiently preheating and calcining the raw meal prior to entering the kiln.

Kiln Line Energy Efficiency Measure 10: Multistage preheater. The CI GHG Control White Paper recommends converting to multistage preheaters to allow higher energy transfer efficiency and lower fuel requirements. Kiln lines 1 and 2 are equipped with multi-stage preheaters consisting of several cyclones in suspension. The material is fed at the top of the preheater and exchange heat with hot gases from the kiln as they pass thru the various stages and cyclones. The intimate contact between the material and the hot gas in each cyclone allows for efficient heat exchange between materials.

Kiln Line Energy Efficiency Measure 11: Conversion of long dry kiln to preheater/precalciner kiln. The CI GHG Control White Paper recommends reducing energy consumption by converting a long dry kiln to a preheater/precalciner kiln. The CEMEX Kkilns 1 and 2 are both preheater/precalciner kilns.

Kiln Line Energy Efficiency Measure 12: Kiln drive efficiency. The CI GHG Control White Paper recommends using high efficiency motors to rotate the kiln. The Balcones Kiln 1 has a direct current adjustable speed drive and Kiln 2 has an alternating current adjustable speed drive. The variable frequency/speed drives installed at both kilns provides high energy efficiency motor control. Both kilns have a single pinion drive with a direct coupled gear coupling.

Kiln Line Energy Efficiency Measure 13: Adjustable speed drive for kiln fan. The CI GHG Control White Paper recommends installing adjustable speed drives on kiln fans for increased energy efficiency. Kilns 1 and 2 use variable frequency drives which allow for high efficiency of the kiln fans. The fan efficiency is maintained in different speeds using variable frequency drive instead of the damper operation where the fan efficiency is reduced while the damper is closing.

Kiln Line Energy Efficiency Measure 14: Mid kiln firing. The CI GHG Control White Paper states that: "Mid kiln firing, which is the practice of adding fuel (often scrap tires) at a point near the middle of the kiln, can result in reduced fuel usage thereby potentially reducing overall CO_2 emissions. This practice is most often used with long wet or long dry kilns." Mid-kiln firing is proven for long dry kilns but results are not the same for calciner kilns. In a long, dry kiln with mid-kiln firing, the combustion efficiency increases for two reasons: (1) the fuel at the main burner is reduced and (2) hot flame at mid-kiln firing will destroy and ensure complete combustion of the main fuel. The kiln in a calciner system is shorter than long dry or wet kilns and therefore do not have the adequate conditions for mid-kiln firing. Both kilns at Balcones are preheater/precalciner kilns.

Kiln Line Energy Efficiency Measure 15: Air mixing technology. The CI GHG Control White Paper states that: "Mixing air is the practice of injecting a high pressure air stream into a kiln to break up and mix stratified layers of gases within the kiln. Mixing the air improves the combustion efficiency. Due to the increased efficiency, less fuel is required, leading to lower CO_2 emissions." The type of mixing air technology discussed in the CI GHG Control White Paper is only needed if there is poor mixing at the burner pipe. CEMEX Kilns 1 and 2 have multichannel burners that allow for necessary mixing of fuel and air to complete combustion. Multichannel burners allow for adjustment of multiple streams of mixing air to complete combustion.

Kiln Line Energy Efficiency Measure 16: Preheater riser duct fuel firing. The CI GHG Control White Paper states that: "The operation of cement manufacturing operations that include a preheater prior to the kiln can be improved by firing a portion of the fuel in the riser duct to increase the degree of calcination in the preheater." In the CEMEX Kilns 1 and 2, a portion of the fuel is fired in the riser duct to increase the degree of calcinations in the preheater. Firing at the riser serves two functions: (1) more mixing and longer residence time for the fuel to complete combustion and (2) generate enough CO to destroy NO_x from the kiln by the reaction $NO + CO \rightarrow N_2 + CO_2$. This reaction has been reported to be catalyzed by limestone present in the hot meal.

Lower GHG emitting Fuels

Kilns 1 and 2 were previously authorized by TCEQ Air Permit 6048/PSD-TX-74M1 to fire the following fuels in the kiln/preheater system: coal, petroleum coke, natural gas, wood, tire derived fuel, other rubber products, and other alternative fuels including carpet products, non-asbestos containing shingles, construction and demolition waste, oil filter fluff, oily rags, oily wood, paper, cardboard, rick husks, and cotton gin residue. Fuel costs, fuel availability, and fuel reliability have primarily dictated the fuel mix used in the kilns but the permit, when originally issued, contained a special provision stating, in part that fuels other than coal and petroleum coke may make up a substantial portion of heat input. For example, Special Condition No. 4 states in part "… Alternate fuels shall at no time comprise more than 70 percent of the energy required to fire either kiln, including the preheater."[5]

The EPA PSD and Title V Permitting Guidance for Greenhouse Gases[6] states that "…permitting authorities might determine that, with respect to the biomass component of a facility's fuel stream, certain types of biomass by themselves are BACT for GHGs." This is based on the premise that CO_2 emissions from burning biomass are the result of carbon that has relatively recently been removed from the atmosphere through uptake by plants and thus does not have the global warming impact that burning fossil fuel has. Potential types of biomass that can be burned in the Balcones cement kilns already include:

- Wood
- Paper
- Cardboard
- Rice Husks,
- Pecan shells, and

[5] See Special Condition No 4 of TCEQ issued permit PSD-TX-74M1, issued February 6, 2010

[6] EPA. *PSD and Title V Permitting Guideance for Greenhouse Gases,* p10. EPA-457/B-11-001. March 2011. U.S. Environmental Protection Agency

- Cotton gin residue.

Globally, the 2011 average percent of thermal energy from fossil fuels (primarily coal and petroleum coke) used in grey clinker production was about 86.7% while in the United States, from 1990 to 2011, the average percentage use of those fossil fuels has dropped from 95.9 to 84.1%. [7] Cemex reported that their world wide average alternative fuel use was 27% in 2012, with a target of 35% for 2015. [8] While the Balcones facility has used fuels other than petroleum coke and coal in the fuel mix in the past, the burner modifications undertaken in this project will enable the better and more controlled use of fuels other than petroleum coke and coal in the two kilns.

Add-On Controls

Methods for CO_2 Capture for Subsequent Sequestration 1: The Calera Process. The Calera process captures carbon dioxide from flue gas and converts the gas to stable solid minerals. The process employs a scrubber with high pH water containing calcium, magnesium, sodium, and chloride as the scrubbing liquid. The CO_2 is absorbed by the water, converting it to a dissolved carbonic acid species. Pilot plant testing has only been in relation to the electric utility industry so the technology may be transferable to cement clinker production.

Methods for CO_2 Capture for Subsequent Sequestration 2: Membrane technology. The CI GHG Control White Paper indicates that membrane technology is being researched as a means to separate or adsorb CO_2 in the kiln exhaust. The captured CO_2 would then be purified and compressed for transport.

Methods for CO_2 Capture for Subsequent Sequestration 3: Superheated calcium oxide. The CI GHG Control White Paper noted that a superheated Calcium Oxide (CaO) process has also been identified as potential CO_2 control technology. The superheated CaO process separates the calcination and combustion reactions into independent chambers. The heat necessary to run the calciner is provided by circulating a stream of superheated CaO particles between a fluidized bed combustor and a fluidized bed calciner. Retrofits of an existing kiln would involve removal of existing preheaters and precalciners, construction of the fluidized beds, cyclones, heat exchangers, and compressors associated with the process.

Methods for CO_2 Capture for Subsequent Sequestration 4: Amine absorbtion. Of the emerging CO_2 capture technologies that have been identified, only amine absorption (post-combustion solvent capture and stripping) is currently commercially used for state-of-the- art CO_2 separation processes. Amine absorption has been applied to processes in the petroleum refining and natural gas processing industries and for exhausts from gas-fired industrial boilers but there has been little work discussing its feasibility at cement plants.

Transportation and Sequestration of Captured CO_2 emissions. If CO_2 capture can be achieved at a cement plant at full scale, it would need to be routed to a geologic formation capable of long-term storage. Due to volume, transportation of CO_2 would be most efficient

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[7] World Business Council for Sustainable Development. Cement Sustainability Initiative, "*Global cement database on CO_2 and energy information*," Available at http://wbcsdcement.org, Last accessed September 6, 2013.

[8] CEMEX Corporation Annual Report for 2012 available at http://www.cemex.com/CEMEX_AR2012/eng/OurDNA.html. Last accessed September 6 2013.

via pipeline with the CO_2 being transported in the supercritical fluid state. The long-term storage potential for a geological storage formation is a function of the volumetric capacity of a geologic formation and CO_2 trapping mechanisms within the formation, including dissolution in brine, reactions with minerals to form solid carbonates, and/or adsorption in porous rock. The U.S. Department of Energy's National Energy Technology Laboratory (DOE-NETL) describes the geologic formations that could potentially serve as CO_2 storage sites as follows:

"Geologic carbon dioxide (CO_2) storage involves the injection of supercritical CO_2 into deep geologic formations (injection zones) overlain by competent sealing formations and geologic traps that will prevent the CO_2 from escaping. Current research and field studies are focused on developing better understanding of 11 major types of geologic storage reservoir classes, each having their own unique opportunities and challenges. Understanding these different storage classes provides insight into how the systems influence fluids flow within these systems today, and how CO_2 in geologic storage would be anticipated to flow in the future. The different storage formation classes include: deltaic, coal/shale, fluvial, alluvial, strandplain, turbidite, eolian, lacustrine, clastic shelf, carbonate shallow shelf, and reef. Basaltic interflow zones are also being considered as potential reservoirs. These storage reservoirs contain fluids that may include natural gas, oil, or saline water; any of which may impact CO_2 storage differently…"[9]

B. BACT Analysis Step 2: Eliminate Technically Infeasible Options

Of the 16 identified control methods addressing energy efficiency and kiln design options, 2 have been eliminated due to being technically infeasible. The control options so eliminated are as follows:

Kiln Line Energy Efficiency Measure 4: Use of fluxes and mineralizers to reduce energy demand. CEMEX conducted a test using fluoride in a kiln at one of its other U.S. cement plants. Based on the test results, CEMEX evaluated the use of fluoride in kilns and determined the benefit in fuel savings does not offset the cost of the fluoride. There were also negative effects in quality of cement and concrete physical properties that prohibited the use at some plants. Therefore, CEMEX considers and the EPA agrees that the use of flues and mineralizers is technically and economically infeasible at this facility.

