JACKSONVILLE LIME FACILITY

GREENHOUSE GAS PREVENTION OF SIGNIFICANT DETERIORATION PERMIT APPLICATION

Prepared for:

Jacksonville Lime, LLC

A Carmeuse Lime & Stone and Keystone Properties JV

Jacksonville, Florida

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1.0 INTRODUCTION AND SUMMARY

1.1 INTRODUCTION

Carmeuse Lime & Stone and Keystone Industries are entering into a joint venture agreement to construct and operate a lime manufacturing operation in Jacksonville, Florida. The joint venture is hereinafter referred to as Jacksonville Lime, LLC (Jacksonville Lime) to be located on Keystone property. This operation will be comprised of two vertical lime kilns and associated lime and solid fuel handling systems. The kiln process uses limestone (calcium carbonate [$CaCO_3$]) and, with the application of heat, causes a chemical reaction resulting in carbon dioxide (CO_2) gas and lime (calcium oxide) (CaO).

The plant's primary Standard Industrial Classification code will be 3274, Lime, and the plant's North American Industry Classification System code will be 327410, Lime Manufacturing.

Lime is the product of the calcination of limestone: a rock containing predominantly $CaCO_3$ but may also contain magnesium carbonate ($MgCO_3$). High calcium lime is manufactured by the following reaction:

$$\text{Limestone} + \text{heat} \rightarrow CO_2 + \text{CaO (high calcium lime)}$$

The basic processes in the production of lime are:

- Quarrying raw limestone.
- Preparing limestone for the kilns by crushing and sizing.
- Calcining limestone.
- Miscellaneous transfer, storage, and handling operations.

Section 2.0 contains descriptions of the various processes associated with the proposed operations at the Jacksonville facility.

The Jacksonville Lime, LLC, facility has potential to emit greater than 100 tons per year (tpy) of several criteria pollutants. Therefore, the facility is classified as a major source with respect to the federal Title V permitting program. Additionally, the facility will be a new major source with respect to the federal Prevention of Significant Deterioration (PSD) permitting program. A PSD major source is defined as a source with potential emissions of any criteria pollutant greater than 250 tpy, unless they are one of the 28 named source categories. Lime plants are included in the list of 28 and are subject to a PSD threshold of 100 tpy. The proposed project results in emissions of carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), particulate matter (PM), particulate matter with an aerodynamic diameter less than 10 microns (PM_{10}), particulate matter with an aerodynamic diameter less than 2.5 microns ($PM_{2.5}$), volatile organic compounds (VOCs), and greenhouse gases (GHGs). The emissions increases of CO, NO_x, SO_2 PM, PM_{10}, $PM_{2.5}$, and GHGs each exceed their respective PSD significant emissions rates (SERs). Therefore, this proposed project is subject to PSD review for these pollutants. A PSD permit application was previously submitted in August 2013 for all pollutants except GHGs, and the PSD construction permit was issued on February 20, 2014. This application addresses the GHGs. Eventual issuance of the PSD construction permit for GHG emissions will complete the authorization required to construct the facility.

1.2 PROPOSED GHG BACT EMISSIONS LIMITS

Based on the use of energy-efficient technology, Jacksonville Lime, LLC, calculated a GHG best available control technology (BACT) emissions limit for the vertical lime kilns of 1.3 tons of carbon dioxide equivalent (CO_2e) per ton of lime produced based on a 12-month rolling average. This GHG BACT emissions limit was derived based on the total GHG emissions from both lime kilns (based on the process CO_2 emissions and the GHG emissions resulting from the combustion of the worst-case fuel, i.e., petcoke) divided by the corresponding total amount of lime produced. It also includes the GHG produced by the combustion of natural gas in the fuel dryer. The maximum plantwide emissions limits for the high calcium and dolomitic limestone are 1.2 and 1.3 tons CO_2e per ton of lime produced, respectively.

2.0 DESCRIPTION OF THE PROPOSED FACILITY

The proposed Jacksonville Lime facility is located on Keystone's property situated on the west bank of the St. Johns River in an industrialized section of Jacksonville, Florida. The physical address for the facility is 1915 Wigmore Street, Jacksonville, Duval County, Florida. The property consists of approximately 110 acres of land situated on both sides of Wigmore Street. The main parcel on which the kilns are to be situated is comprised of approximately 100 acres, and a second parcel of approximately 10 acres is located across Wigmore Street from the main parcel. The property was used as a kraft linerboard mill and manufacturing facility from 1938 until 2006. A chain-linked fence is located along the southern, western, and northern boundaries of the property so as to restrict the site from public access. One of JEA's peaking unit power plants is located adjacent to the project site on the southern boundary. A mixture of both commercial and residential properties surrounds the western and northwestern boundaries. Residential housing is located approximately 450 feet (ft) north of the developed portion of the site. The St. Johns River, which runs along the northeastern and eastern boundaries, serves as a natural barrier for the property. Figure 2-1 shows the general location of the subject property and surrounding areas. Figure 2-2 provides the layout of the Keystone property and the proposed Jacksonville Lime facility showing the lime kilns and related material handling equipment. Figure 2-3 provides a more detailed site layout of the Jacksonville Lime facility.

As previously mentioned, the site was previously used as a kraft linerboard mill and manufacturing facility from 1938 until 2006. Shortly after purchasing the property in early 2006, Keystone initiated negotiations with Florida Department of Environmental Protection (FDEP) concerning the desirability of having the property designated as a brownfield site pursuant to Florida's Brownfields Program. Negotiations between Keystone and FDEP were complicated by the ongoing eminent domain action taken by Jacksonville Port Authority against Keystone. A brownfields site rehabilitation agreement was agreed to and signed by FDEP and Keystone in July 2007. Figures 2-4 and 2-5 provide aerial photographs of the site as a former manufacturing facility (1950s) and the site's postredevelopment view (2011), respectively.

FIGURE 2-1.
LOCATION MAP (2011AERIAL)

Sources: ESRI, 2011; ECT, 2013.

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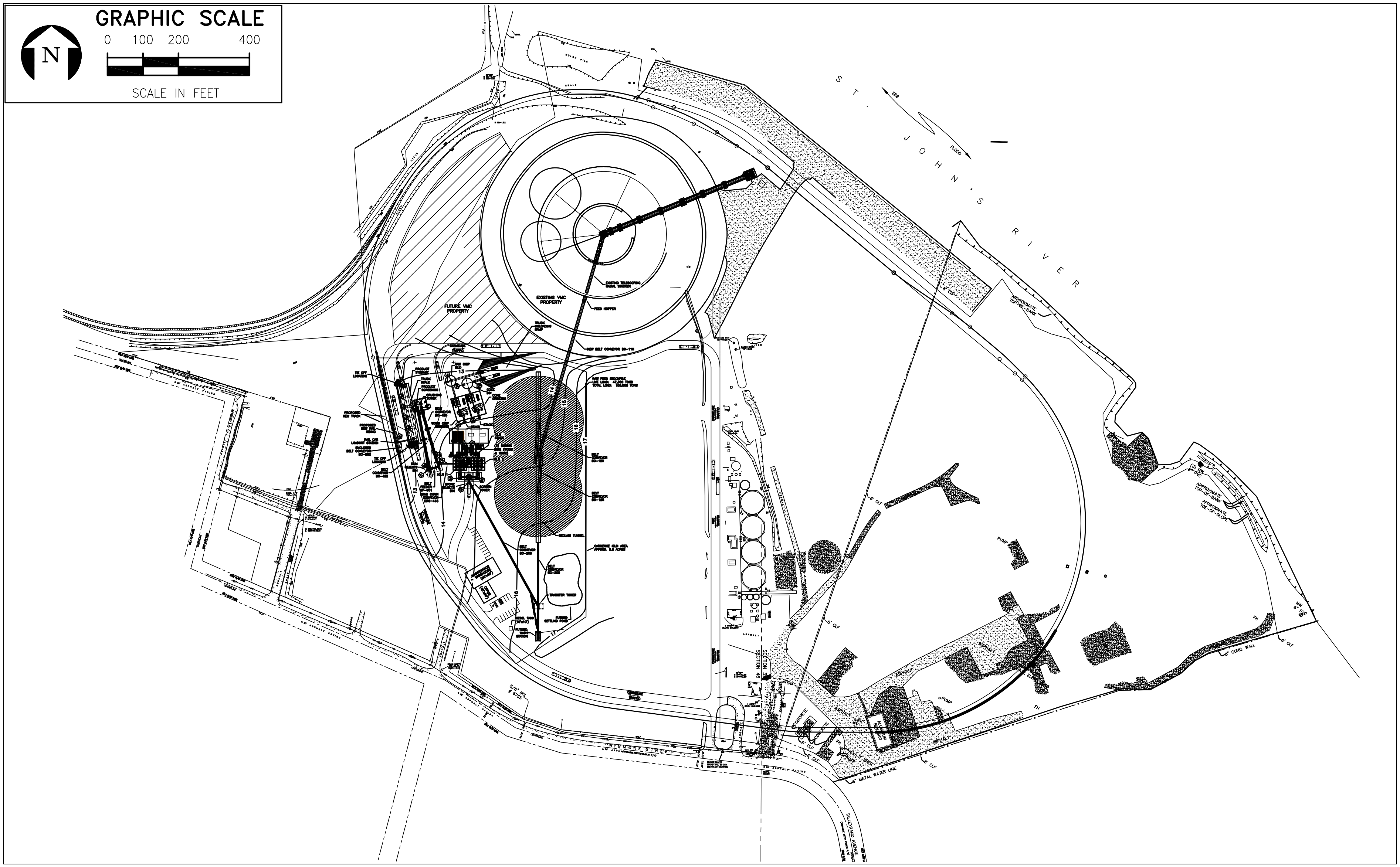

FIGURE 2-2.
OVERALL SITE LAYOUT

Sources: LB&W Engineering, Inc., 2013; ECT, 2013.

ECT Environmental Consulting & Technology, Inc.

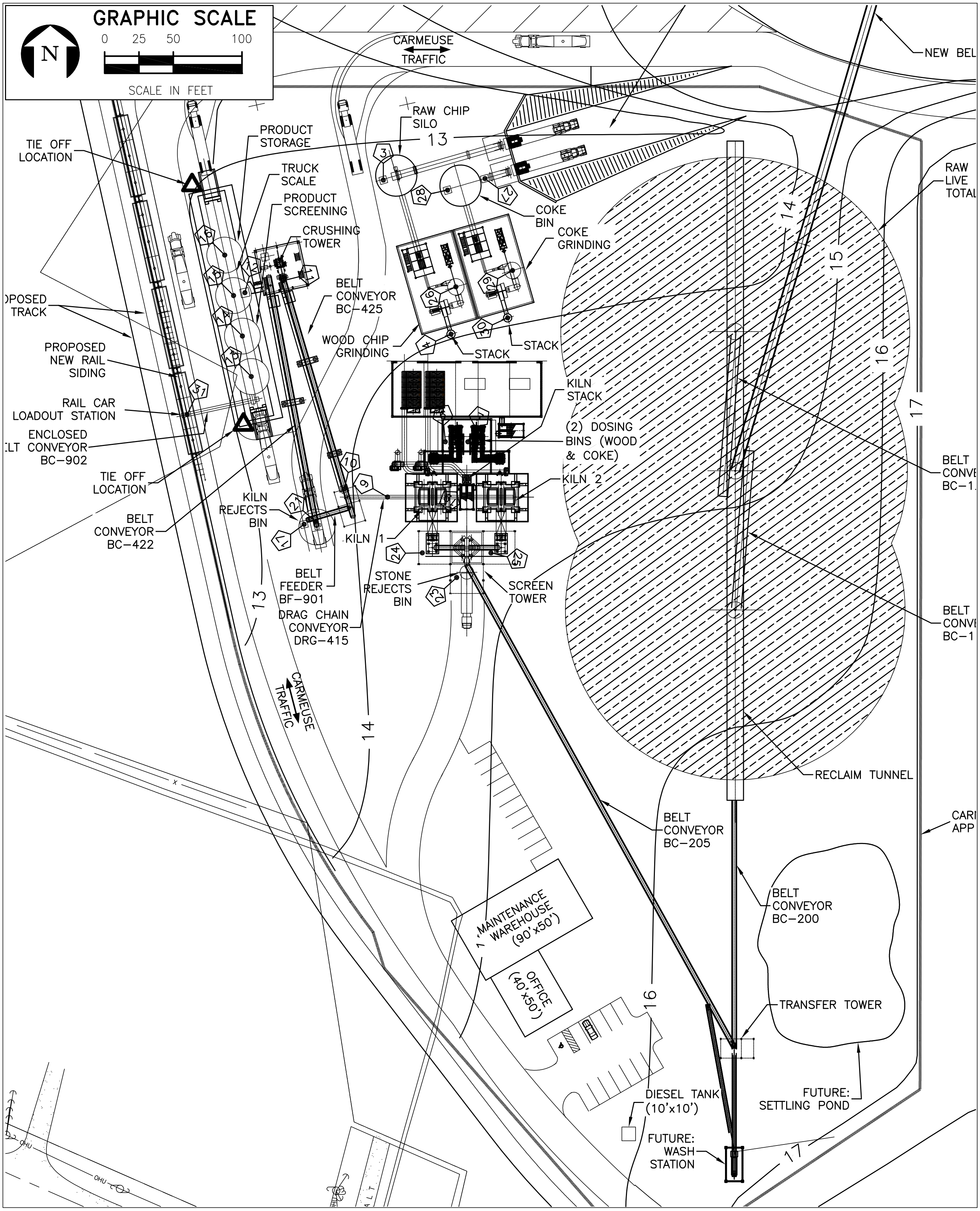

FIGURE 2-3. DETAILED SITE LAYOUT Sources: LB&W Engineering, Inc., 2013; ECT, 2013.	ECT Environmental Consulting & Technology, Inc.

FIGURE 2-4.

FORMER MANUFACTURING OPERATION AERIAL PHOTOGRAPH (1950s)

Source: ECT, 2012.

Environmental Consulting & Technology, Inc.

FIGURE 2-5.