Kiln Line Energy Efficiency Measure 14: Mid kiln firing. The kilns are preheater/precalciner design which are physically shorter than long dry or wet kilns and therefore do not have the adequate conditions for mid-kiln firing. EPA concludes that this control technology is technically infeasible for this existing facility.

EPA has concluded that none of the 4 potential methods to capture CO_2 from clinker production are technically feasible. The reasons include:

The Calera Process. This technology has not been implemented on a full scale basis and pilot plant testing has only been in relation to the electric utility industry.

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[9] DOE-NETL, *Carbon Sequestration: Geologic Storage Focus Area*, http://www.netl.doe.gov/technologies/carbon_seq/corerd/storage.html (last visited August 1, 2013)

Membrane Technology. According to the 2010 CI GHG Control White Paper, this technology is still primarily in the research stage, with industrial application at least 10 years away. There are significant problems to overcome designing membrane reactors large enough to handle the kiln exhaust.

Superheated Calcium Oxide. Superheated CaO simulations have shown that the superheated CaO process is theoretically feasible; however, the system remains theoretical with no systems yet built according to the CI GHG Control White Paper.

Amine Absorber. Amine absorption has been applied to processes in the petroleum refining and natural gas processing industries and for exhausts from gas-fired industrial boilers but there has been little work discussing its feasibility at cement plants. The CI GHG ControlWhite Paper listed the following technical issues associated with using post-combustion amine scrubbing at a cement kiln:

- Additional Steam Requirements. One of the major issues with using MEA CO_2 capture is the large steam requirement for solvent regeneration. The CEMEX Balcones plant currently does not have steam generation capabilities.
- Sulfur Dioxide (SO_2). The concentration of SO_2 in the flue gas from the cement process is important for post-combustion capture with amines because amines react with acidic compounds to form salts that will not dissociate in the amine stripping system.
- Nitrogen Dioxide (NO_2). NO_x within the flue gas is problematic for MEA absorption as this results in solvent degradation.
- Dust. The presence of dust reduces the efficiency of the amine absorption process. The dust level must be kept below 15 mg/Nm^3.
- Reducing Conditions. The clinker must not be generated in reducing conditions and an excess of oxygen must be maintained in the process.
- Heat Reduction for MEA Absorption. The flue gas must be cooled from about 110°C to about 50°C to meet the ideal temperature for CO_2 absorption with MEA.
- Other Gases. The presence of any acidic components will reduce the efficiency of the MEA absorption process.

Notwithstanding that the above technology may be transferrable to the cement industry, there are no installations where amine absorption has been implemented at a cement clinker production facility to date.

CO_2 Transportation and Sequestration. Even if it is assumed that CO_2 capture and compression could feasibly be achieved for the proposed project, the high-volume CO_2 stream generated would need to be transported to a facility capable of storing it. Potential geologic storage sites for CO_2 sequestration in Texas, Louisiana, and Mississippi to which CO_2 could be transported if a pipeline was constructed are delineated in Figure 2 at the end of this document.[10] The potential length of such a CO_2 transport pipeline is uncertain due to

[10] Susan Hovorka, University of Texas at Austin, Bureau of Economic Geology, Gulf Coast Carbon Center, *New Developments: Solved and Unsolved Questions Regarding Geologic Sequestration of CO2 as a Greenhouse Gas*

the uncertainty of identifying a site(s) that is definitively suitable for large-scale, long-term CO_2 storage. The hypothetical minimum length required for any such pipeline(s) will be the distance to the closest site with recognized potential for some geological storage of CO_2, storage in saline formations, or use in enhanced oil recovery (EOR) operations.

While the potential exists for long-term CO_2 storage in saline formations along the Texas Gulf Coast, none are currently being utilized for CO_2 storage. In comparison, the closest site that is currently being field-tested to demonstrate its capacity for large-scale geological storage of CO_2 is the Southeast Regional Carbon Sequestration Partnership's (SECARB) Cranfield test site, which is located in Adams and Franklin Counties, Mississippi over 400 miles away (see location map at Figure 2 at the end of this document for the SECARB site location). Therefore, to access this potentially large-scale storage capacity site, assuming that it is eventually demonstrated to indefinitely store a substantial portion of the large volume of CO_2 generated by the proposed project, a very long and sizable pipeline would need to be constructed to transport the large volume of high-pressure CO_2 from the plant to the storage facility

The suitability of potential storage sites is a function of volumetric capacity of their geologic formations, CO_2 trapping mechanisms within formations (including dissolution in brine, reactions with minerals to form solid carbonates, and/or adsorption in porous rock), and potential environmental impacts resulting from injection of CO_2 into the formations. Potential environmental impacts resulting from CO_2 injection that still require assessment before Carbon Capture and Sequestration/Storage (CCS) technology can be considered feasible include:

- Uncertainty concerning the significance of dissolution of CO_2 into brine,
- Risks of brine displacement resulting from large-scale CO_2 injection, including a pressure leakage risk for brine into underground drinking water sources and/or surface water,
- Risks to fresh water as a result of leakage of CO_2, including the possibility for damage to the biosphere, underground drinking water sources, and/or surface water,12 and
- Potential effects on wildlife.

Potentially suitable storage sites, including EOR sites and saline formations, exist in Texas, Louisiana, and Mississippi. The closest EOR sites with such recognized potential for some geological storage of CO_2 are located within 50 miles of the proposed project, but such nearby sites have not yet been technically demonstrated with respect to all of the suitability factors described above. The closest active CO_2 pipeline and EOR area is Denbury's Green Pipline which runs to the Hastings oil field south/southeast of Houston, Texas which is approximately 175 miles from Cemex. In comparison, the closest site that is currently being field-tested to demonstrate its capacity for geological storage of the volume of CO_2 that is currently being generated and which would see increased GHG emissions with this cement clinker project, is the previously mentioned SECARB's Cranfield test site located in western Mississippi, over 400 miles away. It should be

Reduction Method (GCCC Digital Publication #08-13) at slide 4 (Apr. 2008), available at: http://www.beg.utexas.edu/gccc/forum/codexdownloadpdf.php?ID=100(last visited Aug. 8, 2011).

noted that, based on the suitability factors described above, the suitability of the Cranfield site or any other test site to store a substantial portion of the large volume of CO_2 generated by the proposed project has yet to be fully demonstrated. Consequently, CCS is considered not technically feasible at the present time.

C. BACT Analysis Step 3: Rank Remaining Control Technologies

As documented above, EPA has determined that that implementation of CCS technology is currently infeasible, leaving energy efficiency measures and the use of lower GHG generating fuels (biomass, etc) as the only technically feasible emission reduction options. As all of the remaining technically feasible energy efficiency related processes, practices, and designs discussed above are being proposed for this project, as is the use, at least in part of lower GHG intensive fuels, a ranking of the control technologies is not necessary for this application.

D. BACT Analysis Step 4: Evaluate Most Effective Controls and Document Results

While CCS technology was eliminated in Step 2 above as being technically infeasible, the economics of implementation are also here considered to reflect a more thorough evaluation of the option and to discuss an additional basis for its elimination. The relative costs of implementing a CCS solution is provided here.

The International Energy Agency (IEA) Greenhouse Gas R&D Programme conducted a study to assess the technologies that could be used to capture CO_2 in cement production and their associated performance and costs.[11] The technical and economic assessments were based on a new preheater/precalciner cement plant in the United Kingdom producing 1 million tonnes/year of cement (910,000 ton/yr of cement).

The post combustion CO_2 capture technology chosen for the study was CO_2 absorption using monoethynolamine (MEA). The study listed the main additions to the plant for post combustion CO_2 capture as: a CO_2 capture plant including a solvent scrubber and regenerator; a compressor to increase the pressure of the CO_2 product for transport by pipeline; high efficiency flue gas desulfurization and de-NO_x to satisfy the flue gas purity requirements of the CO_2 capture process; and a plant to provide the steam required for regeneration of the CO_2 capture solvent. The initial capital cost for a CO_2 capture system was estimated to be $295 €/tonne cement ($401.44/ton cement at the 1.5 $/€ exchange rate used in the study). The average annual cost per tonne of CO_2 emissions avoided in the IEA study for CO_2 capture and compression was calculated to be 118.15 €/tonne ($146.15/ton at the 1.5 $/€ exchange rate used in the study).

Scaling the results of the study to fit the characteristics of the CEMEX facility, the projected costs for installation of CO_2 capture equipment for the Balcones Kiln 1 and 2 would be $1,013,000,000. For comparison purposes, the estimated capital cost for the upgrades to the main kiln burners in Kiln No. 1 and Kiln No. 2 to multipath adjustable units is $750,000. Implementation of post combustion carbon capture system alone for Kilns 1 and 2 would

[11] IEA Greenhouse Gas R&D Programme (IEA GHG), *CO2 Capture in the Cement Industry*, Final Report, July 2008

result in initial capital costs of approximately 1,350 times higher than the projected project costs.

Transportation of supercritical CO_2 by pipeline is technically feasible but expensive. Based on recent studies reported in the "Report of the Interagency Task Force on Carbon Capture and Storage"[12], pipeline transport costs for a 100 kilometer (62 mile) pipeline transporting 5 million tonnes per year range from approximately $1 per tonne to $3 per tonne ($0.91 per ton to $2.72 per ton). The distance from the CEMEX Balcones Plant to the nearest existing oil recovery site with a recognized potential for some geological storage of CO_2 is 170 miles, while the distance to the nearest potential unproven enhanced oil recovery site in Karnes County is 50 miles. Conservatively assuming that the pipeline cost is linear, the estimate average annual cost for just CO_2 transport would be $1.46/ton CO_2 avoided if a EOR were currently available in Karnes County.

It was also reported in "Report of the Interagency Task Force on Carbon Capture and Storage"[13] that the costs associated with CO_2 storage have been estimated to be approximately $0.4 – 20/tonne plus $0.16 – 0.30/tonne CO_2 stored for monitoring. The average annual cost on a $/ton CO2 storage basis for storage and monitoring would be $9.33/ton. A summary of the calculated annual costs associated with a CCS system is shown in the following table. This is a very high annual cost and would make the proposed project economically nonviable if selected.

Table 2. Annual Cost Analysis for CEMEX Balcones Cement Plant CCS

Activity	Cost /ton CO_2 Avoided	Potential Tons of CO_2 Avoided Per Year	Total Projected Annual Operating Cost (Million $ per Year)
Capture and Compression	$146.15	2,157,593	$315.33
Transport	$1.46	2,157,593	$3.15
Storage and Monitoring	$9.33	2,157,593	$20.13
Total CCS System Cost	$156.94		$338.61

E. BACT Analysis Step 5: Select BACT

The following system design elements which have already been implemented at the site are BACT requirements:

- Kiln refractory material selection that maximizes long life and insulation efficiency
- Use of reciprocating grate clinker coolers
- Use of in-line raw mills which recover heat from the kiln exhausts

[12] *Report of the Interagency Task Force on Carbon Capture and Storage*, p. 37 (Aug. 2010) (http://www.epa.gov/climatechange/policy/ccs_task_force.html)

[13] *Ibid.*, p. 44 (Aug. 2010)

- Use of clinker cooler exhaust as secondary air to provide oxygen and heat to the kilns
- Use of suspension preheater low pressure drop cyclones
- Use of preheater/precalciner kilns
- Use of efficient, variable frequency drives for kilns
- Use of efficient, variable frequency drives for kiln fans

The following energy efficiency process controls and workpractices are BACT for the project:

- Kiln process control and management system
- Kiln seal maintenance program
- Kiln combustion system optimization
- Kiln/preheater insulation inspection program
- Use of multichannel kiln burners that allow for necessary mixing of fuel and air to complete combustion
- Firing a portion of the fuel in the preheater riser duct
- Use of Lower GHG emitting fuels including natural gas and biomass. As stated previously, the implementation of multichannel burners will not only result in more efficient combustion of primary fuels, it will make possible the more efficient use of lower GHG emitting fuels, that is, fuels other than coal and petroleum coke. However, the use of biomass is limited by cost, availability, and kiln process variables including high moisture or high chlorides content. Because biomass wastes have heating values that are typically lower than heating values for coal and petroleum coke, more biomass is needed to provide the same heating value as a given weight of coal or petroleum coke. Higher chlorides contents of fuels can negatively affect the quality of the cement product from the kiln. Therefore the exact mix of fuels to be used is based on a mix of fuel availability, quality, quantity, cost, and effect on product; nevertheless, lower GHG emitting fuels (fuels other than coal and petroleum coke) must make up a technically feasible and economically reasonable percentage of all fuel used, up to 35%, on a mmBTU basis, the total heat input annually for both kilns combined. The exact minimum percentage of heat input required will the lesser of 35% or the maximum sustainable value based on the results of a study to be undertaken in the first 24 months of permit issuance, and during the study, a minimum percentage of 10% is required.

The following emissions limits are the proposed BACT limits for Kiln line 1 and Kiln line 2, which are in units of tons of CO_2e per rolling 12-month average values:

- 0.41 tons CO_2e per ton of clinker attributable to kiln fuel combustion; and,
- 0.54 tons CO_2e per ton of clinker attributable to process (calcining) emissions; and,
- 0.95 tons CO_2e per ton of clinker attributable to combined fuel firing and process emissions.

Demonstration of compliance with the energy efficiency, workpractice, and kiln design BACT limits shall be demonstrated by implementing the following:

- For system design BACT elements, design elements already implemented will be tracked via a GHG monitoring plan, which includes the documentation of all maintenance or corrective actions taken.

- For energy efficiency and process controls and workpractice BACT elements, documentation of the methods used and actions taken shall be documented as part of the GHG monitoring plan.
- For heat input and CO_2e emission limitation (ton/yr and ton CO_2e/ton clinker) BACT requirements:
- Fuel use shall be monitored and calorific value determined on a frequency appropriate for the fuel type to assure that the rolling 12-month total heat input per kiln and the heat input from coal and petroleum coke and other fuels are met (mmBTU basis). Values are calculated monthly.
- Emissions of CO_2 shall be continuously monitored for each kiln to allow for daily calculation of the 30-day rolling average related limitations on clinker CO_2e .
  - Emissions of N_2O and CH_4 shall be determined by calculation based on fuel fired daily for compliance with the various pollutant specific and CO_2e limitation determinations needed.
  - Determination of clinker emissions factor and kiln dust emissions factors monthly to assure compliance with the per ton clinker based emissions limits.

BACT Analysis Discussion – Comparison with recently issued cement production PSD permits.

CEMEX performed a search of the EPA's RACT/BACT/LAER Clearinghouse for Portland cement kilns and found no entries which address BACT for GHG emissions at the time of their permit application. EPA subsequently performed a search and found only one entry reglated to Portland cement manufacturing, that of Universal Cement in Chicago, Ill. Although not listed in the RACT/BACT/LAER Clearinghouse, a GHG BACT analysis was performed by the following Portland Cement Plants: LaFarge Building Materials, Inc., Town of Coeymans, New York (commonly known as the Ravena Plant), Carolinas Cement Company in Castle Hayne, North Carolina, and . A discussion of EPA's BACT as compared to those projects is provided below:

LaFarge Ravena Plant

The proposed LaFarge project would replace the existing "wet" cement-making process at the Ravena Plant with a preheater/precalciner "dry" cement-making process. The proposed capacity of the modified plant was 2.81 million tons of clinker per year. The kiln system was designed to fire coal, petroleum coke, oil, and tire derived fuel. PSD Permit 4-0124-00001/00112 was issued on July 19, 2011. The permit included a GHG emission limit for the kiln system of 1900 pounds (0.95 tons) of CO_2e per ton of clinker, rolling 12-month average.

Universal Cement

Universal Cement proposed construction of a new preheater/precalciner kiln system capable of producing about 1 million tons per year of clinker. The clinker production train consists of an in-line raw mill, a blending silo, kiln system (preheat tower, precalciner, rotary kiln), clinker cooler and a solid fuel mill. Other equipment in the project includes clinker storage silos, a finish mill, and the associated raw material, solid fuel and finished product handling equipment. The kiln system was designed to fire coal and petroleum coke in the kiln and the precalciner; scrap tires, as available, in the precalciner; and natural gas or propane during kiln startup. Permit 031600GVX was issued by the Illinois Environmental Protection Agency on December 20, 2011. The permit included a GHG emission limit for the kiln system of 1860 pounds (0.93 tons) of CO_2 equivalent per ton of clinker, rolling 12-month average.

Carolinas Cement Company

Carolinas Cement Company proposed to construct a new Portland cement manufacturing facility at the site of an existing cement storage terminal near Castle Hayne, North Carolina. The proposed plant consisted of a multistage preheater/precalciner kiln with an in-line raw mill, coal mill, alkali bypass and clinker cooler venting through the main stack. Production was proposed to be 6000 tons per day (tons/day) and 2,190,000 tons per year (tons/yr) of clinker. Fuels included coal, petroleum coke, biomass fuels (organic material that is available on a renewable or recurring basis), and distillate fuel oil. Coal and petroleum coke was proposed as the primary fuels. Biomass was proposed to be utilized to the extent practical depending on performance, availability, and economic viability. Fuel oil was proposed to be used mainly for kiln startup. Permit O7300R09 was issued by the North Carolina Department of Environment and Natural Resources on February 29, 2012. The permit included a GHG emission limit for the kiln system of 0.91 tons of CO_2 equivalent per ton of clinker, rolling 12-month average, determined with procedures used for reporting GHG emissions pursuant to 40 CFR Part 98.

GCC Rio Grande, Inc Pueblo Cement Plant

GCC Rio Grande, Inc. (GCC) was authorized on July 9, 2012 by the Colorado Department of Public Healther and Environment in Permit 98PB0893 (Modification No. 5) to increase clinker production and to incorporate the use of tire derived fuels at their Pueblo Colorado cement manufacturing facility. The review included triggering PSD review for several criteria pollutants and for GHG. The GHG controls selected for the project as BACT included the following:

- Continued use of the modern, high efficiency preheater/precalciner kiln process.
- Continued use of all the latest high-efficiency equipment systems installed throughout the facility.
- Continued implementation of a sustainability program to reduce overall GHG emissions from the Facility. This program will continue evaluating the use of new additives, raw materials, and fuels consistent with the availability and cost of materials while continuing to maintain the quality of the cement product, and continuing to utilize the high-efficiency, pyro-processing design in place.

The BACT limit was set at 0.95 tons of carbon dioxide equivalent (CO_2e) per ton of clinker.

CEMEX Balcones Cement Plant

EPA agrees that the CEMEX' proposed BACT limit of 0.95 ton CO_2e/ton clinker per kiln line is equivalent to the BACT limit for the Ravena Plant modification but slightly higher than the BACT limit for the new Universal Cement Plant and the new Carolinas Cement Company Plant. The new, greenfield facilities can take advantage of original design of more stages in the preheater tower and better and more energy efficient material handling equipment than is within the scope of the CEMEX modification. However, the CEMEX facility, as an existing facility, is the only facility of the four being compared here with known kiln specific CO_2e/ton clinker process and fuel firing emissions rates. While the Ravena site is not undergoing major renovations for the existing material handling systems, they are changing the main kiln design and installing a new preheater tower and precalciner, thereby affording them the opportunity to make better use of the more energy efficient stages of preheat than is proposed for the CEMEX project. Process emissions are a major portion of the CO_2 emissions from cement clinker manufacturing, and the fact that the CEMEX process based CO_2 emissions are larger than the 2001 US average (57% vs 54%,)[14] and are known based on current process data at this existing facility, the BACT limitation of 0.95 ton CO_2e/ton clinker together with the limitations on annual fuel heat input and the imposed limits for CO_2 emissions per ton of clinker between fuel (0.41 ton CO_2e/ton clinker) and process (0.54 ton CO_2e/ton clinker) is reasonable and appropriate as BACT for this project.

[14] See discussion on page 8 above.