POSTREDEVELOPMENT AERIAL PHOTOGRAPH (2011)

Source: ECT, 2012.

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2.1 PROCESS DESCRIPTION

Limestone is a naturally occurring sedimentary rock containing predominantly $CaCO_3$ but may also contain $MgCO_3$. Rock that contains 5 percent or less $MgCO_3$ is used to produce high-calcium lime. Rock containing 35 to 46 percent $MgCO_3$ is referred to as dolomite, or dolomitic limestone ($CaCO_3 \bullet MgCO_3$).

High-calcium lime (i.e., CaO) and dolomitic lime (CaO • MgO) are produced by the high temperature (approximately 1,850 to 2,190 degrees Fahrenheit [°F]) thermal decomposition (i.e., calcination) of limestone or dolomitic limestone to lime and CO_2 as shown by the following reactions:

$$CaCO_3 + heat \rightarrow CaO + CO_2(g) \quad (1)$$

$$CaCO_3 \bullet MgCO_3 + heat \rightarrow CaO \bullet MgO + 2CO_2(g) \quad (2)$$

where: $CaCO_3 \bullet MgCO_3$ = dolomitic limestone.
$CaCO_3$ = calcium carbonate.
CaO = high-calcium lime.
$CO_2(g)$ = gaseous carbon dioxide.
CaO • MgO = dolomitic lime.

The basic processes in the production of lime are:

- Quarrying raw limestone.
- Preparing limestone for calcination by crushing and sizing.
- Calcining limestone in kilns.
- Miscellaneous raw material and product transfer, storage, and handling operations.

The two proposed kilns are each designed to produce a nominal 330 tons per day (tpd) of lime per kiln, with a maximum lime production rate of up to 396 tpd per kiln. Although the kilns are expected to operate 24 hours per day and 357 days per year, Jacksonville Lime wishes to have the flexibility of operating continuously (i.e., 365 days per year, 8,760 hours per year [hr/yr]) for permitting purposes.

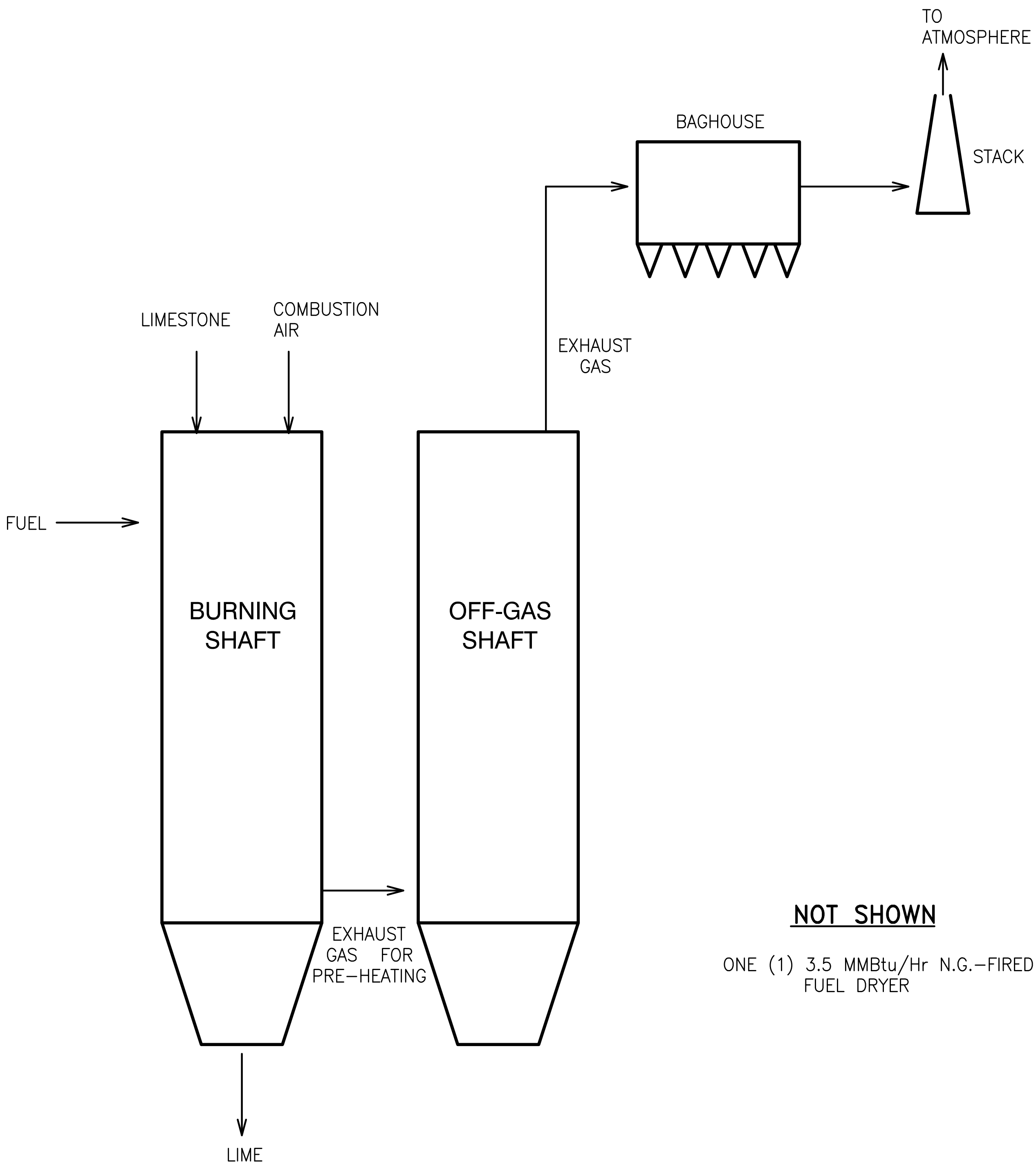
Figure 2-6 illustrates a typical parallel flow regenerative (PFR) vertical lime kiln, and Figure 2-7 depicts the overall facility process flow including material handling equipment. Appendix A contains more detailed process flow diagrams.

2.1.1 LIMESTONE HANDLING

Unprocessed limestone will be delivered to the Keystone property from an offsite quarry and conveyed via stacker conveyor to a surge hopper on the Jacksonville Lime property. Material will then be diverted to a series of belt conveyors and sent to live storage piles. From this point, an enclosed (tunnel) belt conveyor will be fed from the live storage piles with pan feeders to deliver the stone to a transfer conveyor and screen. The screen will segregate the limestone according to size, with finer material being delivered to a 65-ton reject bin and kiln feed stone delivered to two 120-ton charging bins. The limestone handling and sizing operations will be controlled with wet suppression. The screen and charging bins will be enclosed. From the charging bins, the kiln feed will be transferred via belt conveyors and skip hoists to the kiln feed surge bins. Emissions from the surge bins and transfer points will be controlled by fabric filter dust collectors. From the surge bins, kiln feed stone will be delivered via pan feeder to two 20-ton storage bins. The surge bins and associated material transfer points will be enclosed. The surge bins will feed limestone to the two proposed vertical kilns.

2.1.2 FUEL HANDLING

The proposed PFR kilns are designed to produce lime that meets customer quality specifications at competitive prices based on market demand. As such, they are designed to accommodate various fuels to achieve economic viability and satisfy multiple markets with varying quality demands. Five kiln fuel options are proposed for this project, namely petroleum coke or petcoke (primary), coal, lignite, natural gas, and wood chips (as available). In the event that a single fuel becomes cost prohibitive, the proposed configuration will allow the facility to pursue fuel that is more economically viable, as opposed to producing a product that is too expensive for the market or idling operations. Nominal fuel consumption rates per kiln are 1.8 tons per hour (tph) for petcoke, 1.9 tph for coal, 3.4 tph for lignite, 786 cubic feet per minute (ft^3/min) for natural gas, and 2.9 tph for wood chips.



NOT SHOWN

ONE (1) 3.5 MMBtu/Hr N.G.–FIRED FUEL DRYER

NOTES: 1. PARALLEL FLOW SHAFTS ALTERNATE BETWEEN BURNING MODE & OFF–GAS (PRE–HEATING) MODE FOR INCREASED ENERGY EFFICIENCY.

2. ONE (1) PARALLEL FLOW REGENERATIVE LIME KILN SHOWN. TWO (2) TOTAL.

FIGURE 2-6.

SIMPLIFIED PROCESS FLOW DIAGRAM
(VERTICAL PFR LIME KILN)

Source: ECT, 2010.

ECT Environmental Consulting & Technology, Inc.

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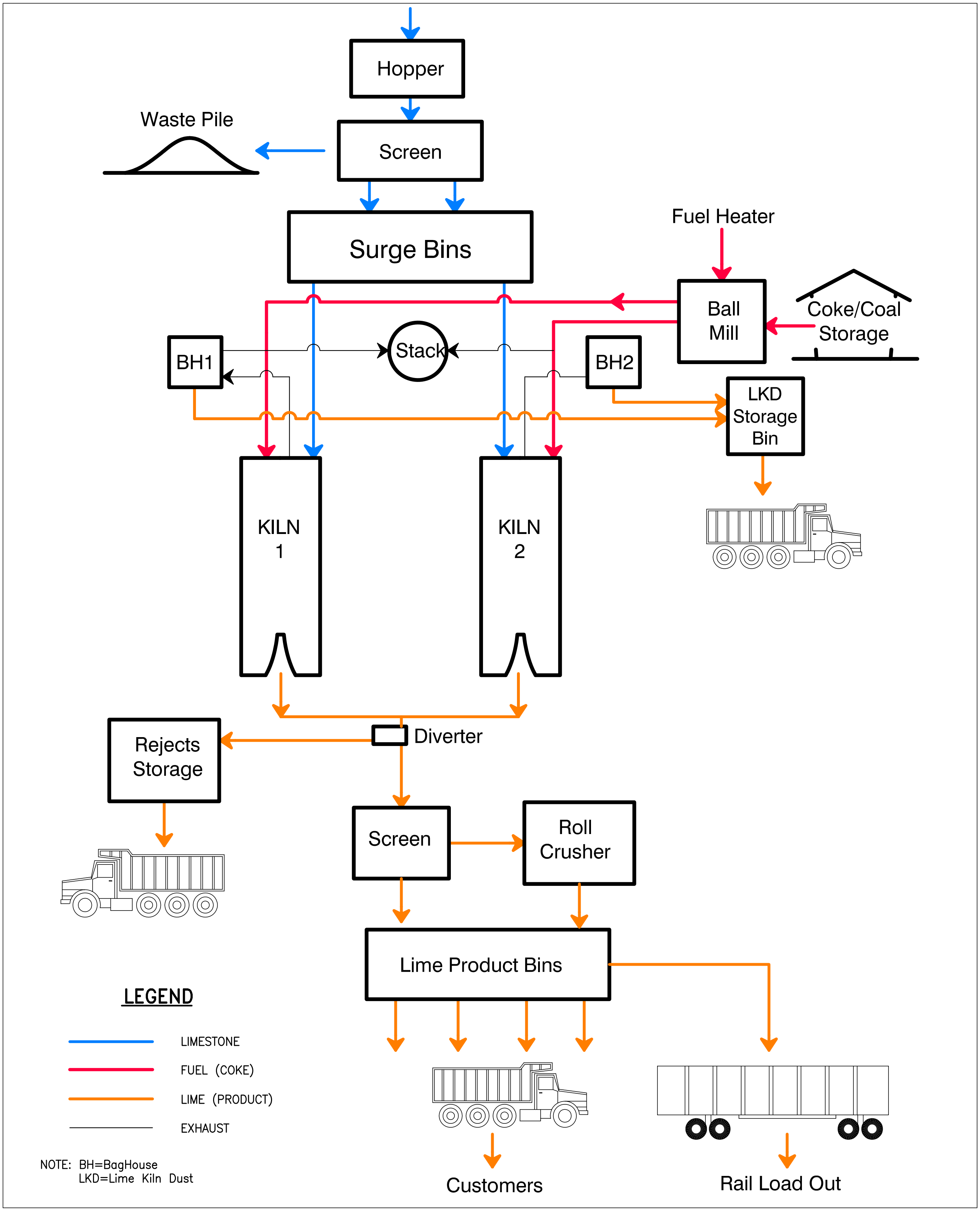


FIGURE 2-7.

SIMPLIFIED PROCESS FLOW DIAGRAM
(OVERALL FACILITY)

Source: ECT, 2013.

Environmental Consulting & Technology, Inc.

Petcoke/coal will be loaded into a dump hopper by truck and/or front-end loaders and sent to a 500-ton coke/coal bin via belt conveyor. The petcoke/coal in the coke bin is unloaded onto a weighing belt feeder, which sends the petcoke to a bowl mill to dry and size the fuel prior to being combusted in the limestone kilns. Air for the mill to dry the petcoke/coal is preheated with a natural gas-fired heater, rated at 3.5 million British thermal units per hour (MMBtu/hr). The high temperature flue gases from a 3.5-MMBtu/hr natural gas-fired heater will be used to dry the fuel by direct contact. The milled petcoke/coal and air are sent through a classifier and collected in a dust collector. The milled petcoke/coal collected in the dust collector is transferred via a pneumatic conveyor to a 50-ton petcoke/coal bin. The milled fuel is combined and pressurized in smaller bins for feed into the vertical lime kilns. Emissions from the proposed petcoke/coal bins and processing equipment are controlled by three fabric filter dust collectors.

Wood-derived fuel will be loaded into a dump hopper by front-end loaders and/or dump trucks and sent to a 168-ton raw storage bin via belt conveyor. The wood-derived fuel in the raw storage bin is transferred via a drag chain conveyor to a mill. The milled wood fuel is collected in a dust collector and pneumatically conveyed to a 50-ton ground chip storage bin. The milled fuel is combined and pressurized in smaller bins for feed into the vertical lime kilns. Emissions from the proposed wood-derived fuel storage bins and processing equipment are controlled by three fabric filter dust collectors.