X. Endangered Species Act

Pursuant to Section 7(a)(2) of the Endangered Species Act (ESA) (16 U.S.C. 1536) and its implementing regulations at 50 CFR Part 402, EPA is required to insure that any action authorized, funded, or carried out by EPA is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species or result in the destruction or adverse modification of such species' designated critical habitat.

To meet the requirements of Section 7, EPA is relying on a Biological Assessment (BA) prepared by the applicant, CEMEX Construction Materials South, LLC ("CEMEX"), and its consultant, Zephyr Environmental Corporation, ("Zephyr"), and adopted by EPA.

A draft BA has identified thirteen (13) species listed as federally endangered or threatened in Comal County, Texas:

Federally Listed Species for Comal County by the U.S. Fish and Wildlife Service (USFWS) and the Texas Parks and Wildlife Department (TPWD)	**Scientific Name**
Plant	
Texas wild-rice	*Zizania texana*
Birds	
Black-capped vireo Golden-cheeked warbler Whooping Crane	*Verio atricapilla* *Setophaga chrysoparia* *Grus americana*
Fish	
Fountain darter	*Etheostoma fonticola*
Crustacean	
Peck's cave amphipod	*Stygobromus pecki*
Mammals	
Black Bear Jaguarundi Red Wolf	*Ursus americanus* *Herpailurus yaguarondi* *Canis rufus*
Insects	
Comal Springs riffle beetle Comal Springs dryopid beetle	*Comaldessus stygius* *Stygoparnus comalensis*
Amphibians	
San Marcos salamander Texas blind salamander	*Eurycea nana* *Typhlomolge rathbuni*

EPA has determined that issuance of the proposed permit will have no effect on any of the thirteen listed species, as there are no records of occurrence, no designated critical habitat, nor potential suitable habitat for any of these species within the action area.

Because of EPA's "no effect" determination, no further consultation with the USFWS is needed.

Any interested party is welcome to bring particular concerns or information to our attention regarding this project's potential effect on listed species. The final draft biological assessment can be found at EPA's Region 6 Air Permits website at http://yosemite.epa.gov/r6/Apermit.nsf/AirP.

XI. National Historic Preservation Act (NHPA)

Section 106 of the NHPA requires EPA to consider the effects of this permit action on properties eligible for inclusion in the National Register of Historic Places. To make this determination, EPA relied on and adopted a cultural resource report prepared by Horizon Environmental Services, Inc. ("Horizon") on behalf of Zephyr submitted on August 30, 2013.

For purposes of the NHPA review, the Area of Potential Effect (APE) was determined to be location of the two existing cement kilns within the existing cement production facility. Horizon conducted a desktop review within a 1.0-mile radius area of potential effect (APE). The desktop review included an archaeological background and historical records review using the Texas Historical Commission's online Texas Archaeological Site Atlas (TASA) and the National Park Service's National Register of Historic Places (NRHP). Based on the desktop review, one cultural resources survey, that included a field survey, was previously performed in 1978 with an APE that includes the current APE of this project. No cultural resources were recorded at the location of the kilns during this prior survey. Based on the desktop review, two previously recorded archaeological sites were identified within 1-mile of the APE; however, neither site was recommended to be eligible for listing on the Nation Register.

EPA Region 6 determines that because no historic properties are located within the APE and that a potential for the location of archaeological resources within the construction footprint itself is low, issuance of the permit to CEMEX will not affect properties potentially eligible for listing on the National Register.

On September 10, 2013, EPA sent letters to Indian tribes identified by the Texas Historical Commission as having historical interests in Texas to inquire if any of the tribes have historical interest in the particular location of the project and to inquire whether any of the tribes wished to consult with EPA in the Section 106 process. EPA received no requests from any tribe to consult on this proposed permit. EPA will provide a copy of the report to the State Historic Preservation Officer for consultation and concurrence with its determination. Any interested party is welcome to bring particular concerns or information to our attention regarding this project's potential effect on historic properties. A copy of the report may be found at http://yosemite.epa.gov/r6/Apermit.nsf/AirP.

XII. Environmental Justice (EJ)

Executive Order (EO) 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive branch policy on environmental justice. Based on this EO, the EPA's Environmental Appeals Board (EAB) has held that environmental justice issues must be considered in connection with the issuance of federal PSD permits issued by EPA Regional Offices [See, e.g., *In re Prairie State Generating Company*, 13 E.A.D. 1, 123 (EAB 2006); *In re Knauf Fiber Glass,* Gmbh, 8 E.A.D. 121, 174-75 (EAB 1999)]. This permitting action, if finalized, authorizes emissions of GHG controlled by what we have determined is BACT for those emissions. It does not select environmental controls for any other pollutants. Unlike the criteria pollutants for which EPA has historically issued PSD permits, there is no NAAQS for GHGs. The global climate-change inducing effects of GHG emissions, according to the "Endangerment and Cause or Contribute Finding", are far-reaching and multi-dimensional (75 FR 66497). Climate change modeling and evaluations of risks and impacts are typically conducted for changes in emissions that are orders of magnitude larger than the emissions from individual projects that might be analyzed in PSD permit reviews. Quantifying the exact impacts attributable to a specific GHG source obtaining a permit in specific places and points would not be possible [PSD and Title V Permitting Guidance for GHGS at 48]. Thus, we conclude it would not be meaningful to evaluate impacts of GHG emissions on a local community in the context of a single permit. Accordingly, we have determined an environmental justice analysis is not necessary for the permitting record.

XIII. Conclusion and Proposed Action

Based on the information supplied by CEMEX, our review of the analyses contained in the TCEQ PSD Permit Application and Permit and the GHG PSD Permit Application, and our independent evaluation of the information contained in our Administrative Record, it is our determination that the proposed conditions in the draft permit represent BACT for GHGs. Therefore, EPA is proposing to issue CEMEX a PSD permit for GHGs for the facility, subject to the PSD permit conditions specified therein. This permit is subject to review and comments. A final decision on issuance of the permit will be made by EPA after considering comments received during the public comment period.

APPENDIX: Annual Facility Emission Limits

Table 1. Maximum annual heat input, clincker production, emissions limitations, and BACT limitations for kiln lines 1 and 2.

FIN	EPN	Description	Maximum Heat Input Limitation[1]	GHG Mass Basis Limitation[1]		CO_2e Limitation[1]	BACT Limitation
			MMBtu/year	GHG[2]	TPY[2]	TPY[2]	Rolling 12-month average
KF13	PS-16	Kiln Line No. 1 used to produce cement clinker.	4,102,239	CO_2	463,088	463,088	0.41 ton CO_2e /ton clinker from fuel firing
				CH_4	49.74	1,045	
				N_2O	7.24	2,244	
				Total	--	466,377	
KILN2	PS-77	Kiln Line No. 2 used to produce cement clinker.	4,998,420	CO_2	564,254	564,254	0.41 ton CO_2e /ton clinker from fuel firing
				CH_4	60.61	1,273	
				N_2O	8.82	2,734	
				Total	--	568,261	

FIN	EPN	Description	Maximum Clinker Production Limitation[1]		GHG Mass Basis Limitation[1]		CO_2e Limitation[1]	BACT Limitation
			Tons/day 30-day rolling average	Tons/yr 12-month rolling total	GHG[2]	TPY[2]	TPY[2]	Rolling 12-month average
KF13	PS-16	Kiln Line No. 1	3,250	1,137,500	CO_2	614,250	614,250	0.54 ton CO_2e/ton clinker from raw material calcinations
KILN2	PS-77	Kiln Line No. 2	3,960	1,386,000	CO_2	748,440	748,440	0.54 ton CO_2e/ton clinker from raw material calcination
Both Kiln Systems Total (fuel firing and calcination)					**CO_2**	**2,390,032**	**2,397,328**	**0.95 tonCO_2e / ton clinker for each kiln system**
					CH_4	**110.35**		
					N_2O	**16.06**		

1. All annual limitations are based on a rolling 12- month period unless otherwise noted. Maximum heat input limitation is based on all fuels combined total heat input (million BTUs per year) in a rolling 12-month total. The fuel firing, production, emissions and BACT limitations specified in this table are not to be exceeded for this facility and include emissions from the facility during all operations, including maintenance, startup, and shutdown activities.
2. GHG= Greenhouse Gas. TPY=total tons per year, based a 12-month rolling total. CO_2e values calculated by multiplying the TPY mass basis limitation value by the Global Warming Potentials (GWP): CO^2=1, CH_4 = 21, N_2O = 310. Note that numbers may not add exactly due to rounding.

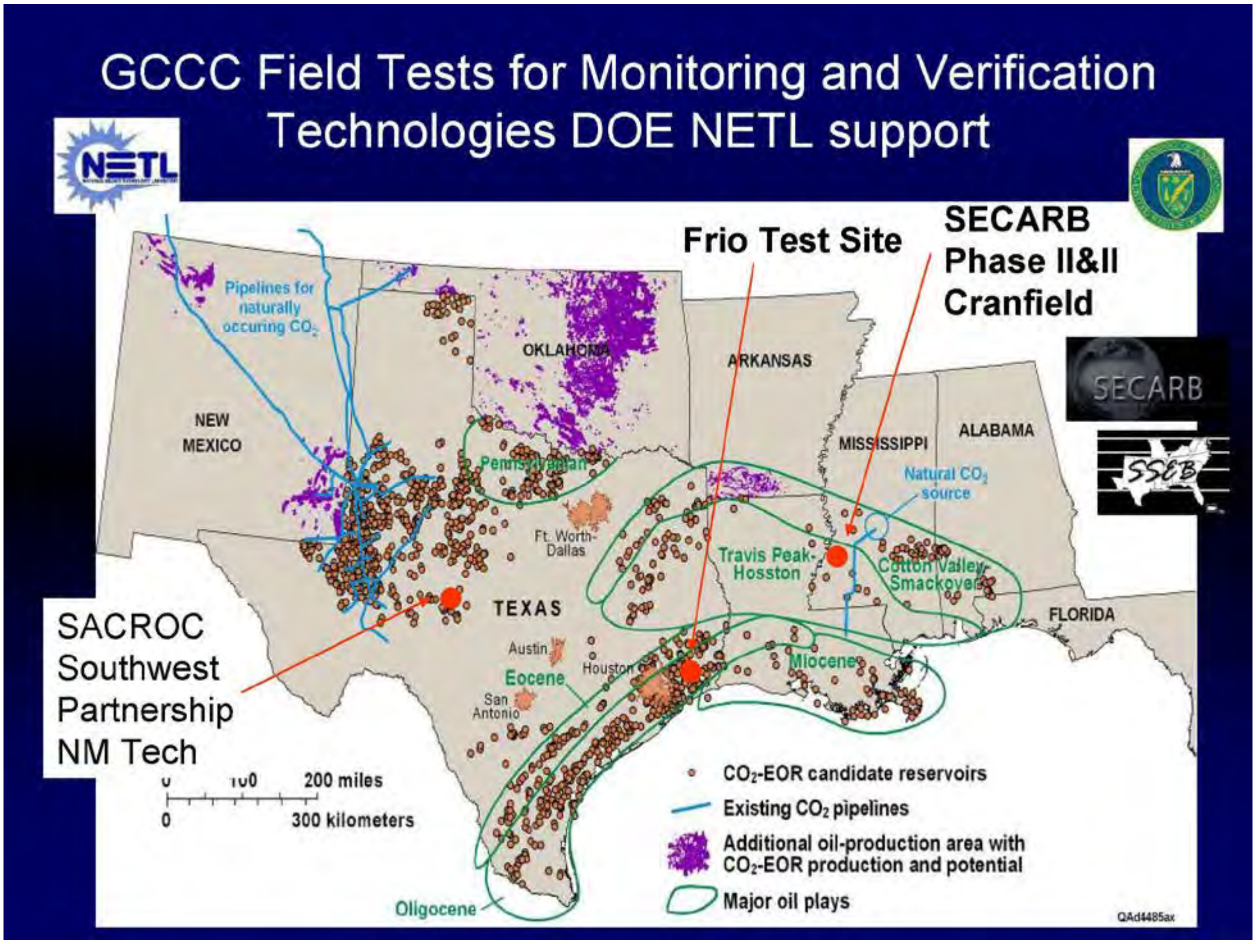

Figure 2. Location of potential CO_2 sequestration sites.

PREVENTION OF SIGNIFICANT DETERIORATION PERMIT FOR GREENHOUSE GAS EMISSIONS ISSUED PURSUANT TO THE REQUIREMENTS AT 40 CFR § 52.21

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 6

PROPOSED DRAFT PSD PERMIT NUMBER:	**PSD-TX-74-GHG**
PERMITTEE:	CEMEX Construction Materials South, LLC
FACILITY NAME:	CEMEX – Balcones Cement Plant
FACILITY LOCATION:	2580 Wald Road New Braunfels, TX 78132

Pursuant to the provisions of the Clean Air Act (CAA), Subchapter I, Part C (42 U.S.C. Section 7470, *et. Seq.*), and the Code of Federal Regulations (CFR) Title 40, Section 52.21, and the Federal Implementation Plan at 40 CFR § 52.2305 (effective May 1, 2011 and published at 76 FR 25178), the U.S. Environmental Protection Agency, Region 6 is issuing a *Prevention of Significant Deterioration* (PSD) permit to CEMEX Construction Materials South, LLC Balcones Cement Plant (CEMEX) for Greenhouse Gas (GHG) emissions. Emissions of all non GHG pollutants are not addressed in or governed by this authorization.

CEMEX is authorized to increase clinker production from kiln line No. 2 to 3960 tons per day (30-day average) and upgrade the existing burners to multichannel adjustable burners in both the No. 1 and No. 2 kilns in accordance with the permit application (and plans submitted with the permit application), the federal PSD regulations at 40 CFR § 52.21, and other terms and conditions set forth in this PSD permit in conjunction with the corresponding Texas Commission on Environmental Quality (TCEQ) PSD Permit No. 6048/PSD-TX-74M2.

Failure to comply with any condition or term set forth in this PSD permit may result in enforcement action pursuant to Section 113 of the Clean Air Act (CAA). This PSD permit does not relieve CEMEX of the responsibility to comply with any other applicable provisions of the CAA (including applicable implementing regulations in 40 CFR Parts 51, 52, 60, 61, 72 through 75, and 98) or other federal and state requirements (including the state PSD program that remains under approval at 40 CFR § 52.2303).

In accordance with 40 CFR §124.15(b), this PSD Permit becomes effective 30 days after the service of notice of this final decision unless review is requested on the permit pursuant to 40 CFR §124.19.

______________________________ ________________________

Wren Stenger, Director   Date
Multimedia Planning and Permitting Division

CEMEX – Balcones Cement Plant (PSD-TX-74-GHG)
Prevention of Significant Deterioration Permit
For Greenhouse Gas EmissionsP
Proposed Draft Permit Conditions

PROJECT DESCRIPTION

The basic steps in cement production include the milling of various raw materials, over 75% of which is limestone, combing those finely ground raw materials to form a meal that is then fed into a kiln (comprised of fired preheaters/precalciners, a fired rotating kiln, and forced draft clinker cooler), progressively heating the material to drive off moisture, to calcine the carbonate bearing materials (limestone, marl), and ultimately to fuse the various materials at very high temperatures (>2500° F) in the rotating portion of the kiln system to form molten clinker. The molten clinker forms clinker nodules as it is rapidly cooled using a clinker cooler and then ground together with other additives in the finish mills to form cement. The finely ground cement is then shipped by bulk rail or truck. GHG emissions are generated in cement production from two distinct sources: so called 'process' related emissions which are those from the calcining of limestone or marl to form lime, which liberates CO_2 in the process and from the combustion of the various fuels in the preheaters/precalciners and in the rotating kiln itself where the various raw materials are fused by high temperature to form cement clinker.

This permit authorizes GHG emissions for both the kiln line No. 1 and kiln line No. 2. Each of these lines is comprised of an in-line raw mill, raw material blending silos, preheaters, precalciners, a rotary kiln, clinker cooler, and solid fuel mills. Additional equipment at the site includes raw material handling systems, finish milling equipment, baghouses to capture product and to control particulate emissions, ancillary equipment and processes at the site including shipping systems, gaseous pollutant control systems and alternative fuel receiving, handling, and preparation systems, but none of the other systems result in GHG emissions.

This project includes two distinct changes to the kiln lines at the site. The first change affects kiln line No.2 only, and authorizes increased emissions to raise an existing production limitation from 3,600 to 3,960 tons of clinker per day (30-day rolling average). Clinker production from the kiln line No.1 remains unchanged at 3,250 tons of clinker per day (30-day rolling average). The kiln line No.2 production rate of 3,960 ton per 30- day rolling average requires no physical change to the kiln line to achieve but rather can be derived from the system as it was constructed in 2008.

The second change at the site addressed by this permit includes GHG emissions from the effect of upgrades to the main kiln burners in both kilns to multichannel adjustable units. The upgrades consist of adding a channel to allow the use of alternative fuels such as biomass and refuse derived fuel in the main kiln burners, fuels which were previously authorized in permit PSD-TX-74M1. The burner upgrades will not increase the maximum fuel firing rate for either kiln but will increase flexibility in the amount and kind of fuels (the fuel mix) that can be burned in the main kiln and result in potential energy efficiency improvements. The list of authorized fuels can be found in permit PSD-TX-74M1. That permit authorized the firing of natural gas, coal, and petroleum coke (pet coke) as primary fuels and also authorized multiple, specifically identified alternative fuels including wood products, carpet fibers, shingles, oil filter fluff, rice husks, and cotton gin residue. PSD-TX-74M2, among other things continues to govern the authorized and unchanged list of fuels that may be fired in either kiln line.

EQUIPMENT LIST

The following processes (identified by Facility Information Numbers (FIN) and Emission Point Number (EPN) are subject to this GHG PSD permit.

FIN	EPN	Description
KF13	PS-16	Kiln line No. 1 is used to produce cement clinker. The line includes kiln No. 1, the associated clinker cooler, preheated air from the clinker cooler being routed to the coal mill to dry the solid fossil fuel, preheater/precalciners with their fuel firing capacity and kiln fuel firing emissions which are routed through the inline raw mill when needed to dry the raw feed and then through the kiln No.1 main baghouse prior to discharge at EPN PS-16.
KILN2	PS-77	Kiln line No. 2 is used to produce cement clinker. The line includes kiln No. 2, the associated clinker cooler, preheated air from the clinker cooler being routed to the coal mill to dry the solid fossil fuel, preheater/precalciners with their fuel firing capacity and kiln fuel firing emissions which are routed through the inline raw mill when needed to dry the raw feed and then through the kiln No.2 main baghouse prior to discharge at EPN PS-77.

I. GENERAL PERMIT CONDITIONS

A. Permit Expiration

1. As provided in 40 CFR §52.21(r), this PSD Permit shall become invalid if construction:
    a. is not commenced (as defined in 40 CFR §52.21(b)(9)) within 18 months after the approval takes effect; or
    b. is discontinued for a period of 18 months or more; or
    c. is not completed within a reasonable time.
2. Pursuant to 40 CFR §52.21(r), EPA may extend the 18-month period upon a written satisfactory showing that an extension is justified.

B. Permit Notification Requirements

1. Permittee shall notify EPA Region 6 in writing and by electronic mail of the:
    a. date construction is commenced, postmarked within 30 days of such date;
    b. actual date of initial startup, as defined in 40 CFR §60.2, postmarked within 15 days of such date. The notice shall include a description of how the energy efficiency system design elements identified in Special Condition No. II.B.3 have been implemented at the site;
    c. date upon which initial performance tests will commence, in accordance with the provisions of Special Condition No.II.D, postmarked not less than 30 days prior to such date. Notification may be provided with the submittal of the performance test protocol required pursuant to Special Condition No.II.D.2.

C. Facility Operations

At all times, including periods of startup, shutdown, and maintenance, Permittee shall, to the extent practicable, maintain and operate the facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the EPA, which may include, but is not limited to, monitoring results, review of operating maintenance procedures and inspection of the facility.