2.1.3 VERTICAL KILNS

In a lime kiln, limestone is calcined to produce lime and CO_2. The kiln must be operated at high temperatures for this reaction to take place. Jacksonville Lime is proposing to construct two vertical lime kilns, nominally rated at 330 tpd of lime product per kiln. The proposed vertical kilns are PFR-type kilns. The kilns each have two vertical shafts that are connected by a cross-over channel. In this style of kiln, heated limestone and hot combustion gases flow parallel in one shaft (the burning shaft). Simultaneously in the other shaft (the nonburning shaft), the hot lime product and combustion gases flow countercurrent to the raw limestone.

In the burning shaft, combustion air is introduced under pressure at the top of the preheating zone above the limestone bed. The complete system is pressurized. The combustion air is preheated by hot limestone in the regenerator (preheating zone) prior to mixing with the fuel. The air/fuel flame is in direct contact with the calcining limestone as it passes through the burning zone from top to bottom (parallel flow heating).

The off-gases leave the burning shaft and enter the nonburning shaft through the crossover channel, travelling up in counter flow to the raw limestone. The off-gases transfer heat to the limestone in the nonburning shaft and even calcine it to a small degree. The off-gases then regenerate the limestone bed in the preheating zone of the burning shaft in preparation for the next burning cycle on that particular shaft.

These shafts cycle between burning and nonburning modes every 10 to 15 minutes. The vertical kilns will be direct fired and use petcoke containing approximately 5.2 percent sulfur by weight as the primary fuel. The kilns will also be capable of firing coal, lignite, natural gas, and wood chips. The preheating of limestone by the hot kiln exhaust gas results in increased thermal efficiency for vertical kilns when compared to rotary kilns. Therefore, the amount of fuel needed per ton of lime product is less when compared to a rotary kiln. The vertical kilns operate under pressure, which reduces the residence time and temperature necessary for calcining limestone. Parallel flow results in lower burning zone temperatures, subsequently contributing to less thermal NO_x formation. By routing the calcining chamber exhaust gases through the limestone feed preheating chamber, additional control of SO_2 can be obtained, as the SO_2 is adsorbed onto the limestone raw material. Appendix B provides technical literature describing the operation of a typical PFR vertical kiln.

Once the exhaust gas exits the kiln feed preheat chamber, it is routed to a dust collector. Each vertical kiln is equipped with a dedicated fabric filter dust collector. The kiln dust collected in the dust collectors will be pneumatically conveyed for reinjection into the vertical kilns. During episodes of startup and shutdown when the vertical kiln dust is not representative of typical product, the material will be transferred to a portable tote container for disposal.

2.1.4 LIME HANDLING

The lime exiting the vertical kilns is released into one of the two dedicated 18-ton hoppers per kiln (two per kiln chamber). The hoppers transfer the product to a drag chain conveyor. PM emissions due to lime product transfers from the hoppers to the drag chain conveyors below will be controlled by fabric filter dust collectors. From the product belt conveyor, the lime is transferred through a series of transfer chutes and additional conveyors, all of which employ dust collection systems. The lime product will then be directed to a screen and roll crusher prior to transfer of the final product to storage silos. The screen, roll crusher, transfer points, and associated dust collector are enclosed within a building.

Reject material from product lime processing is routed to the reject material handling system. The reject material handling system is comprised of a reject bin belt conveyor, 230-ton reject bin, and associated equipment including load-out, roll crusher, crusher product screw conveyor, and bucket elevators.

The segregated final product is directed to one of four 500-ton product storage bins, each equipped with a self-contained dustless truck loading spout. PM emissions resulting from the various product transfers is captured and controlled by fabric filter dust collection systems at various locations. These dust collection systems have high control efficiencies and are effective in controlling PM emissions. The silo truck loadout area is also enclosed.

2.2 EMISSIONS RATES

To summarize, air emissions sources at the proposed Jacksonville Lime include two PFR lime kilns; miscellaneous raw material, fuel, and product handling, processing, and storage operations; and one natural gas-fired 3.5-MMBtu/hr fuel dryer.

Table 2-1 presents the potential annual GHG emissions for the kilns by fuel type and type of limestone feed, i.e., high calcium or dolomitic limestone. Appendix C contains the

Table 2-1. Potential GHG Annual Emissions for Each Fuel and Limestone Feed

	Limestone (tpy)	
Fuel	High Calcium	Dolomitic
Natural gas	271,928	296,773
Coal	315,596	340,442
Lignite	322,633	347,478
Petcoke	318,811	343,657
Wood	310,482	335,327

Source: ECT, 2014.

basis of the emissions calculations and estimates. Additional information may be found in the FDEP permit application form, which may be found in Appendix D.

The efficiency of the kilns range from 3.24 to 3.52 million British thermal units (MMBtu) per ton of lime produced. The efficiency for each kiln may be estimated as shown in Table 2-2.

The 3.5-MMBtu/hr natural gas-fired fuel dryer has potential GHG annual emissions of 3,377 tpy. This emissions estimate is based on running continuously for 8,760 hr/yr. The fuel dryer is only used when the kilns are fired with petcoke or coal. Table 2-3 presents the fuel dryer GHG emissions.

Table 2-2. Kiln Efficiency

Fuel	Fuel Heat Content (MMBtu/ton)	Fuel Heat Content (MMBtu/ft^3)	Fuel Use (tpd)	Fuel Use (ft^3/dy)	Lime Production (tpd)	Efficiency (MMBtu per ton of Lime)
Petcoke	24.80	—	51.7	—	396	3.24
Coal	24.93	—	54.72	—	396	3.44
Lignite	14.21	—	97.92	—	396	3.51
Natural gas	—	0.001026	—	1,358,208	396	3.52
Wood	17.48	—	73.40	—	396	3.24

Source: ECT, 2014.

Table 2-3. Potential GHG Annual Emissions for the Fuel Dryer

Pollutant	Emissions Factor (kg/MMBtu)	Annual Emissions (tpy)	Global Warming Potential	CO_2e Emissions (tpy)
CO_2	53.06	1,793.25	1	1,793
Methane	0.001	0.034	25	0.84
Nitrous oxide	0.0001	0.0034	298	1.0
Total				**1,795**

Note: kg/MMBtu = kilogram per million British thermal units.

Source: ECT, 2014.

3.0 STATE AND FEDERAL REGULATORY REQUIREMENTS

3.1 STATE REQUIREMENTS

FDEP has the authority to administer the federal U.S. Environmental Protection Agency (EPA) GHG regulatory air permitting program and will issue the Jacksonville Lime air construction permit relating to GHG emissions. The PSD construction permit for the criteria pollutants was issued on February 20, 2014.

3.2 FEDERAL REQUIREMENTS

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

- CO_2: GWP = 1.
- Nitrous oxide (N_2O): GWP = 298.
- Methane: GWP = 25.
- Hydrofluorocarbons (HFCs): GWP varies with specific HFC.
- Perfluorocarbons (PFCs): GWP varies with specific PFC.
- Sulfur hexafluoride (SF_6): GWP = 22,800.

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

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

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

- The source is subject to PSD review for another PSD pollutant, and the potential to emit GHGs is greater than or equal to 75,000 tpy on a CO_2e basis and greater than 0 tpy on a mass basis.
- Potential emissions of GHGs from the source is equal to or greater than 100,000 tpy on a CO_2e basis and equal to or greater than 100/250 tpy on a mass basis.

As a result of the 1990 Clean Air Act (CAA), EPA has enacted primary and secondary national ambient air quality standards (NAAQS) for six air pollutants (40 CFR 50). Primary NAAQS are intended to protect the public health, and secondary NAAQS are intended to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air. Areas of the country in violation of ambient air quality standards are designated as nonattainment areas, and new sources to be located in or near these areas may be subject to more stringent air permitting requirements; i.e., nonattainment area NSR. PSD NSR applies to major new facilities and major modifications that will be located in areas designated attainment with the NAAQS. Since NAAQS have not been adopted for GHGs, nonattainment NSR is not applicable.

3.3 PSD APPLICABILITY

Potential GHG emissions for the Jacksonville Lime project exceed 75,000 tpy on both a CO_2e and mass basis; therefore, the project qualifies as a major source subject to PSD GHG review. Accordingly, the project will need to comply with the applicable provisions of the PSD NSR requirements contained in 40 CFR 52.21. Appendix C provides detailed project GHG emissions rate estimates.

3.4 PSD REQUIREMENTS

PSD NSR includes the following requirements:

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

3.4.1 AMBIENT AIR QUALITY AND IMPACT ANALYSES

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

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

A discussion of the PSD NSR review requirements for control technology review (BACT) is provided in the following subsection.

3.4.2 CONTROL TECHNOLOGY REVIEW

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

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

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

BACT is defined in terms of a numerical emissions limit. This numerical emissions limit can be based on the application of air pollution control equipment; specific production processes, methods, systems, or techniques; fuel cleaning; or combustion techniques. BACT limitations may not exceed any applicable federal new source performance standards (NSPS), national emissions standard for hazardous air pollutants (NESHAPs), or any other emissions limitation established by state regulations.

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

1. Available control technology alternatives are identified based on knowledge of the particular industry of the applicant, control technology vendors, technical journals and reports, and previous control technology permitting decisions for other identical or similar sources.
2. The identified available control technologies are evaluated for technical feasibility. If a control technology has been installed and operated successfully on the type of source under review, it is considered demonstrated and technically feasible. An undemonstrated control technology may be considered technically feasible if it is available and applicable. A control technology is considered available if it can be obtained commercially (i.e., the technology has reached the licensing and commercial sales phase of development). An available control technology is applicable if it can reasonably be installed and operated on the source type under consideration. Undemonstrated available control technologies that are determined to be technically infeasible, based on physical, chemical, and engineering principals, are eliminated from further consideration.
3. The technically feasible technology alternatives are rank-ordered by stringency into a control technology hierarchy.
4. The hierarchy is evaluated starting with the top or most stringent alternative, to determine economic, environmental, and energy impacts and assess the feasibility or appropriateness of each alternative as BACT based on site-

specific factors. If the top control alternative is accepted as BACT from an economic and energy standpoint, evaluation of energy and economic impacts is not required, since the only reason for conducting these assessments is to document the rationale for rejecting an alternative technology as BACT. Instead, the applicant proceeds to evaluate the top case control technology for impacts of unregulated air pollutants or impacts in other media (i.e., collateral environmental impacts). If there are no issues regarding collateral environmental impacts, the BACT analysis is complete, and the top case control technology alternative is proposed as BACT. If the top control alternative is not applicable due to adverse energy, environmental, or economic impacts, it is rejected as BACT and the next most stringent control alternative is then considered.

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

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

4.0 BACT FOR GREENHOUSE GASES

On June 3, 2010, EPA published a final rule (effective August 2, 2010) in Volume 75, No. 106, Federal Register (FR), entitled *Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule*, commonly referred to as the Tailoring Rule. For PSD/Title V purposes, GHGs are a single air pollutant defined as the aggregate group of CO_2, N_2O, methane, HFCs, PFCs, and SF_6. This final rule established specific applicability thresholds for GHG emissions for new major sources and modifications to existing major sources under the PSD and Title V programs.

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

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

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

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

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

In addition to using the aforementioned documents to complete the BACT analysis, Jacksonville Lime also evaluated the existing Reasonably Available Control Technology (RACT)/BACT/Lowest Achievable Emissions Rate (LAER) Clearinghouse (RBLC) database, which did not have any results or permitting decisions for lime kilns within Process Code 90.019 (Lime/Limestone Handling/Kilns/Storage/Manufacturing) for GHGs, nor did the GHG Mitigation Strategies Database contain any information relevant to lime manufacturing operations.

4.1 STEP 1—IDENTIFY AVAILABLE CONTROL TECHNOLOGIES

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

Technologies that formed the basis of an applicable NSPS should also be considered in the BACT analysis, since a BACT emissions limit cannot be less stringent than an applicable NSPS emissions limit. This project is not subject to an applicable NSPS. The lime kiln is not subject to the NSPS for lime manufacturing plants, 40 CFR 60, Subpart HH, since this NSPS is only applicable to lime manufacturing plants that use a rotary lime kiln.

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

The available control technologies for GHG emissions for the vertical lime kiln are carbon capture and sequestration (CCS), energy efficiency, and clean fuels.

4.1.1 CARBON CAPTURE AND SEQUESTRATION

CCS consists of the separation and capture of CO_2 from the flue gas, pressurization of the captured CO_2, transportation of the CO_2 as a critical fluid via pipeline, and injection and long-term geologic storage. EPA recognizes the significant logistical hurdles that the installation and operation of a CCS system presents and that set it apart from other add-on controls typically used to reduce emissions of other regulated pollutants that already have an existing reasonably accessible infrastructure in place to address waste disposal and other offsite needs. Logistical hurdles for CCS may include obtaining contracts for offsite land acquisition (including the availability of land), the need for funding (including, for example, government subsidies), timing of available transportation infrastructure, and developing a site for secure long-term storage (EPA, 2011).

The GHG BACT Guidance for Boilers white paper cites the interagency task force on carbon capture and storage, which references several deployments of CCS technologies.

These applications have been predominately engaged at power plants and are still in the developmental stages. Permanent sequestration is inhibited by geologic formation and associated pipeline infrastructure. Other applications are mentioned, although not in association with the lime industry, and are currently progressing to preliminary demonstration phase. The application of such technologies is not quantifiable at present given the current status of the following methods:

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

Precombustion and oxy-combustion systems are not technically feasible for lime manufacturing facilities. Postcombustion systems (such as absorption processes [liquid], hybrid solution [mixed physical and chemical solvent], adsorption process [solid surface, ionic liquid], and physical separation [membrane, cryogenic separation]) would be considered technically feasible. These postcombustion systems are also associated with high-energy penalties. Some have been demonstrated at the pilot scale, while others are at the bench-top or laboratory stage of development. Most of the existing demonstrations, and those in the planning stage, are designed to remove CO_2 from the combustion of fossil fuels, primarily coal and natural gas. Coal and natural gas combustion units operate at low excess air rates providing lower flue gas volumes and higher CO_2 concentrations or densities in the exhausted flue gas. The lower flue gas volumes and higher CO_2 densities increase the efficiency of CO_2 removal. Several demonstration projects are being supported through the U.S. Department of Energy's Clean Coal Power Initiative, but these facilities will exclusively burn coal (Interagency Task Force, 2010).

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

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

4.1.2 ENERGY EFFICIENCY

Increased energy efficiency is a potential means of reducing GHG emissions and should be considered as a potential control technology for GHG emissions. There are generally two types of categories of energy efficiency improvement categories. The first category consists of technologies, process improvements, or other means of increasing the energy efficiency of the new source; i.e. vertical lime kiln. Increased energy efficiency of the new source will result in less quantity of fuel combusted per unit of output. In the case of a vertical lime kiln, the unit of output would be tons of lime produced. It is EPA’s opinion that the available technologies for this first category will not be significantly different than those technologies considered for other NSR pollutant BACT analyses.

The second category of energy efficiency improvements consists of technologies, process improvement, or other means of improving the amount of energy that is generated or used on the site. This second category does not look at the direct GHG emissions from the new source, which was evaluated in the first category of energy efficiency options, but looks at other facility processes or ancillary equipment that could reduce the amount of energy consumed. Potential technologies included in this category may include increasing the efficiency of process equipment such as a heat exchanger, electric motors, fans, pumps, etc., as well increasing the energy efficiency of ancillary equipment, such as heaters, lighting, etc. Primarily any focus applied to the kilns to facilitate heat recovery or prevent heat loss through such applications as kiln insulation will further contribute to overall energy efficiency at the source. EPA does not recommend an individual evaluation of each and every energy efficiency option in this second category due to the potentially large number of options. Rather, EPA recommends new facilities evaluate their overall energy efficient technologies against a high-level performance facility in the industry to demonstrate that the facility will achieve comparable levels of energy efficiency.

This project will use a state-of-the-art, PFR vertical lime kiln. The primary advantage of a PFR vertical lime kiln, as compared to a rotary lime kiln, is the higher average fuel efficiency. Comparison of rotary kilns with vertical kilns constitutes a redefinition of the source and is not an acceptable practice for the purposes of BACT analysis. Preheating of the limestone with the exhaust gas results in increased thermal efficiency for a PFR vertical lime kiln as compared to a rotary kiln. Therefore, the amount of fuel needed per ton of lime produced is less for a PFR vertical lime kiln as compared to a rotary lime kiln. Also, a vertical lime kiln typically operates under pressure, which reduces the residence time and temperature necessary for calcining the limestone. A typical heat consumption figure for a vertical PFR lime kiln is approximately 2.8 to 3.6 million British thermal units per ton (MMBtu/ton), as compared to 4.4 to 7.9 MMBtu/ton for a rotary lime kiln. Appendix B of this permit application provides representative vendor information for a PFR vertical lime kiln.

In addition to the energy efficiency advantages of the PFR vertical lime kiln design, operating practices that increase energy efficiency are potential control options for improving energy efficiency. These practices primarily focus on improved process control and management systems and include:

- Kiln state-of-the-art instrumentation and controls to optimize process operation and increase fuel efficiency.

- Kiln maintenance in accordance with manufacturer's recommendations to insure kiln is operating at maximum efficiency.

4.1.3 CLEAN FUELS

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

There are two sources of GHG emissions from the lime kiln: one, the CO_2 produced from the process of converting the limestone ($CaCO_3$, $MgCO_3$) to lime using the following equation:

$$\textit{Limestone} + \textit{heat} = CaO + CO_2$$

The second source of CO_2 emissions is the combustion of fossil fuel to produce the heat required in the process. The combustion of fossil fuel also produces a relatively small quantity of CO_2e emissions from methane and N_2O emissions. Jacksonville Lime is proposing to combust petcoke as the primary fuel with the option to combust coal, lignite, wood chips, or natural gas as secondary fuels. As shown in the tables contained in Appendix C, CO_2e emissions from the combustion of the fuel accounts for approximately 20 to 36 percent of the total CO_2e emissions, depending on the fuel source. The majority of the CO_2e emissions are the result of the actual process of converting the limestone to lime.

Jacksonville Lime proposes several fuels for combustion in the two vertical lime kilns (petcoke, coal, natural gas, lignite, and wood chips). The selected fuels will contribute to certain product quality specifications based on market demands/customer needs.

4.2 STEP 2—ELIMINATE TECHNICALLY INFEASIBLE OPTIONS

Step 2 of the top-down BACT analysis is the elimination of technically infeasible options. EPA considers a technology to be technically feasible if: (1) it has been demonstrated and operated successfully on the same type of source under review, or (2) it is available and applicable to the source type under review. A control technology should also be considered technically available or applicable if it has been demonstrated on an exhaust stream with similar physical and chemical characteristics.

Evaluations of technical feasibility should consider all characteristics of a technology option, including its development stage, commercial applications, and scope of installations. CCS has not been demonstrated and is not shown to be commercially available for a full-scale industrial facility. CCS technology has not been demonstrated on a similar-sized, full-scale lime kiln and, therefore, cannot be considered currently commercially available for this project. In addition, there has been no demonstration of CCS technology on a similar volume of exhaust gas stream.

The capture of CO_2 emissions from vertical kilns would require a postcombustion capture system. The conditions of this exhaust from a vertical kiln yields CO_2 in the flue gas at atmospheric pressure and relatively low concentrations. The use of a postcombustion system on a vertical kiln is problematic, since the low pressure and dilute concentration would require that a high volume of gas would need to be treated. Additional challenges stem from the impurities in the flue gas that tend to negatively affect the ability to adsorb CO_2 (Carbon Sequestration – CO_2 storage, U.S. Department of Energy <http://www.netl.doe.gov/technologies/carbon_seq/core_rd/co2capture.html>). The compression of CO_2 for transport and storage would require a substantial auxiliary power load, resulting in additional fuel consumption, either direct or indirect, and increased GHG emissions (EPA, 2010). Therefore, CCS is not considered technically feasible for this project.

Jacksonville Lime is proposing to combust petcoke as the primary fuel with the option to combust coal, lignite, natural gas, and wood chips as secondary fuels. As shown in Tables HC-8 through DL-8 of Appendix C, the combustion of natural gas would result in the lowest total amount of GHG emissions. However, due to the possibility of curtailment and the need to meet the demands and specifications for several markets (e.g., high- and low-sulfur product for the commodity and specialty markets), natural gas cannot be relied upon as the sole fuel for the kilns. The limiting of the fuel to natural gas alone will limit the intended markets for the kiln, which fundamentally changes the scope of the project. Therefore, the use of natural gas exclusively or as the primary fuel is infeasible for this project. In addition, it can be shown that using natural gas as a method to control GHG would be economically infeasible as discussed in the following paragraphs.

Even though the exclusive use of natural gas is considered to be infeasible for the Jacksonville Lime project, an analysis was performed to compare the cost of using the generally higher-priced natural gas to control GHG emissions. Since natural gas results in the lowest GHG emissions among the alternative fuels, the differential between costs and emissions were compared. Appendix E contains the detailed calculations. The following Table 4-1 summarizes the cost estimates for using natural gas to control GHG emissions.

The cost for using natural gas to control CO_2e emissions is the lowest when compared to lignite (approximately \$30 per ton of CO_2e). The cost of using natural gas in place of the other fuels for controlling CO_2e ranges from approximately \$36 to \$66 per ton of CO_2e. To put these costs in perspective, the European GHG cap-and-trade system cost is currently approximately \$5 Euro per metric ton of CO_2e (\$5.93 US per short ton). Also, since June 14, 2011, the more than 300 trading transactions reported by the Chicago Climate Exchange for several countries including the United States showed most costs to be less than \$1 per metric ton of CO_2e. Since a reasonable cost for controlling industrial sources of GHGs under the PSD program for BACT has not been established, these trading costs are a logical benchmark to consider in the evaluation. Therefore, exclusive use of natural gas to control GHG emissions can also be rejected on economic grounds.

Table 4-1. Cost Estimates for Natural Gas Control of GHGs

Fuel Comparison: Natural Gas Versus …	Lime Option ($ per ton CO_2e)		Comparison Basis
	High-Calcium	Dolomite	Average Cost Natural Gas Versus:
Petcoke	40.48	41.06	High-sulfur petcoke
Petcoke	43.12	43.74	Low-sulfur petcoke
Coal	36.06	36.73	Average cost coal for Florida
Lignite	30.21	30.68	Average cost lignite for Florida
Wood chips	63.48	65.77	Average cost wood chips for Florida

Source: ECT, 2014.

The following were considered in estimating the various costs of the alternative fuels:

- Carmeuse considers several different quality parameters, including sulfur content, in making purchasing decisions for petcoke. Therefore, the average prices from existing Carmeuse vendors were considered to be more representative of the petcoke that will be used at the Jacksonville Lime facility than costs based on state or national averages.
- Except for petcoke, fuel prices were taken from the Energy Information Administration (EIA) at http://www.eia.gov/. Coal and wood fuel prices were taken from EIA's State Energy Data System (SEDS) at http://www.eia.gov/state/seds/seds-data-fuel.cfm?sid=US. The 2011 coal price for Florida was assumed to be valid for lignite as well.
- The average natural gas price information for Florida industrial users for the period of January 2011 through March 2013 from the EIA was used in the analysis. The natural gas prices ranged from \$6.35 to \$9.57/MMBtu, with an average of \$7.70/MMBtu.

The existing natural gas line into the facility will be used for the proposed new kilns. At this time, contracts have not been secured for any of the fuels.

Another factor to consider is the plant efficiency of the various fuels in units of heat input per ton of lime produced. All fuels are comparable in terms of efficiency. Therefore, energy efficiency is the only technically feasible control option and will be further considered in this GHG BACT analysis.

4.3 STEP 3—RANK REMAINING CONTROL TECHNOLOGIES

Step 3 of the top-down BACT analysis is the ranking of technically feasible options, starting with the most effective control option. Since energy efficiency is the only technically feasible control option, ranking of multiple control options is not required.

4.4 STEP 4—EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS

Step 4 of the top-down BACT analysis is the consideration of economic, energy, and environmental impacts. Because it has been determined that CCS is technically infeasible and clean fuels would fundamentally redefine the project, consideration of economic, energy, and environmental impacts is not required.

4.5 STEP 5—SELECT BACT

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

4.5.1 BACT FOR VERTICAL LIME KILN AND FUEL DRYER

There have been no BACT determinations to date for GHG emissions from lime kilns. Based on the top-down process described herein, Jacksonville Lime proposes the parallel flow regenerative design and the incorporation of several energy efficiency design features as BACT for control of GHG emissions from the proposed vertical lime kilns. The energy efficiency design features include:

- Kiln Maintenance—The kilns and auxiliary equipment will be maintained in accordance with the manufacturer's recommendations to ensure continued efficient operation throughout the life of the equipment.
- Kiln Process Control—The kilns will have state-of-the-art instrumentation and control devices for monitoring and controlling combustion.
- Optimized Combustion—Combustion air and flue gas will be adjusted as necessary to optimize combustion efficiency and minimize excess air.
- Improved Kiln Insulation—The new vertical kilns will be insulated to manufacturer's specifications to minimize heat loss. Additionally, the kiln will install manufacturer's specified refractory materials to retain heat within the kiln.
- Gas Heat Recovery—Air from the firing chamber will be routed through the preheating chamber kiln to recover energy from the firing chamber exhaust gases. Preheating the kiln chamber will result in less fuel combusted and less GHG emissions.

This project will also use energy efficiency technologies to reduce the amount of electricity consumed onsite. These technologies will be comparable to technologies used throughout the lime manufacturing industry, including but not limited to energy efficient motors, pumps, fans, and lighting.

Based on the use of energy efficient technology, Jacksonville Lime proposes a GHG BACT emissions limit for the vertical lime kilns of 1.30 ton of CO_2e per ton of lime produced based on a 12-month rolling average. This GHG BACT emissions limit was derived based on the total GHG emissions from both lime kilns (based on the process CO_2 emissions and the GHG emissions resulting from the combustion of the worst-case fuel, i.e., lignite) divided by the corresponding total amount of lime produced.

While the calculated GHG BACT emissions limit is 0.9 ton of CO_2e per ton of lime produced, based on actual field experience, measurement uncertainty, variances in final equipment design, and vendor selection, a GHG BACT emissions limit of 1.3 tons of CO_2e per ton of lime produced is proposed.

Jacksonville Lime proposes exclusive use of natural gas and efficient combustion techniques and operation as BACT for the fuel dryer.

Compliance with the proposed GHG BACT limit for the lime kilns will be demonstrated by data analysis currently used within the industry to satisfy provisions of the GHG Reporting Rule for calculating emissions associated with the process. The calculated CO_2 emissions will include the process CO_2 emissions generated during the process of converting limestone to lime as well as the CO_2 emissions resulting from the fuel combustion. The process CO_2 emissions will be calculated in accordance with Subpart S of EPA's 40 CFR 98, Mandatory Greenhouse Gas Reporting Rule. CO_2, methane, and N_2O emissions from the fuel combustion will be calculated in accordance with Subpart C of EPA's 40 CFR 98, Mandatory Greenhouse Gas Reporting Rule, for all fuel combustion based on the heat input for each fuel and the associated emissions factor in 40 CFR 98 from Subpart C, Tables C-1 and C-2. Methane and N_2O calculated emissions are to be multiplied by their respective GWPs of 25 and 298, to determine total CO_2e emissions.

Total facility CO_2e emissions will be divided by the total amount of lime produced in tons to demonstrate compliance with the GHG BACT emissions limit.

Appendix D of this permit application includes a completed FDEP long form that addresses these emissions sources.

4.5.2 BACT DURING STARTUP AND SHUTDOWN

Best operational practices consistent with safe operation of the vertical lime kiln will be used to minimize emissions during startup and shutdown events. Startup and shutdown events are projected to occur infrequently for the vertical lime kilns. In addition, natural gas will be used exclusively during all periods of startup. Jacksonville Lime will comply with the proposed numerical GHG BACT emissions limit provided previously in Section 4.5.1, including emissions during startup and shutdown events.