D. Malfunction Reporting

1. Permittee shall notify EPA by mail within 48 hours following the discovery of any failure of air pollution control equipment, process equipment, or of a process to operate in a normal manner, which results in an increase in GHG emissions above the allowable emission limits stated in Section II of this permit.
2. Within 10 days of the restoration of normal operations after any failure described in General Condition I.D.1 of this permit, Permittee shall provide a written supplement to the initial notification that includes a description of the malfunctioning equipment or abnormal operation, the date of the initial malfunction, the period of time over which emissions were increased due to the failure, the cause of the failure, the estimated resultant emissions in excess of those allowed in Section II, the methods utilized to mitigate emissions and the date normal operations were restored.
3. Compliance with this malfunction notification provision shall not excuse or otherwise constitute a defense to any violation of this permit or any law or regulation such malfunction may cause.

E. Right of Entry

1. EPA authorized representatives, or representatives of any air pollution control program with jurisdiction, upon the presentation of credentials, shall be permitted:
   a. to enter the premises where the facility is located or where any records are required to be kept under the terms and conditions of this PSD Permit;
   b. during normal business hours, to have access to and to copy any records required to be kept under the terms and conditions of this PSD Permit;
   c. to inspect any equipment, operation, or method subject to requirements in this PSD Permit; and,
   d. to sample materials and emissions from the source(s).

F. Transfer of Ownership

In the event of any changes in control or ownership of the facilities to be constructed, this PSD Permit shall be binding on all subsequent owners and operators. Permittee shall notify the succeeding owner and operator of the existence of the PSD permit and its conditions by letter; a copy of the letter shall be forwarded to EPA Region 6 within thirty days of the letter signature.

G. Severability

The provisions of this PSD Permit are severable, and, if any provision of the PSD Permit is held invalid, the remainder of this PSD Permit shall not be affected.

H. Adherence to Application and Compliance with Other Environmental Laws

Permittee shall construct and operate this project in compliance with this PSD Permit, the application on which this permit is based, TCEQ PSD Permit PSD-TX-74M2 and all other applicable federal, state, and local air quality regulations. This PSD permit does not release the Permittee from any liability for compliance with other applicable federal, state and local environmental laws and regulations, including the Clean Air Act.

I. Acronyms and Abbreviations

AVO	Auditory, Visual, and Olfactory
BACT	Best Available Control Technology
CAA	Clean Air Act
CC	Carbon Content
CCS	Carbon Capture and Sequestration
CEMS	Continuous Emissions Monitoring System
CFR	Code of Federal Regulations
CH_4	Methane
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
dscf	Dry Standard Cubic Foot
EF	Emission Factor
EPN	Emission Point Number
FIN	Facility Identification Number
FR	Federal Register
GCV	Gross Calorific Value
GHG	Greenhouse Gas
gr	Grains
GWP	Global Warming Potential
HHV	High Heating Value
hr	Hour
HRSG	Heat Recovery Steam Generating
LAER	Lowest Achievable Emission Rate
lb	Pound
LDAR	Leak Detection and Repair
MAPD	Methyl Acetylene Propadiene
mmBtu	Million British Thermal Units
MSS	Maintenance, Start-up and Shutdown
NAAQS	National Ambient Air Quality Standards
NNSR	Nonattainment New Source Review
N2O	Nitrous Oxides
NSPS	New Source Performance Standards
PSD	Prevention of Significant Deterioration
QA/QC	Quality Assurance and/or Quality Control
SCFH	Standard Cubic Feet per Hour
SCR	Selective Catalytic Reduction
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TOC	Total Organic Carbon
TPY	Tons per Year
USC	United States Code
VDU	Vapor Destruction Unit
VHP	Very High Pressure
VOC	Volatile Organic Compound

II. PERMIT SPECIAL CONDITIONS

A. Fuel Firing, Clinker Production, GHG emissions, and BACT Limitations

Fuel firing, clinker production, GHG emissions, and BACT limitations for the facility are listed in Table 1 and may not be exceeded.

Table 1. Maximum annual heat input, clincker production, emissions limitations, and BACT limitations for kiln lines 1 and 2.

FIN	EPN	Description	Maximum Heat Input Limitation[1]		GHG Mass Basis Limitation[1]		CO_2e Limitation[1]	BACT Limitation
			MMBtu/year		GHG[2]	TPY[2]	TPY[2]	Rolling 12-month average
KF13	PS-16	Kiln line No. 1 used to produce cement clinker.	4,102,239		CO_2	463,088	463,088	0.41 ton CO_2e /ton clinker from fuel firing
					CH_4	49.74	1,045	
					N_2O	7.24	2,244	
					Total	--	466,377	
KILN2	PS-77	Kiln line No. 2 used to produce cement clinker.	4,998,420		CO_2	564,254	564,254	0.41 ton CO_2e /ton clinker from fuel firing
					CH_4	60.61	1,273	
					N_2O	8.82	2,734	
					Total	--	568,261	
FIN	**EPN**	**Description**	**Maximum Clinker Production Limitation[1]**		**GHG Mass Basis Limitation[1]**		**CO_2e Limitation[1]**	**BACT Limitation**
			Tons/day 30-day rolling average	**Tons/yr 12-month rolling total**	**GHG[2]**	**TPY[2]**	**TPY[2]**	**Rolling 12-month average**
KF13	PS-16	Kiln line No. 1	3,250	1,137,500	CO_2	614,250	614,250	0.54 ton CO_2e/ton clinker from raw material calcinations
KILN2	PS-77	Kiln line No. 2	3,960	1,386,000	CO_2	748,440	748,440	0.54 ton CO_2e/ton clinker from raw material calcination
Both Kiln Systems Total (fuel firing and calcination)					**CO_2**	**2,390,032**	**2,397,328**	**0.95 tonCO_2e / ton clinker for each kiln system**
					CH_4	**110.35**		
					N_2O	**16.06**		

1. All annual limitations are based on a rolling 12- month period unless otherwise noted. Maximum heat input limitation is based on all fuels combined total heat input (million BTUs per year) in a rolling 12-month total. The fuel firing, production, emissions and BACT limitations specified in this table are not to be exceeded for this facility and include emissions from the facility during all operations, including maintenance, startup, and shutdown activities.
2. GHG= Greenhouse Gas. TPY=total short tons per year, based a 12-month rolling total. CO_2e values calculated by multiplying the TPY mass basis limitation value by the Global Warming Potentials (GWP): CO^2=1, CH_4 = 21, N_2O = 310.

B. Workpractices and Operational Limitations

1. Fuel Firing

a. Maximum annual fuel firing (mmBtu/yr) in each respective kiln line is not to exceed the values in Table 1 of this permit.

b. Fuel types authorized for firing and limitations placed on fuel used in either kiln line shall be limited as follows:

(1) natural gas;

(2) coal;

(3) petroleum coke (pet coke); and

(4) non-hazardous alternate fuels, engineered fuels, or fuel blends consisting of the following:

(i) biomass, including, but not limited to: rice husks, agricultural residues, grasses, stover, straw, chaff, hulls, and cotton gin residue;

(ii) oil containing materials, including, but not limited to: on-site and off-site generated oil filter fluff, oily rags, oily wood, carbon black, absorbents, and grease;

(iii)plastics: post industrial packaging film, plastic labels, and shredded plastic;

(iv)tire derived fuel (TDF) and rubber products, including, but not limited to: tubes, plugs, seals, and tire manufacturer trimmings, in shredded or whole form;

(v) wood, including, but not limited to: sawdust, woodchips, pallets, crates, carpenter shop waste, brush, bark, seed shells, seeds, dyed pallets, creosote treated wood (including utility poles and railroad ties), and untreated and unpainted wood; and,

(vi)others: biosolids, cardboard, carpet products, construction and demolition waste, geotextile fabric, hydrocarbon liquids, label waste, non-asbestos shingles, paper, post-industrial personal care material, printed paper, and wax.

c. Cemex shall incorporate lower GHG emitting fuels than coal and petroleum coke into the mix of fuels fired in the kiln lines such that in any rolling 12 month period, the combined contribution (heat input, mmBTU basis) of fuels other than coal and petroleum coke must be the lesser of 35% of the total sitewide kiln heat input or an amount found through engineering studies completed within the first 24 months of operation after startup to be technically and economically sustainable, as follows:

(1) Within 60 days of issuance of this permit, submit for approval a written plan to determine a technologically and economically sustainable fraction of heat input into the kilns from authorized fuels other than coal and petroleum coke to the Air Permits program of EPA Region 6. The written test plan shall not contain confidential information.

(2) For the first 24 months after the start of operation of the kilns being fitted with the

multichannel burners, utilize fuels other than coal and petroleum coke for a minimum of 10% of the heat input to the kilns on a 12-month rolling average heat input basis.

(3) Within 180 days of issuance of this permit, initiate the evaluation plan approved in paragraph (1) of this provision. The evaluation program will end after 12 months or earlier with written approval from either the EPA or from the TCEQ, if a SIP approved TCEQ GHG permitting program is in place in Texas.

(4) Within three months of completing the evaluation program, submit a report, detailing the results of the evaluation containing at least the most recent 24 months of fuel fired data, by date, fuel type and location, along with daily clinker production data, and projections of future fuel availability by type. The report is to be submitted to the Air Permits section at the address listed in Section III of this permit. The report will be used to determine the appropriate technologically and economically sustainable minimum 12-month average percentage heat input for fuels other than coal and petroleum coke based on the approved test plan results. The 12-month rolling average minimum percentage non coal and petroleum coke heat input percentage is considered to be the maximum annual percentage heat input attributable to all fuels other than coal or petroleum coke achievable and sustainable if demonstrated to be viable for at least 3 months during the test period, considering fuel supply adequacy, and impacts to product quality and cement manufacturing operations.

(5). Beginning no later than 24 months from the date of this permit issuance the minimum 12-month average heat input to all kiln systems from all fuels other than petroleum coke and coal shall be the lesser of 35% or that value determined in subparagraph (4) of this paragraph.

2. Clinker Production

   a. Maximum annual clinker production (12-month rolling total) and daily average (30-day rolling average) clinker production is limited for each respective kiln line not to exceed the values in Table 1 of this permit.

   b. The BACT limitations for each kiln line as listed in Table 1 shall not be exceeded for each kiln line.

3. Kiln line equipment design, operation, and workpractices

   a. Burners for use in both kilns shall be multichannel adjustable burners.

   b. The fuel supply system shall be capable of monitoring and metering the fuel flow for any authorized fuel type.

   b. The combustion systems for both kiln lines, including the multichannel adjustable burners, indirect fired systems, and balance of fuel firing in the various kiln and preheater riser ducts, preheaters and precalciners shall be optimized, operated, and maintained in a manner consistent with the representations made in the permit application dated July 11, 2012 as updated as of August 26, 2013.

   c. Kiln refractory, insulation, seals, and kiln line ductwork shall be maintained in good condition and subject to a written maintenance plan that requires inspection of the seals and ductwork weekly and inspection of all other components at least as frequently as each major outage, but no less frequently than annually.

d. Cooling air exhaust from the clinker coolers shall be routed thru the appropriate kiln line components, including the solid fuel driers to maximize heat utilization prior to being discharged to atmosphere through the EPN of the respective kiln line. Except for periods of time when avoidance of severe equipment damage or personnel safety dictates otherwise, kiln exhaust shall be routed thru the low pressure drop cyclones in the multistage preheaters/precalciners so as to maximize heat utilization by the raw materials prior to being exhausted to atmosphere at the EPN of the respective kiln line.

e. Kiln drive motors and kiln line fans shall include variable speed/variable frequency drive devices and operated so as to maximize energy efficiency. Kiln drive ID fan motors may have the ability to operate with damper controls when necessary.

C. Monitoring and Recordkeeping

1. GHG Operations and Monitoring plan (GHG O&M plan). The permittee must create and maintain, and make available upon request by the EPA or any air pollution control program with jurisdiction, a GHG operations and monitoring plan that is consistent with the requirements of 40 CFR §98.3(g). Such a plan shall include but is not limited to:

a. information for all systems used to monitor and track raw material usage, fuel characterization (higher heating value, and other relevant fuel analyses), fuel usage by specific fuel and firing location, clinker production, kiln dust production, kiln dust recirculation or alkali bypass, GHG gas monitoring from both fuel firing and calcination processes and all associated data acquisition, reduction, and archiving processes related to GHG emissions or energy usage of the kiln lines.

b. Permittee shall calibrate, operate, maintain, and take corrective action to restore to proper operations the various instruments used to validly monitor fuel flow, clinker production, and any other instrumental measuring devices in accordance with manufacturers' recommendations. For such equipment with no manufacturers recommendations, such calibrations shall be performed no less frequently than annually. Results of any such checks, corrective action taken, and dates of same shall be documented and retained for 5 years from last use.

c. All data collected, example calculations, and calculated values shall be retained for a minimum of 5 years from its last use.

d. Permittee shall ensure that all required continuous emissions, continuous volumetric flow rate, and continuous stack moisture monitoring systems (if any), and associated data acquisition and storage systems and equipment are installed and all certification tests are completed on or before the earlier of 90 unit operating days or 180 calendar days after the date the unit commences operation. Such systems testing shall include those testing and certifications required in 40 CFR§98.34(c).

e. Maintenance activities and any corrective action taken on each systems or element of the kiln lines referenced in Special Condition No II.B.3 shall be documented at the time of the maintenance activities. Repairs and maintenance activities shall include the cause of the activity, the date the activity was undertaken and completed, the person responsible for the activity and maintenance performed or corrective actions taken, if any.

2. Fuel Firing

   a. For each location in each kiln line that fuel is fired, and for each fuel type fired, fuel usage shall be determined as follows:

      (1) Continuously monitor and record the fuel usage with an operational non-resettable elapsed flow meter suitable for use for each fuel type or fuel blend being introduced into any point of each kiln line. Valid, quality assured data of fuel usage must be collected for any hour or portion of hour that fuel is fired in any portion of the kiln line. The method of fuel usage data collection, methods and equipment used, method and equipment calibration and associated QA/QC requirements for determining fuel usage shall be documented in the GHG O&M plan required in Special Condition No. II.C.1 of this permit. If any fuel firing data are missing, then follow the procedures of 40 CFR §98.35 to estimate fuel firing for the hour or portion of the hour for which data are missing. Fuel use records for each fuel for each usage location for each hour shall include an indicator if the fuel usage value was derived by missing value procedures.

      (2) Total fuel usage, by fuel type and firing location, shall be summed and recorded hourly for each clock hour. In addition, concurrent kiln operational status (startup, shutdown, or kiln operating with raw mill on, kiln operating with raw mill off, or kiln line down) shall be identified for each hour fuel is fired for each kiln line. Only those clock hours where no fuel is introduced to any portion of the kiln line for the entire hour may be characterized as kiln line down operational status for the kiln line.

      (3) Total fuel usage by fuel type, firing location, and kiln line shall be summed for each day and for each month and recorded monthly. Percent of fuel fired by type for each firing location and kiln line shall be calculated and recorded each month.

   b. The annual high heating value (HHV) of each fuel or fuel blend must be determined for each fuel or fuel blend fired, using either a fuel default HHV or by fuel sampling as follows:

      (1) For fuels listed in Table C-1 of 40 CFR 98 Subpart C, the default annual HHV for the fuel referenced in that table may be used.

      (2) For any fuel or fuel blend that is not so listed, or for any fuel that the permittee does not wish to use the annual default HHV value found in Table C-1, the procedures listed in 40 CFR §98.33(a)(2)(ii) shall be used to determine the annual HHV for the fuel or fuel blend.

      (i) The sampling procedures used to collect the samples, the frequency of sampling, and the analytical methods used to conduct the analysis of the samples to determine the annual HHV of the fuel or fuel blend shall be done in accordance with the procedures found in 40 CFR §98.34(a),

      (ii) The procedures for estimating missing data for any HHV sample outlined in

40 CFR §98.35 shall be followed to supply required but missing HHV sample data.

(iii)The details of the actual sampling, analysis, analytical QA/QC methods, and data collection and reduction for each fuel annual HHV determination shall be documented in the GHG O&M plan required under Special Condition II.C.1 of this permit.

(iv)Records related to HHV determinations shall be created and maintained in accordance with the requirements of 40 CFR §98.3(g) except that the records retention listed in 40 CFR§98.3(g) shall be maintained for 5 years rather than 3 years.

c. The annual HHV for each fuel or fuel blend shall be calculated monthly for any fuel or fuel blend used in the preceding 12 months based on the data collected in Special Condition II.B.2.b, above. The annual value shall be calculated in accordance with Equation C-2b of 40 CFR§98.34(a)(2).

d. The 12-month rolling total heat input, in mmBtu/yr shall be calculated monthly for the preceeding 12-month rolling period for each kiln line as follows:

(1) For each fuel type and fuel firing point, multiply the total fuel used in the relevant 12 months at the point, as derived in Special Condition No. II.C.2.a.(3) of this permit with the annual HHV for the respective fuel type, as derived in Special Condition No. II.C.2.c of this permit.

(2) Sum the heat input totals (mmBtu/yr heat input) across all fuel usage points by fuel types for each kiln line for the relevant 12-month period. Use these values to demonstrate compliance both with the kiln line specific annual heat input limitations found in Table 1 of Special Condition No II.A. and with the percent heat input attributable to firing coal and petroleum coke combined and percent heat input for all other fuels combined limits found in Special Condition No. II.B.1.c.

e. Upon request, permittee shall provide a sample and/or analysis of the fuel that is fired in any unit covered by this permit at the time of the request, or shall allow a sample to be taken for analysis by EPA or any air permitting authority with jurisdiction.

f. Create and maintain all records to support the heat input evaluation program required in Special Condition No. 2.B.C, a copy of the test plan, all data used in the plan execution, and plan report from that study.

3. Clinker Production

   a. Maximum annual clinker production and daily average (30-day rolling average) clinker production is limited for each respective kiln line not to exceed the values in Table 1.

      (1) Daily clinker production (in short tons) shall be determined by direct weight measurement of raw kiln feed and application of a kiln specific clinker factor using the same plant techniques used for accounting purposes, consistent with the requirements found in 40 CFR§98.84(d) for each day of production. Production data are to be recorded daily for each kiln line. Daily totals shall be summed and recorded monthly to derive the monthly clinker production total weight in short tons.

      (2) Annual clinker production shall be calculated and recorded monthly on a 12-month rolling total basis using the data collected in Special Condition No II.C.3.a(1) of this permit. Compliance with the production limitation in Table 1 shall be determined using this data.

   b. Clinker production for each kiln line shall be determined by direct weight measurement of raw kiln feed and application of a kiln specific clinker factor using the same plant techniques used for accounting purposes in accordance with the requirements found in 40 CFR §98.84(d) using the monitoring and QA/QC requirements found in 40 CFR §98.84. Total clinker production in short tons must be determined for each month the kiln line operates for any period of time during the month. When quality assured clinker production weight data are not available, supply missing data in accordance with the requirements found in 40 CFR §98.85(c).

   c. Determine on a monthly basis the kiln specific clinker emission factor for each kiln line at the facility in accordance with the requirements of 40 CFR §98.83(d)(2)(i), following the relevant requirements of 40 CFR §98.84 for data collection and QA/QC requirements and 40 CFR §98.85 for missing data procedures.

   d. Determine the kiln specific clinker kiln dust emission factor monthly in accordance with the provisions of 40 CFR §98.83(d)(2)(ii) and the CO_2 emissions from raw materials in accordance with the method listed in 40 CFR§98.83(d)(3), reporting the CO_2 emissions from raw materials on a short ton basis. Determination of these two parameters shall be accomplished following the relevant requirement of 40 CFR §98.84 for data collection, monitoring, and QA/QC requirements The clinker dust emissions factor shall be calculated monthly and be based on data gathered in the preceding 3 calendar months.

4. Determining CO_2 emissions attributable to processing from each kiln line.

   a. Determine and record monthly the CO_2 mass emission rate in short tons per month attributable to process emissions for each kiln using the data collected in Special Condition No. II.C.3 of this permit, making the calculations in a manner consistent with the requirements of 40 CFR§98.33(d)(2), in units of short tons.

   b. Calculate and record each month the annual 12-month rolling total CO_2 emissions attributable to process emissions for each kiln.