5.0 REFERENCES

U.S. Energy Information Administration (EIA). 2014a. U.S. Department of Energy, Washington, DC. <http://www.eia.gov/>

———. 2014b. State Energy Data System (SEDS): 2012 (Updates). U.S. Department of Energy, Washington, DC. <http://www.eia.gov/state/seds/seds-data-fuel.cfm?sid=US>

U.S. Environmental Protection Agency (EPA). 2011. PSD and Title V Permitting Guidance for Greenhouse Gases. EPA-457/B-11-001. Office of Air Quality Planning and Standards, Air Quality Policy Division, Research Triangle Park, NC. <http://www.epa.gov/nsr/ghgdocs/ghgpermittingguidance.pdf>

———. 2010. Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Portland Cement Industry. Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC. <http://www.epa.gov/nsr/ghgdocs/cement.pdf>

APPENDIX A

PROCESS FLOW DIAGRAMS

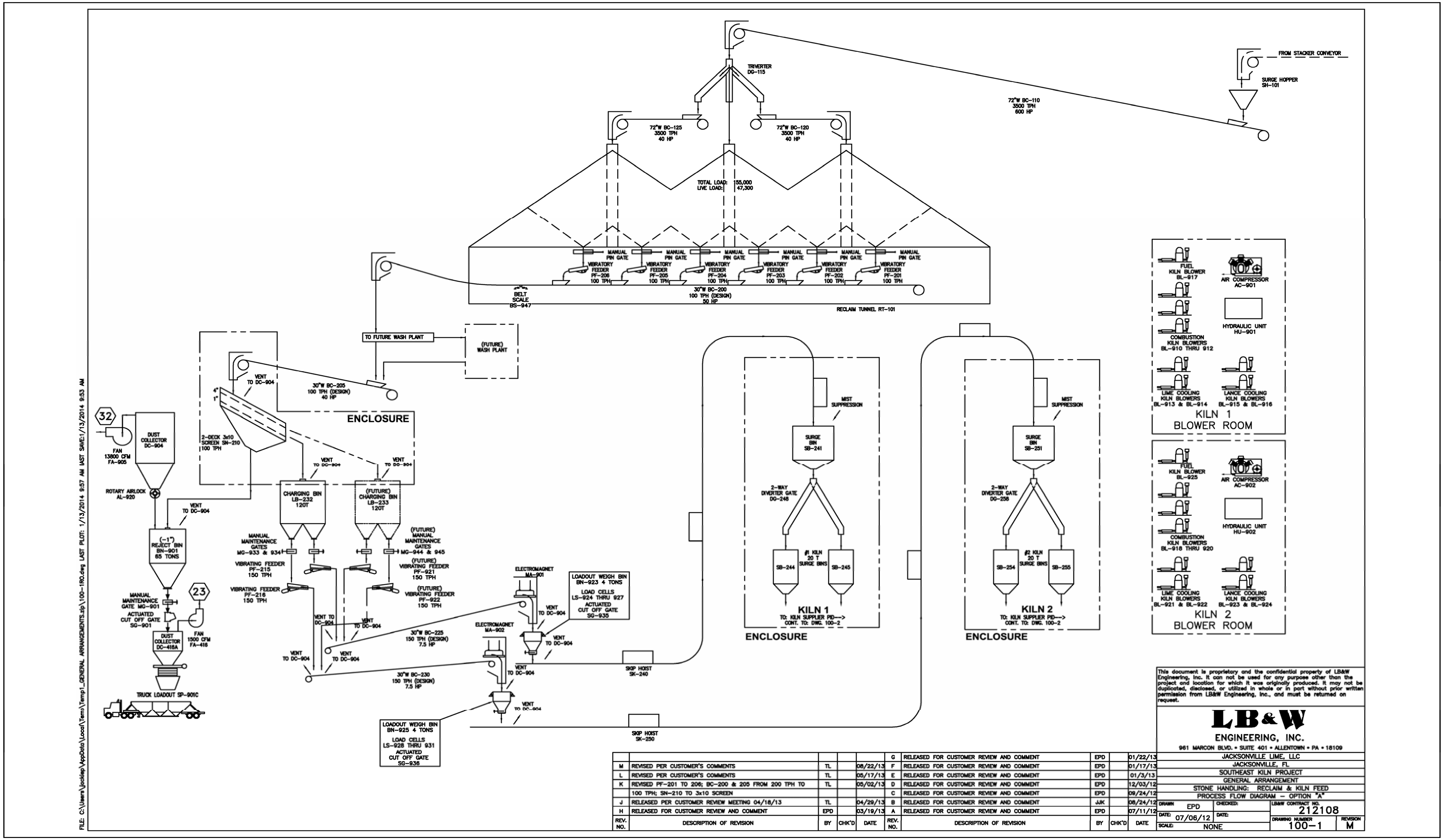


FIGURE A-1.

STONE HANDLING: RECLAIME AND STONE FEED

Source: LB&W, 2014.

Environmental Consulting & Technology, Inc.

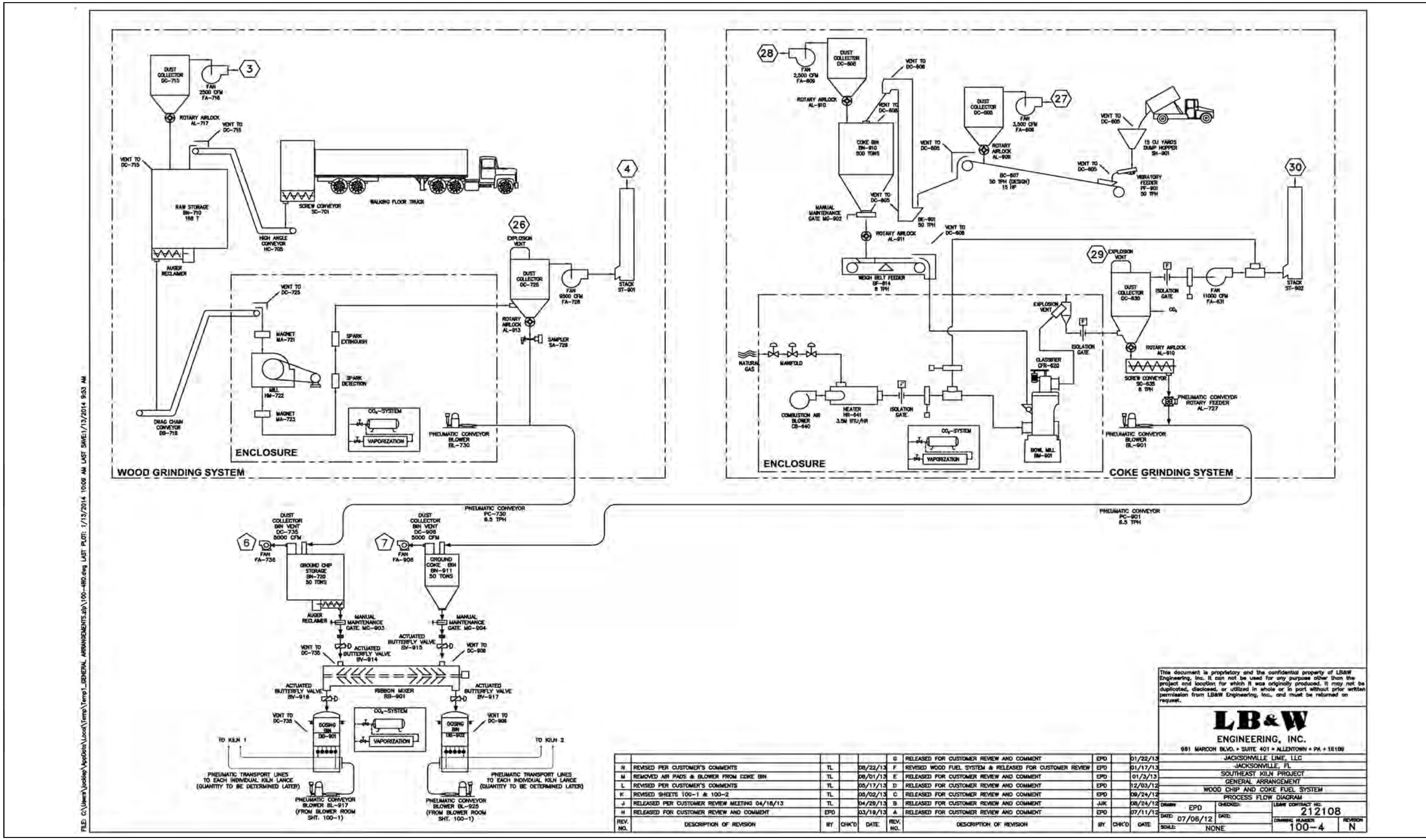
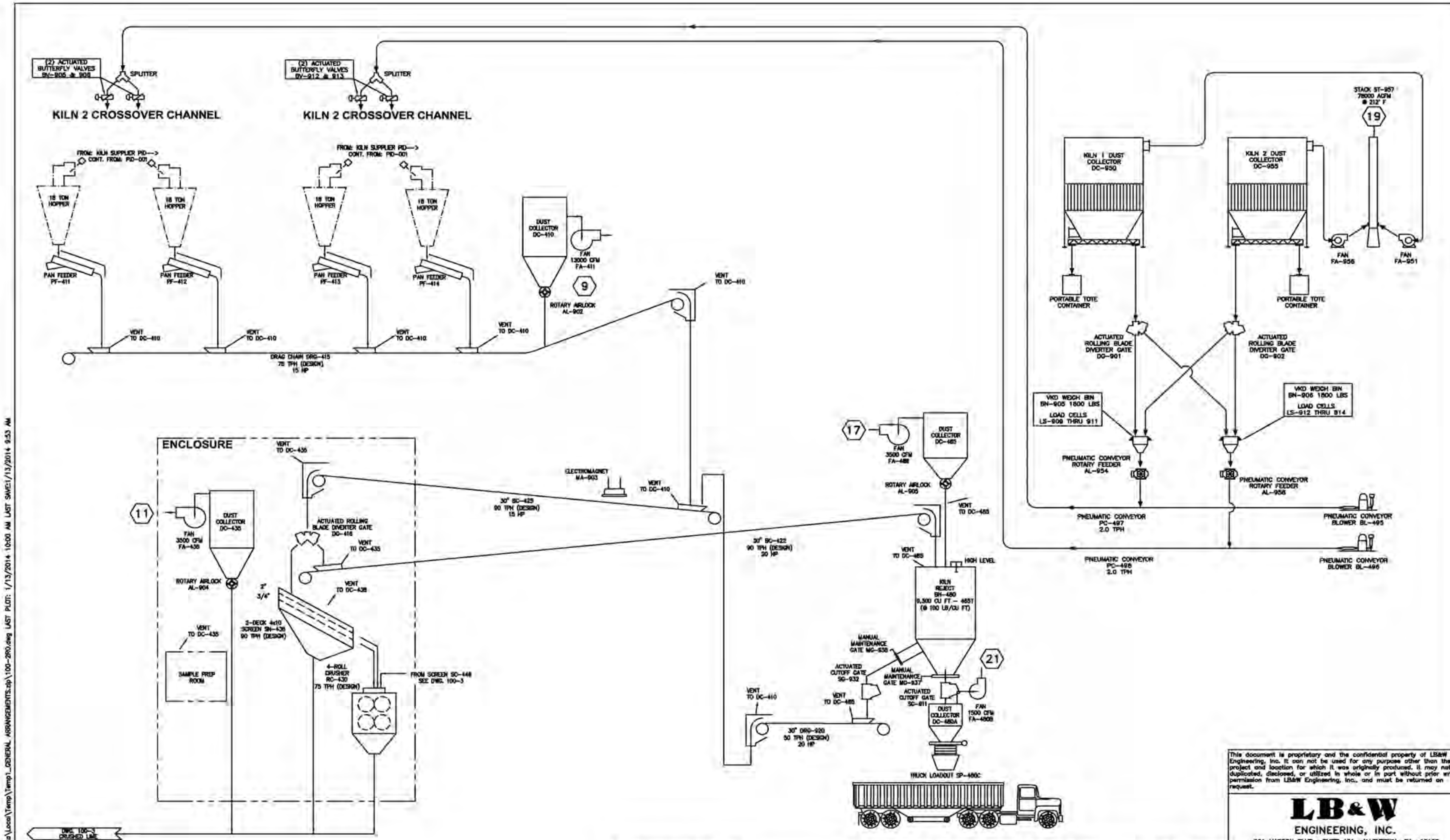


FIGURE A-2.

WOOD CHIP AND COKE FUEL SYSTEM

Source: LB&W, 2014.



REV. NO.	DESCRIPTION OF REVISION	BY	CHK'D	DATE	REV. NO.	DESCRIPTION OF REVISION	BY	CHK'D	DATE
O	RELOCATED MAGNET ON BC-425	TL		11/20/13	G	RELEASED FOR CUSTOMER REVIEW AND COMMENT	EPD		01/22/13
N	REVISED CRUSHER TO ELIMINATE SC-435	TL		11/06/13	F	RELEASED FOR CUSTOMER REVIEW AND COMMENT	EPD		01/17/13
M	REVISED PER CUSTOMER'S COMMENTS	TL		08/22/13	E	RELEASED FOR CUSTOMER REVIEW AND COMMENT	EPD		01/3/13
L	REVISED PER CUSTOMER'S COMMENTS	TL		05/17/13	D	RELEASED FOR CUSTOMER REVIEW AND COMMENT	EPD		12/03/12
K	CORRECTED SN-436 SIZE	TL		05/02/13	C	RELEASED FOR CUSTOMER REVIEW AND COMMENT	EPD		09/24/12
J	RELEASED PER CUSTOMER REVIEW MEETING 04/18/13	TL		04/29/13	B	RELEASED FOR CUSTOMER REVIEW AND COMMENT	JJK		08/24/12
H	RELEASED FOR CUSTOMER REVIEW AND COMMENT	EPD		03/19/13	A	RELEASED FOR CUSTOMER REVIEW AND COMMENT	EPD		07/11/12

LB&W ENGINEERING, INC.
961 MARCON BLVD. • SUITE 401 • ALLENTOWN • PA • 18109

JACKSONVILLE LIME, LLC
JACKSONVILLE, FL
SOUTHEAST KILN PROJECT
GENERAL ARRANGEMENT
LIME HANDLING: CRUSHING, REJECTS, & LKD
PROCESS FLOW DIAGRAM — OPTION "A"

DRAWN: EPD | CHECKED: | LB&W CONTRACT NO. 212108
DATE: 07/06/12 | DATE: | DRAWING NUMBER: 100-2 | REVISION: O
SCALE: NONE

FIGURE A-3.