5. Monitoring total GHG emissions from each kiln line.

   a. Determine hourly average CO_2 mass emissions rate, in short tons, from each kiln line by using continuous monitoring systems (CMS) in accordance with the requirements of Tier 4 calculation methodology found in 40 CFR§98.33(a)(4) and all associated requirements for Tier 4 calculations in 40 CFR 98 Subpart C (General Stationary Fuel Combustion Sources), including monitoring and QA/QC requirements of 40 CFR§98.34 and the missing data procedures of 40 CFR §98.35. The valid CMS generated data are to be used to determine the hourly average CO_2 mass emissions rate, in short tons, for each hour fuel is fired for any amount of time in any part of a kiln system. In addition, to recording the kiln line CO_2 emissions rate, concurrent indication of kiln line operational status (normal operations, startup, shutdown, normal operations, in-line mill on or off) for each clock hour shall also be recorded. The methods used must be documented in the GHG O&M plan as required in Special Condition No. II.C.1 of this permit.

   b. The procedures found in 40 CFR§98.33(c) shall be used to calculate rolling 12-month total annual mass emissions rate for CH_4 and N_2O emissions, in short tons, from each kiln line. Calculations shall be made based on the total fuel firing and HHV by fuel type or blend for each kiln as derived in Special Condition No. II.C.2. of this permit. Report the emissions in short tons. Calculate and record the emissions by contaminant and fuel type for each kiln line for each month. Sum across all fuel types for each kiln to derive a total mass emissions by contaminant for the month for each kiln. Using the global warming potential values found in footnote 2 in Table 1 of this permit to calculate and record the CO_2e emissions rates for each contaminant per month for each kiln.

   c. Total daily and monthly CO_2 and CO_2e emissions for each fuel type for each kiln line are to be calculated and recorded monthly. Monthly totals are to be used to calculate and record each month the rolling 12-month total emissions rate of CO_2 and CO_2e.

6. Compliance with 12-month rolling total mass emissions, 12-month rolling total CO_2e emissions limitations and BACT limitations for each kiln line.

   a. The BACT limitation for each kiln line as listed in Table 1 shall not be exceeded for each kiln line or for the site as a whole.

   b. Use the data collected in Special Condition No. II.C.5 of this permit to demonstrate compliance with the annual CO_2 and CO_2e emissions limits found in Table 1.

   c. Calculate the tons CO_2e per ton clinker for each month for each kiln line, by dividing the the total CO_2e emissions for each kiln line by the total clinker production for the kiln line for month. Calculate and record the 12-month rolling average CO_2e per ton clinker each month, using this data to demonstrate compliance with the ton CO_2e per ton clinker BACT limitation of Table 1.

   d. Calculate and report the BACT limitations of CO_2e per ton clinker attributable to fuel combustion by subtracting the total tons CO_2 per month attributable to process emissions as determined in Special Condition No. II.C.4 of this permit from the total CO_2e emissions per kiln as determined by Special Condition No. II.C.5 of this permit.

   e. Calculate and record percent of total fuel related CO_2e attributable to each fuel type for each kiln each month, and for each rolling 12-month period. Use this data to demonstrate, in part, compliance with Special Condition No. II.B.1.c of this permit.

7. Additional Recordkeeping Requirements

   a. Permittee shall maintain a file of all records, data, measurements, reports, and documents related to the operation of the facilities authorized by this permit at the site, including, but not limited to, the following: all records or reports pertaining to significant maintenance performed on any system or device at the kiln lines; duration of startup, shutdown; the initial startup period for the emission units; pollution control units; malfunctions; all records relating to performance tests, calibrations, checks, and monitoring of combustion equipment; duration of an inoperative monitoring device and emission units with the required corresponding emission data; and all other information required by this permit recorded in a permanent form suitable for inspection. The file shall be retained for not less than five years following the date such measurements, maintenance, reports, and/or records are required to be used.

   b. Permittee shall maintain records and submit a written report of deviations from permit requirements, including all excess emissions events, to EPA semi-annually except when more frequent reporting is specifically required by an applicable subpart, or the Administrator or authorized representative, on a case-by-case basis, determines that more frequent reporting is necessary to accurately assess the compliance status of the source. The report is due on the 30th day following the end of each semi-annual period and shall include the following:

      (1) Time intervals, the nature of the deviation or excess emissions event, the data and magnitude of the excess emissions, the nature and cause (if known) of corrective actions taken and preventive measures adopted;

      (2) Applicable time and date of each period during which the monitoring equipment was inoperative (monitoring down-time);

      (3) A statement in the report of a negative declaration; that is; a statement when no deviations have occurred or any excess emissions occurred or when the monitoring equipment has not been inoperative, repaired or adjusted;

      (4) Any failure to conduct any required source testing, monitoring, or other compliance activities; and

      (5) Any violation of limitations on operation.

   c. Excess emissions shall be defined as any period in which the facility emissions exceed an emission limit set forth in this permit or a malfunction occurs causing such an emissions exceedance. Deviations are instances where compliance with a permit term or condition, or of a permit application representation upon which permit limitations have been based that and that may result in unauthorized emissions or practically render ineffective the ability to determine compliance with any term or condition of the permit.

   d. Excess emissions indicated by GHG emission source certification testing or compliance monitoring shall be considered violations of the applicable emission limit for the purpose of this permit.

   e. Unless otherwise noted, instruments and monitoring systems required by this PSD permit shall have a 95% on-stream time on an annual basis.

D. Initial Performance Testing Requirements:

1. The Permittee shall perform stack sampling and other testing to establish the actual pattern and quantities of air contaminants (as listed in paragraph 3 below) being emitted into the atmosphere from the stacks of kiln line 1 and kiln line 2 (EPNs: PS-16 and PS-77, respectively) to determine the initial compliance with the GHG mass emissions limits established in this permit. Initial performance testing shall be conducted in accordance with 40 CFR§60.8. The holder of this permit is responsible for providing sampling and testing facilities and conducting the sampling and testing operations at his expense. The following methods, found in 40 CFR Part 60 Appendix A unless otherwise noted, shall be used:

    a. Method 1—Sample and Velocity Traverses for Stationary Sources.

    b. Method 2—Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube).

    c. Method 3C—Determination of Carbon Dioxide, Methane, Nitrogen, and Oxygen From Stationary Sources.

    d. Method 4—Determination of Moisture Content in Stack Gases. Sampling shall be conducted in accordance with 40 CFR § 60.8 and EPA Method 3a or 3b for the concentration of CO_2.

    e. Method 320 – Measurement of vapor phase organic and inorganic emissions by extractive Fourier transform infrared (FTIR) Spectroscopy.

2. The EPA Region 6 shall be notified in writing as soon as testing is scheduled but not less than 45 days prior to sampling to afford the EPA the opportunity to schedule a pretest meeting. The notice shall include:

    a. proposed date for pretest meeting.

    b. Date sampling will occur.

    c. Name of firm conducting sampling.

    d. Type of sampling equipment to be used.

    e. Method or procedure to be used in sampling.

    The purpose of the pretest meeting is to review the necessary sampling and testing procedures, to provide the proper data forms for recording pertinent data, and to review the format procedures for submitting the test reports.

    A written proposed description of any deviation from sampling procedures specified in permit conditions or TCEQ or the U.S. Environmental Protection Agency sampling procedures shall be made available to the EPA prior to the pretest meeting. The EPA Region 6 shall approve or disapprove of any deviation from specified sampling procedures.

    Requests to waive testing for any pollutant specified in paragraph 1 of this condition shall be submitted to the EPA Region 6 Air Permits Division.

3. Air contaminants to be tested for include (but are not limited to) CO_2, CH_4, and N_2O.

Determination of CO2e emissions shall be made by calculation based on the specific GHG contaminants measured and the global warming potential values found in Table 1 footnote 2 of this permit.

4. Sampling shall occur within 60 days of startup after the modifications are complete and at such other times as may be required by the EPA Region 6 or any pollution control program with jurisdiction. Requests for additional time to perform sampling shall be submitted to the EPA Region 6 office.

5. Testing shall be performed when the feedstock input rate for each unit is at the maximum usable rate for achieving the quality specifications of the clinker being produced at the time.

   a. The production rate of clinker shall be monitored and recorded during the test, as well as the fuel type firing and firing rate at each fuel firing location in the kiln lines being tested.

   b. Initial performance testing shall be comprised of at least 3, 1-hr runs, averaged to derive the hourly rate and shall be conducted at or near full production operations. Future operations may not operate in excess of the tested production rate without first establishing the emissions rate through stack testing of higher production limits. The test derived hourly emission rates will be scaled up to 8760 hrs to produce an annualized emissions rate to compare projected compliance with Table 1.

   c. If the calculated annualized CO_2 emissions rate exceeds 95% of the Table 1 limitation for any given GHG pollutant or for all pollutants combined (CO_2e), then the company shall produce a report along with the required test report identifying how they will operate in order to stay within the limitations of Table 1, and report on progress monthly, including in the report the calculated 12-month rolling total GHG mass emissions rate and CO_2e emissions rate, clinker production, kiln specific clinker emissions factor, for each kiln line for the first 24 months of operation. If the above calculated CO_2 emission total exceeds 90% of the annual limitation listed in Table 1, then performance tests will be required annually, otherwise performance testing shall be repeated at least once every 3 years for each kiln line.This information, together with the sampling results, shall be used to determine hourly emission rates for each GHG and all GHG combined (CO_2e), which will be scaled up by 8760 hrs to produce emissions in short tons per year. This analysis shall appear in the sampling report.

   d. A copy of the final sampling report shall be forwarded to EPA Region 6 within 60 days after sampling is completed. If reports are required under sub paragraph c of this paragraph, then those reports are due within 60 days of the end of each calendar month.

6. Permittee shall provide, or cause to be provided at permittees expense, performance testing facilities as follows:

   a. Sampling ports adequate for test methods applicable to this facility,

   b. Safe sampling platform(s),

   c. Safe access to sampling platform(s), and

   d. Utilities for sampling and testing equipment.

III. AGENCY NOTIFICATIONS

Permittee shall submit GHG permit applications, permit amendments, and other applicable permit information to:

Multimedia Planning and Permitting Division
Air Permits Section
EPA Region 6
1445 Ross Avenue (6 PD-R)
Dallas, TX 75202
Email: Group R6AirPermits@EPA.gov

Permittee shall submit a copy of all compliance and enforcement correspondence as required by this Approval to Construct to:

Compliance Assurance and Enforcement Division
EPA Region 6
1445 Ross Avenue (6EN)
Dallas, TX 75202