LIME HANDLING: CRUSHING, REJECTS, AND LIME KILN DUST (LKD)

Source: LB&W, 2014.

Environmental Consulting & Technology, Inc.

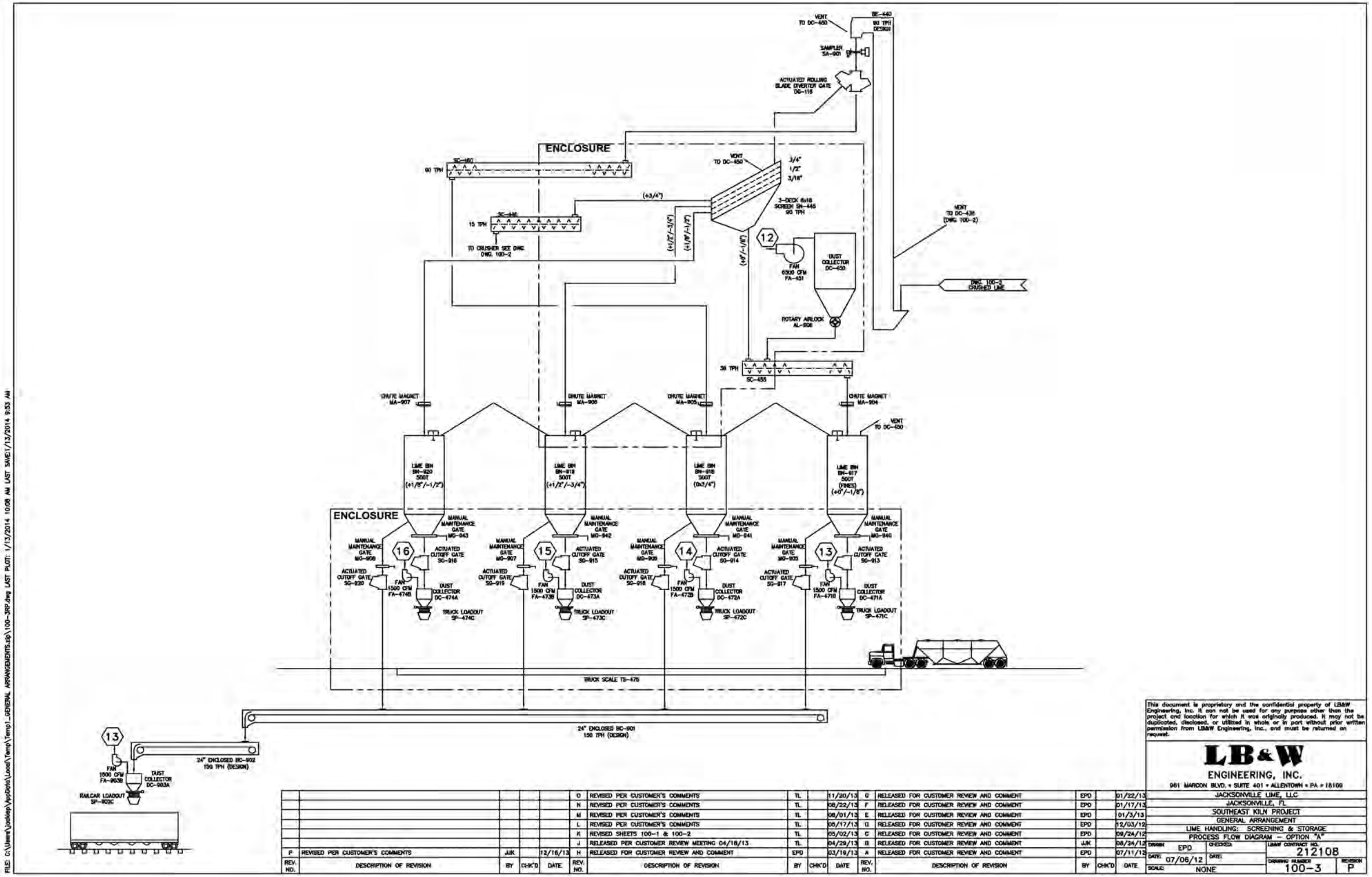


FIGURE A-4.

LIME HANDLING: SCREENING AND STORAGE

Source: LB&W, 2014.

APPENDIX B

REPRESENTATIVE VERTICAL KILN LITERATURE

Presentation Designated as Confidential by Cimprogetti was Removed by the Department for this Posting. A.A. Linero

APPENDIX C

EMISSIONS CALCULATIONS

APPENDIX C

HIGH-CALCIUM LIMESTONE OPTION

DOLOMITIC LIMESTONE OPTION

Table HC-1. Key Process Data (High Calcium Limestone Option)

General Kiln Information					
				Carbonate Type	Estimated Mix
Description:	Vertical, Parallel-Flow Regnerative Lime Kiln			High Calcium	**100%**
Manufacturer:	Cimprogetti			Dolomite	**0%**
Number of Units:	2				

Parameter		Units	Nominal	Maximum	Basis
Lime Stone Feed Rate	High-Calcium	tph	24.5	29.4	ton CaO/ ton stone = 0.5603
		tpd	589.0	706.8	
		tpy	204,227	257,971	
	Dolomite	tph	0.0	0.0	ton CaO.MgO/ ton stone = 0.5227
		tpd	0.0	0.0	
		tpy	0	0	
Lime Production Rate	Quick Lime (CaO)	tpd	**330**	396	Vendor-Specified
		tpy	114,428	137,313	
	Dolomitic Lime (CaO.MgO)	tpd	0	0	
		tpy	0	0	
Fuel Consumption	Pet Coke	tph	1.8	2.2	Primary Fuel
		tpd	**43.1**	**51.7**	
		tpy	14,945	18,871	
	Coal	tph	1.9	2.3	
		tpd	45.6	54.72	
		tpy	15,812	19,973	
	Lignite	tph	3.4	4.1	
		tpd	81.6	97.92	
		tpy	28,295	35,741	
	Natural Gas	ft^3/min	786.0	943.2	
		ft^3/hr	47,160	56,592	
		$MMft^3$/yr	372.8	471.0	
	Wood Chips	tph	2.5	3.1	- 3 mm, 12% moisture max.
		tpd	61.1	73.4	Est. Btu-equivalent Rates
		tpy	21,203	26,783	
Fuel Sulfur Content	Coke	% weight		6.0	
	Coal	% weight			
	Lignite	% weight			
	Natural Gas	% weight			
	Wood Chips	% weight			
Fuel Heat Content (HHV)	Coke	MMBtu/ton	24.80		40 CFR 98
	Coal	MMBtu/ton	24.93		40 CFR 98
	Lignite	MMBtu/ton	14.21		40 CFR 98
	Natural Gas	$MMBtu/ft^3$	1.026E-03		Proposed revision to 40 CFR 98
	Wood Chips	MMBtu/ton	17.48		Proposed revision to 40 CFR 98
Hours of Operation	daily	hr/dy	24	24	
	annual	day/yr	347	365	Nominal - 95%; Maximum - 100%
	annual	hr/yr	8,322	8,760	Nominal - 95%; Maximum - 100%

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table HC-2. Raw Material Limestone Options and Evaluation

A. Input Data

Parameter	Units	Value
Molecular Weights		
$CaCO_3$	lb/lb-mole	100.09
$MgCO_3$	lb/lb-mole	84.33
CaO	lb/lb-mole	56.08
MgO	lb/lb-mole	40.32
CO_2	lb/lb-mole	44.01

Limestone Input

100% High Calcium Lime		
$CaCO_3$	weight % (ignoring minor constituents)	100.00
$MgCO_3$	weight % (highest theroretical)	0.00
Total	weight %	100.00

Worst Case Dolmitic Lime		
$CaCO_3$	weight % (ignoring minor constituents)	54.28
$MgCO_3$	weight % (highest theroretical)	45.72
Total	weight %	100.00

B. Calculations

Lime Output

Case 1 (Using High Calcium Lime)		
$CaCO_3$ + heat = CaO + CO_2		
CaO	metric tons/metric ton stone	**0.5603**
CO_2	metric tons/metric ton stone	**0.4397**
CaO (IPCC 2006)	metric tons/metric ton lime	**0.96**
MgO (IPCC 2006)	metric tons/metric ton lime	**0.01**

Case 2 (Using Dolimitic Lime)		
$CaCO_3$ + $MgCO_3$ + heat = CaO + MgO + 2 CO_2		
CaO	metric tons/metric ton stone	**0.3041**
MgO	metric tons/metric ton stone	**0.2186**
CO_2	metric tons/metric ton stone	**0.4773**
CaO (IPCC 2006)	metric tons/metric ton lime	**0.56**
MgO (IPCC 2006)	metric tons/metric ton lime	**0.39**

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table HC-3. Lime Kiln GHG Emission Estimates: Natural Gas Fuel

A. Lime Production

Parameter	Units	Value	Reference
SR_{CaO}	mt CO_2/mt CaO	0.7848	40 CFR 98, Subpart S, Table S-1
CaO	mt CaO/mt lime	0.96	IPCC 2006 (High Calcium)
SR_{MgO}	mt CO_2/mt MgO	1.0918	40 CFR 98, Subpart S, Table S-1
MgO	mt MgO/mt lime	0.01	IPCC 2006 (High Calcium)
EF-lime (sold)	mt CO_2/ton lime	0.697	40 Part Part 98, Subpart S, Eqn. S-1
EF-LKD (sold)	mt CO_2/ton LKD	0.138	Assumed 30% CaO.MgO
EF-waste (unsold)	mt CO_2/ton waste		
Lime Produced (2 Kilns)	tpy	274,626	
LKD Produced (2 Kilns)	tpy	8,239	Asuumed 3% of lime
Waste (2 Kilns)	tpy		Assumed negligible
CO_2 Emissions	**m tpy**	**192,614.2**	
	tpy	**212,357.2**	

B. Natural Gas Combustion

Parameter	Units	Value	Reference
Natural gas HHV	MMBtu/scf	1.026E-03	40 CFR 98, Subpart C, Table C-1
CO_2 EF	kg CO_2/MMBtu	53.06	40 CFR 98, Subpart C, Table C-1
CH_4 EF	kg methane/MMBtu	0.001	40 CFR 98, Subpart C, Table C-2
N_2O EF	kg N_2O/MMBtu	0.0001	40 CFR 98, Subpart C, Table C-2
Natural gas consumed	scf /hr	113,184.00	
(2 kilns)	scf/yr	991,491,840	
CO_2 Emissions	**m tpy**	**53,976.4**	
	tpy	**59,509.0**	
Methane Emissions	**m tpy**	**1.017**	
	tpy	**1.122**	
N_2O Emissions	**m tpy**	**0.1017**	
	tpy	**0.1122**	

C. GHG Emissions (measured as CO_2e)

GHG	Lime Production (tpy)	Natural Gas Combustion (tpy)	GWP	CO_2e from Lime Production (tpy)	CO_2e from Natural Gas Combustion (tpy)	Total CO_2e (tpy)
CO_2	212,357.2	59,509.0	1.0	212,357.2	59,509.0	271,866.1
Methane	0.0	1.12	25.0	0.0	28.0	28.0
N_2O	0.0	0.112	298.0	0.0	33.4	33.4
Totals	212,357.2	59,510.2	N/A	212,357.2	59,570.4	271,927.6

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table HC-4. Lime Kiln GHG Emission Estimates: Coal Fuel

A. Lime Production

Parameter	Units	Value	Reference
SR_{CaO}	mt CO_2/mt CaO	0.7848	40 CFR 98, Subpart S, Table S-1
CaO	mt CaO/mt lime	0.96	IPCC 2006 (High Calcium)
SR_{MgO}	mt CO_2/mt MgO	1.0918	40 CFR 98, Subpart S, Table S-1
MgO	mt MgO/mt lime	0.01	IPCC 2006 (High Calcium)
EF-lime (sold)	mt CO_2/ton lime	0.697	40 Part 98, Subpart S, Eqn. S-1
EF-LKD (sold)	mt CO_2/ton LKD	0.138	Assumed 30% CaO.MgO
EF-waste (unsold)	mt CO_2/ton waste		
Lime Produced (2 Kilns)	tpy	274,626	
LKD Produced (2 Kilns)	tpy	8,239	Asuumed 3% of lime
Waste (2 Kilns)	tpy		Assumed negligible
CO_2 Emissions	**m tpy**	**192,614.2**	
	tpy	**212,357.2**	

B. Coal Combustion

Parameter	Units	Value	Reference	
Coal HHV	MMBtu/ton	24.93	40 CFR 98, Subpart C, Table C-1	(Bituminous)
CO_2 EF	kg CO_2/MMBtu	93.28	40 CFR 98, Subpart C, Table C-1	(Bituminous)
CH_4 EF	kg methane/MMBtu	0.011	40 CFR 98, Subpart C, Table C-2	
N_2O EF	kg N_2O/MMBtu	0.0016	40 CFR 98, Subpart C, Table C-2	
Coal Consumed (2 kilns)	ton/hr	4.56		
	tpy	39,946		
CO_2 Emissions	**m tpy**	**92,892.3**		
	tpy	**102,413.8**		
Methane Emissions	**m tpy**	**10.954**		
	tpy	**12.077**		
N_2O Emissions	**m tpy**	**1.5934**		
	tpy	**1.7567**		

C. GHG Emissions (measured as CO_2e)

GHG	Lime Production (tpy)	Coal Combustion (tpy)	GWP	CO_2e from Lime Production (tpy)	CO_2e from Coal Combustion (tpy)	Total CO_2e (tpy)
CO_2	212,357.2	102,413.8	1.0	212,357.2	102,413.8	314,770.9
Methane	0.0	12.1	25.0	0.0	301.9	301.9
N_2O	0.0	1.8	298.0	0.0	523.5	523.5
Totals	212,357.2	102,427.6	N/A	212,357.2	103,239.2	315,596.4

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table HC-5. Lime Kiln GHG Emission Estimates: Lignite Fuel

A. Lime Production

Parameter	Units	Value	Reference
SR_{CaO}	mt CO_2/mt CaO	0.7848	40 CFR 98, Subpart S, Table S-1
CaO	mt CaO/mt lime	0.96	IPCC 2006 (High Calcium)
SR_{MgO}	mt CO_2/mt MgO	1.0918	40 CFR 98, Subpart S, Table S-1
MgO	mt MgO/mt lime	0.01	IPCC 2006 (High Calcium)
EF-lime (sold)	mt CO_2/ton lime	0.697	40 Part Part 98, Subpart S, Eqn. S-1
EF-LKD (sold)	mt CO_2/ton LKD	0.138	Assumed 30% CaO.MgO
EF-waste (unsold)	mt CO_2/ton waste		
Lime Produced (2 Kilns)	tpy	274,626	
LKD Produced (2 Kilns)	tpy	8,239	Asuumed 3% of lime
Waste (2 Kilns)	tpy		Assumed negligible
CO_2 Emissions	**m tpy**	**192,614.2**	
	tpy	**212,357.2**	

B. Lignite Combustion

Parameter	Units	Value	Reference
Lignite HHV	MMBtu/ton	14.21	40 CFR 98, Subpart C, Table C-1
CO_2 EF	kg CO_2/MMBtu	97.72	40 CFR 98, Subpart C, Table C-1
CH_4 EF	kg methane/MMBtu	0.011	40 CFR 98, Subpart C, Table C-2
N_2O EF	kg N_2O/MMBtu	0.0016	40 CFR 98, Subpart C, Table C-2
Lignite Consumed (2 kilns)	ton/hr	8.16	
	tpy	71,482	
CO_2 Emissions	**m tpy**	**99,259.4**	
	tpy	**109,433.5**	
Methane Emissions	**m tpy**	**11.173**	
	tpy	**12.319**	
N_2O Emissions	**m tpy**	**1.6252**	
	tpy	**1.7918**	

C. GHG Emissions (measured as CO_2e)

GHG	Lime Production (tpy)	Lignite Combustion (tpy)	GWP	CO_2e from Lime Production (tpy)	CO_2e from Lignite Combustion (tpy)	Total CO_2e (tpy)
CO_2	212,357.2	109,433.5	1.0	212,357.2	109,433.5	321,790.7
Methane	0.0	12.3	25.0	0.0	308.0	308.0
N_2O	0.0	1.8	298.0	0.0	534.0	534.0
Totals	212,357.2	109,447.6	N/A	212,357.2	110,275.4	322,632.6

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table HC-6. Lime Kiln GHG Emissions Estimates: Petroleum Coke Fuel

A. Lime Production

Parameter	Units	Value	Reference
SR_{CaO}	mt CO_2/mt CaO	0.7848	40 CFR 98, Subpart S, Table S-1
CaO	mt CaO/mt lime	0.96	IPCC 2006 (High Calcium)
SR_{MgO}	mt CO_2/mt MgO	1.0918	40 CFR 98, Subpart S, Table S-1
MgO	mt MgO/mt lime	0.01	IPCC 2006 (High Calcium)
EF-lime (sold)	mt CO_2/ton lime	0.697	40 Part Part 98, Subpart S, Eqn. S-1
EF-LKD (sold)	mt CO_2/ton LKD	0.138	Assumed 30% CaO.MgO
EF-waste (unsold)	mt CO_2/ton waste		
Lime Produced (2 Kilns)	tpy	274,626	
LKD Produced (2 Kilns)	tpy	8,239	Asuumed 3% of lime
Waste (2 Kilns)	tpy		Assumed negligible
CO_2 Emissions	**m tpy**	**192,614.2**	
	tpy	**212,357.2**	

B. Coke Combustion

Parameter	Units	Value	Reference
Coke HHV	MMBtu/ton	24.80	40 CFR 98, Subpart C, Table C-2
CO_2 EF	kg CO_2/MMBtu	102.41	Proposed revision to 40 CFR 98, Subpart C, Table C-1
CH_4 EF	kg methane/MMBtu	0.011	40 CFR 98, Subpart C, Table C-2
N_2O EF	kg N_2O/MMBtu	0.0016	40 CFR 98, Subpart C, Table C-2
Coke Consumed (2 kilns)	ton/hr	4.31	
	tpy	37,741	
CO_2 Emissions	**m tpy**	**95,853.4**	
	tpy	**105,678.4**	
Methane Emissions	**m tpy**	**10.296**	
	tpy	**11.351**	
N_2O Emissions	**m tpy**	**1.4976**	
	tpy	**1.6511**	

C. GHG Emissions (measured as CO_2e)

GHG	Lime Production (tpy)	Coke Combustion (tpy)	GWP	CO_2e from Lime Production (tpy)	CO_2e from Coke Combustion (tpy)	Total CO_2e (tpy)
CO_2	212,357.2	105,678.4	1.0	212,357.2	105,678.4	318,035.5
Methane	0.0	11.4	25.0	0.0	283.8	283.8
N_2O	0.0	1.7	298.0	0.0	492.0	492.0
Totals	212,357.2	105,691.4	N/A	212,357.2	106,454.1	318,811.3

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table HC-7. Lime Kiln GHG Emissions Estimates: Wood Chips

A. Lime Production

Parameter	Units	Value	Reference
SR_{CaO}	mt CO_2/mt CaO	0.7848	40 CFR 98, Subpart S, Table S-1
CaO	mt CaO/mt lime	0.96	IPCC 2006 (High Calcium)
SR_{MgO}	mt CO_2/mt MgO	1.0918	40 CFR 98, Subpart S, Table S-1
MgO	mt MgO/mt lime	0.01	IPCC 2006 (High Calcium)
EF-lime (sold)	mt CO_2/ton lime	0.697	40 Part Part 98, Subpart S, Eqn. S-1
EF-LKD (sold)	mt CO_2/ton LKD	0.138	Assumed 30% CaO.MgO
EF-waste (unsold)	mt CO_2/ton waste		
Lime Produced (2 Kilns)	tpy	274,626	
LKD Produced (2 Kilns)	tpy	8,239	Asuumed 3% of lime
Waste (2 Kilns)	tpy		Assumed negligible
CO_2 Emissions	**m tpy**	**192,614.2**	
	tpy	**212,357.2**	

B. Wood Combustion

Parameter	Units	Value	Reference
Wood HHV	MMBtu/ton	17.48	40 CFR 98, Subpart C, Table C-1
CO_2 EF	kg CO_2/MMBtu	93.80	40 CFR 98, Subpart C, Table C-1
CH_4 EF	kg methane/MMBtu	0.0072	40 CFR 98, Subpart C, Table C-2
N_2O EF	kg N_2O/MMBtu	0.0036	40 CFR 98, Subpart C, Table C-2
Wood Consumed (2 kilns)	ton/hr	6.11	
	tpy	53,566	
CO_2 Emissions	**m tpy**	**87,828.6**	
	tpy	**96,831.0**	
Methane Emissions	**m tpy**	**6.742**	
	tpy	**7.433**	
N_2O Emissions	**m tpy**	**3.3708**	
	tpy	**3.7163**	

C. GHG Emissions (measured as CO_2e)

GHG	Lime Production (tpy)	Wood Combustion (tpy)	GWP	CO_2e from Lime Production (tpy)	CO_2e from Wood Combustion (tpy)	Total CO_2e (tpy)
CO_2	212,357.2	96,831.0	1.0	212,357.2	96,831.0	309,188.2
Methane	0.0	7.4	25.0	0.0	185.8	185.8
N_2O	0.0	3.7	298.0	0.0	1,107.5	1,107.5
Totals	212,357.2	96,842.2	N/A	212,357.2	98,124.3	310,481.5

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table HC-8. GHG Emissions Summary (High-Calcium Limestone Option)

Potential GHG Emissions (expressed as carbon dioxide equivalent [CO_2e])

Emissions Source	Fuel Option	CO_2e Emissions from Lime Production	GHG Emissions from Associated Combustion			Total CO_2e Emissions	CO_2e Emission Factor		
			CO_2 Emissions*	CH_4 - CO_2e Emissions*	N_2O - CO_2e Emissions*		Lime Production	Combustion	Total
		(short tpy)	(short tpy)	(short tpy)	(short tpy)	(short tpy)	(ton per ton of lime produced)		
(2) Lime Kilns	Natural Gas	212,357	59,509.0	28.0	33.4	**271,927.6**	**0.7733**	**0.2169**	**0.99**
	Coal	212,357	102,413.8	301.9	523.5	**315,596.4**	**0.7733**	**0.3759**	**1.15**
	Lignite	212,357	109,433.5	308.0	534.0	**322,632.6**	**0.7733**	**0.4015**	**1.17**
	Pet Coke	212,357	105,678.4	283.8	492.0	**318,811.3**	**0.7733**	**0.3876**	**1.16**
	Wood	212,357	96,831.0	185.8	1,107.5	**310,481.5**	**0.7733**	**0.3573**	**1.13**
Fuel Dryer	Natural Gas	30,660	1,794	0.8	1.0	**1,795**	**N/A**	**N/A**	**N/A**
Facility-wide						**324,428**			**1.18**

Note:

Emissions from Lime Kilns are based on Mandatory Reporting of Greenhouse Gases Rule, 40 CFR Part 98, Subpart S.

Emissions from Other Combustion Sources are based on Mandatory Reporting of Greenhouse Gases, 40 CFR Part 98, Subpart C.

*Based on global warming potential of 1 for CO_2, 25 for methane, and 298 for N_2O.

Sources: Jacksonville Lime.
ECT, 2014.

Table DL-1. Key Process Data (Dolomitic Limestone Option)

General Kiln Information					
				Carbonate Type	Estimated Mix
Description:	Vertical, Parallel-Flow Regnerative Lime Kiln			High Calcium	**0%**
Manufacturer:	Cimprogetti			Dolomite	**100%**
Number of Units:	2				

Parameter		Units	Nominal	Maximum	Basis
Lime Stone Feed Rate	High-Calcium	tph	0.0	0.0	
		tpd	0.0	0.0	
		tpy	0	0	
	Dolomite	tph	26.3	31.6	
		tpd	631.3	757.6	
		tpy	218,908	276,515	
Lime Production Rate	Quick Lime (CaO)	tpd	**0**	0	
		tpy	0	0	
	Dolomitic Lime (CaO.MgO)	tpd	330	396	
		tpy	114,428	137,313	
Fuel Consumption	Pet Coke	tph	1.8	2.2	Primary Fuel
		tpd	**43.1**	**51.7**	
		tpy	14,945	18,871	
	Coal	tph	1.9	2.3	
		tpd	45.6	54.72	
		tpy	15,812	19,973	
	Lignite	tph	3.4	4.1	
		tpd	81.6	97.92	
		tpy	28,295	35,741	
	Natural Gas	ft^3/min	786.0	943.2	
		ft^3/hr	47,160	56,592	
		$MMft^3$/yr	372.8	471.0	
	Wood Chips	tph	2.5	3.1	
		tpd	61.1	73.4	- 3 mm, 12% moisture max.
		tpy	21,203	26,783	Est. Btu-equivalent Rates
Fuel Sulfur Content	Coke	% weight		6.0	
	Coal	% weight			
	Lignite	% weight			
	Natural Gas	% weight			
	Wood Chips	% weight			
Fuel Heat Content (HHV)	Coke	MMBtu/ton	24.80		40 CFR 98
	Coal	MMBtu/ton	24.93		40 CFR 98
	Lignite	MMBtu/ton	14.21		40 CFR 98
	Natural Gas	$MMBtu/ft^3$	1.026E-03		Proposed revision to 40 CFR 98
	Wood Chips	MMBtu/ton	17.48		Proposed revision to 40 CFR 98
Hours of Operation	daily	hr/dy	24	24	
	annual	day/yr	347	365	Nominal - 95%; Maximum - 100%
	annual	hr/yr	8,322	8,760	Nominal - 95%; Maximum - 100%

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table DL-2. Raw Material Limestone Options and Evaluation

A. Input Data

Parameter	Units	Value
<u>Molecular Weights</u>		
$CaCO_3$	lb/lb-mole	100.09
$MgCO_3$	lb/lb-mole	84.33
CaO	lb/lb-mole	56.08
MgO	lb/lb-mole	40.32
CO_2	lb/lb-mole	44.01

<u>Limestone Input</u>

100% High Calcium Lime		
$CaCO_3$	weight % (ignoring minor constituents)	100.00
$MgCO_3$	weight % (highest theroretical)	0.00
Total	weight %	100.00

Worst Case Dolmitic Lime		
$CaCO_3$	weight % (ignoring minor constituents)	54.28
$MgCO_3$	weight % (highest theroretical)	45.72
Total	0.0072	100.00
	0.0036	

B. Evalautions

<u>Lime Output</u>

Case 1 (Using High Calcium Lime)		
$CaCO_3$ + heat = CaO + CO_2		
CaO	metric tons/metric ton stone	**0.5603**
CO_2	metric tons/metric ton stone	**0.4397**
CaO (IPCC 2006)	metric tons/metric ton lime	**0.96**
MgO (IPCC 2006)	metric tons/metric ton lime	**0.01**

Case 2 (Using Dolimitic Lime)		
$CaCO_3$ + $MgCO_3$ + heat = CaO + MgO + 2 CO_2		
CaO	metric tons/metric ton stone	**0.3041**
MgO	metric tons/metric ton stone	**0.2186**
CO_2	metric tons/metric ton stone	**0.4773**
CaO (IPCC 2006)	metric tons/metric ton lime	**0.56**
MgO (IPCC 2006)	metric tons/metric ton lime	**0.39**

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table DL-3. Lime Kiln GHG Emissions Estimates: Natural Gas Fuel

A. Lime Production

Parameter	Units	Value	Reference
SR_{CaO}	mt CO_2/mt CaO	0.7848	40 CFR 98, Subpart S, Table S-1
CaO	mt CaO/mt lime	0.56	IPCC 2006 (Dolomitic)
SR_{MgO}	mt CO_2/mt MgO	1.0918	40 CFR 98, Subpart S, Table S-1
MgO	mt MgO/mt lime	0.39	IPCC 2006 (Dolomitic)
EF-lime (sold)	mt CO_2/ton lime	0.780	40 Part Part 98, Subpart S, Eqn. S-1
EF-LKD (sold)	mt CO_2/ton LKD	0.118	Assumed 30% CaO.MgO
EF-waste (unsold)	mt CO_2/ton waste		
Lime Produced (2 Kilns)	tpy	274,626	
LKD Produced (2 Kilns)	tpy	8,239	Asuumed 3% of lime
Waste (2 Kilns)	tpy		Assumed negligible
CO_2 Emissions	**m tpy**	**215,149.6**	
	tpy	**237,202.4**	

B. Natural Gas Combustion

Parameter	Units	Value	Reference
Natural gas HHV	MMBtu/scf	1.026E-03	Proposed revision to 40 CFR Part 98
CO_2 EF	kg CO_2/MMBtu	53.06	Proposed revision to 40 CFR Part 98
CH_4 EF	kg methane/MMBtu	0.001	40 CFR 98, Subpart C, Table C-2
N_2O EF	kg N_2O/MMBtu	0.0001	40 CFR 98, Subpart C, Table C-2
Natural gas consumed	scf /hr	113,184.00	
(2 kilns)	scf/yr	991,491,840	
CO_2 Emissions	**m tpy**	**53,976.4**	
	tpy	**59,509.0**	
Methane Emissions	**m tpy**	**1.017**	
	tpy	**1.122**	
N_2O Emissions	**m tpy**	**0.1017**	
	tpy	**0.1122**	

C. GHG Emissions (measured as CO_2e)

GHG	Lime Production (tpy)	Natural Gas Combustion (tpy)	GWP	CO_2e from Lime Production (tpy)	CO_2e from Natural Gas Combustion (tpy)	Total CO_2e (tpy)
CO_2	237,202.4	59,509.0	1.0	237,202.4	59,509.0	296,711.4
Methane	0.0	1.12	25.0	0.0	28.0	28.0
N_2O	0.0	0.112	298.0	0.0	33.4	33.4
Totals	237,202.4	59,510.2	N/A	237,202.4	59,570.4	296,772.8

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table DL-4. Lime Kiln GHG Emissions Estimates: Coal Fuel

A. Lime Production

Parameter	Units	Value	Reference
SR_{CaO}	mt CO_2/mt CaO	0.7848	40 CFR 98, Subpart S, Table S-1
CaO	mt CaO/mt lime	0.56	IPCC 2006 (Dolomitic)
SR_{MgO}	mt CO_2/mt MgO	1.0918	40 CFR 98, Subpart S, Table S-1
MgO	mt MgO/mt lime	0.39	IPCC 2006 (Dolomitic)
EF-lime (sold)	mt CO_2/ton lime	0.780	40 Part 98, Subpart S, Eqn. S-1
EF-LKD (sold)	mt CO_2/ton LKD	0.118	Assumed 30% CaO.MgO
EF-waste (unsold)	mt CO_2/ton waste		
Lime Produced (2 Kilns)	tpy	274,626	
LKD Produced (2 Kilns)	tpy	8,239	Asuumed 3% of lime
Waste (2 Kilns)	tpy		Assumed negligible
CO_2 Emissions	**m tpy**	**215,149.6**	
	tpy	**237,202.4**	

B. Coal Combustion

Parameter	Units	Value	Reference	
Coal HHV	MMBtu/ton	24.93	40 CFR 98, Subpart C, Table C-1	(Bituminous)
CO_2 EF	kg CO_2/MMBtu	93.28	Proposed revision to 40 CFR Part 98	(Bituminous)
CH_4 EF	kg methane/MMBtu	0.011	40 CFR 98, Subpart C, Table C-2	
N_2O EF	kg N_2O/MMBtu	0.0016	40 CFR 98, Subpart C, Table C-2	
Coal Consumed (2 kilns)	ton/hr	4.56		
	tpy	39,946		
CO_2 Emissions	**m tpy**	**92,892.3**		
	tpy	**102,413.8**		
Methane Emissions	**m tpy**	**10.954**		
	tpy	**12.077**		
N_2O Emissions	**m tpy**	**1.5934**		
	tpy	**1.7567**		

C. GHG Emissions (measured as CO_2e)

GHG	Lime Production (tpy)	Coal Combustion (tpy)	GWP	CO_2e from Lime Production (tpy)	CO_2e from Coal Combustion (tpy)	Total CO_2e (tpy)
CO_2	237,202.4	102,413.8	1.0	237,202.4	102,413.8	339,616.2
Methane	0.0	12.1	25.0	0.0	301.9	301.9
N_2O	0.0	1.8	298.0	0.0	523.5	523.5
Totals	237,202.4	102,427.6	N/A	237,202.4	103,239.2	340,441.6

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table DL-5. Lime Kiln GHG Emissions Estimates: Lignite Fuel

A. Lime Production

Parameter	Units	Value	Reference
SR_{CaO}	mt CO_2/mt CaO	0.7848	40 CFR 98, Subpart S, Table S-1
CaO	mt CaO/mt lime	0.56	IPCC 2006 (Dolomitic)
SR_{MgO}	mt CO_2/mt MgO	1.0918	40 CFR 98, Subpart S, Table S-1
MgO	mt MgO/mt lime	0.39	IPCC 2006 (Dolomitic)
EF-lime (sold)	mt CO_2/ton lime	0.780	40 Part Part 98, Subpart S, Eqn. S-1
EF-LKD (sold)	mt CO_2/ton LKD	0.118	Assumed 30% CaO.MgO
EF-waste (unsold)	mt CO_2/ton waste		
Lime Produced (2 Kilns)	tpy	274,626	
LKD Produced (2 Kilns)	tpy	8,239	Asuumed 3% of lime
Waste (2 Kilns)	tpy		Assumed negligible
CO_2 Emissions	**m tpy**	**215,149.6**	
	tpy	**237,202.4**	

B. Lignite Combustion

Parameter	Units	Value	Reference
Lignite HHV	MMBtu/ton	14.21	40 CFR 98, Subpart C, Table C-1
CO_2 EF	kg CO_2/MMBtu	97.72	Proposed revision to 40 CFR Part 98
CH_4 EF	kg methane/MMBtu	0.011	40 CFR 98, Subpart C, Table C-2
N_2O EF	kg N_2O/MMBtu	0.0016	40 CFR 98, Subpart C, Table C-2
Lignite Consumed (2 kilns)	ton/hr	8.16	
	tpy	71,482	
CO_2 Emissions	**m tpy**	**99,259.4**	
	tpy	**109,433.5**	
Methane Emissions	**m tpy**	**11.173**	
	tpy	**12.319**	
N_2O Emissions	**m tpy**	**1.6252**	
	tpy	**1.7918**	

C. GHG Emissions (measured as CO_2e)

GHG	Lime Production (tpy)	Lignite Combustion (tpy)	GWP	CO_2e from Lime Production (tpy)	CO_2e from Lignite Combustion (tpy)	Total CO_2e (tpy)
CO_2	237,202.4	109,433.5	1.0	237,202.4	109,433.5	346,636.0
Methane	0.0	12.3	25.0	0.0	308.0	308.0
N_2O	0.0	1.8	298.0	0.0	534.0	534.0
Totals	237,202.4	109,447.6	N/A	237,202.4	110,275.4	347,477.9

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table DL-6. Lime Kiln GHG Emissions Estimates: Petroleum Coke Fuel

A. Lime Production

Parameter	Units	Value	Reference
SR_{CaO}	mt CO_2/mt CaO	0.7848	40 CFR 98, Subpart S, Table S-1
CaO	mt CaO/mt lime	0.56	IPCC 2006 (Dolomitic)
SR_{MgO}	mt CO_2/mt MgO	1.0918	40 CFR 98, Subpart S, Table S-1
MgO	mt MgO/mt lime	0.39	IPCC 2006 (Dolomitic)
EF-lime (sold)	mt CO_2/ton lime	0.780	40 Part Part 98, Subpart S, Eqn. S-1
EF-LKD (sold)	mt CO_2/ton LKD	0.118	Assumed 30% CaO.MgO
EF-waste (unsold)	mt CO_2/ton waste		
Lime Produced (2 Kilns)	tpy	274,626	
LKD Produced (2 Kilns)	tpy	8,239	Asuumed 3% of lime
Waste (2 Kilns)	tpy		Assumed negligible
CO_2 Emissions	**m tpy**	**215,149.6**	
	tpy	**237,202.4**	

B. Coke Combustion

Parameter	Units	Value	Reference
Coke HHV	MMBtu/ton	24.80	Proposed revision to 40 CFR Part 98
CO_2 EF	kg CO_2/MMBtu	102.41	Proposed revision to 40 CFR Part 98
CH_4 EF	kg methane/MMBtu	0.011	40 CFR 98, Subpart C, Table C-2
N_2O EF	kg N_2O/MMBtu	0.0016	40 CFR 98, Subpart C, Table C-2
Coke Consumed (2 kilns)	ton/hr	4.31	
	tpy	37,741	
CO_2 Emissions	**m tpy**	**95,853.4**	
	tpy	**105,678.4**	
Methane Emissions	**m tpy**	**10.296**	
	tpy	**11.351**	
N_2O Emissions	**m tpy**	**1.4976**	
	tpy	**1.6511**	

C. GHG Emissions (measured as CO_2e)

GHG	Lime Production (tpy)	Coke Combustion (tpy)	GWP	CO_2e from Lime Production (tpy)	CO_2e from Coke Combustion (tpy)	Total CO_2e (tpy)
CO_2	237,202.4	105,678.4	1.0	237,202.4	105,678.4	342,880.8
Methane	0.0	11.4	25.0	0.0	283.8	283.8
N_2O	0.0	1.7	298.0	0.0	492.0	492.0
Totals	237,202.4	105,691.4	N/A	237,202.4	106,454.1	343,656.6

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table DL-7. Lime Kiln GHG Emissions Estimates: Wood Chips

A. Lime Production

Parameter	Units	Value	Reference
SR_{CaO}	mt CO_2/mt CaO	0.7848	40 CFR 98, Subpart S, Table S-1
CaO	mt CaO/mt lime	0.56	IPCC 2006 (Dolomitic)
SR_{MgO}	mt CO_2/mt MgO	1.0918	40 CFR 98, Subpart S, Table S-1
MgO	mt MgO/mt lime	0.39	IPCC 2006 (Dolomitic)
EF-lime (sold)	mt CO_2/ton lime	0.780	40 Part Part 98, Subpart S, Eqn. S-1
EF-LKD (sold)	mt CO_2/ton LKD	0.118	Assumed 30% CaO.MgO
EF-waste (unsold)	mt CO_2/ton waste		
Lime Produced (2 Kilns)	tpy	274,626	
LKD Produced (2 Kilns)	tpy	8,239	Asuumed 3% of lime
Waste (2 Kilns)	tpy		Assumed negligible
CO_2 Emissions	**m tpy**	**215,149.6**	
	tpy	**237,202.4**	

B. Wood Combustion

Parameter	Units	Value	Reference
Wood HHV	MMBtu/ton	17.48	Proposed revision to 40 CFR Part 98
CO_2 EF	kg CO_2/MMBtu	93.80	40 CFR 98, Subpart C, Table C-1
CH_4 EF	kg methane/MMBtu	0.0072	40 CFR 98, Subpart C, Table C-2
N_2O EF	kg N_2O/MMBtu	0.0036	40 CFR 98, Subpart C, Table C-2
Wood Consumed (2 kilns)	ton/hr	6.11	
	tpy	53,566	
CO_2 Emissions	**m tpy**	**87,828.6**	
	tpy	**96,831.0**	
Methane Emissions	**m tpy**	**6.742**	
	tpy	**7.433**	
N_2O Emissions	**m tpy**	**3.3708**	
	tpy	**3.7163**	

C. GHG Emissions (measured as CO_2e)

GHG	Lime Production (tpy)	Wood Combustion (tpy)	GWP	CO_2e from Lime Production (tpy)	CO_2e from Wood Combustion (tpy)	Total CO_2e (tpy)
CO_2	237,202.4	96,831.0	1.0	237,202.4	96,831.0	334,033.4
Methane	0.0	7.4	25.0	0.0	185.8	185.8
N_2O	0.0	3.7	298.0	0.0	1,107.5	1,107.5
Totals	237,202.4	96,842.2	N/A	237,202.4	98,124.3	335,326.7

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table DL-8. GHG Emissions Summary (Dolomitic Limestone Option)

Potential GHG Emissions (expressed as carbon dioxide equivalent [CO_2e])

Emissions Source	Fuel Option	CO_2e Emissions from Lime Production	GHG Emissions from Associated Combustion			Total CO_2e Emissions	CO_2e Emission Factor		
			CO_2 Emissions*	CH_4 - CO_2e Emissions*	N_2O - CO_2e Emissions*		Lime Production	Combustion	Total
		(short tpy)	(short tpy)	(short tpy)	(short tpy)	(short tpy)	(ton per ton of lime produced)		
(2) Lime Kilns	Natural Gas	237,202	59,509.0	28.0	33.4	**296,772.8**	**0.8637**	**0.2169**	**1.08**
	Coal	237,202	102,413.8	301.9	523.5	**340,441.6**	**0.8637**	**0.3759**	**1.24**
	Lignite	237,202	109,433.5	308.0	534.0	**347,477.9**	**0.8637**	**0.4015**	**1.27**
	Pet Coke	237,202	105,678.4	283.8	492.0	**343,656.6**	**0.8637**	**0.3876**	**1.25**
	Wood	237,202	96,831.0	185.8	1,107.5	**335,326.7**	**0.8637**	**0.3573**	**1.22**
Fuel Dryer	Natural Gas	30,660	1,794	0.8	1.0	**1,795**	**N/A**	**N/A**	**N/A**
Facility-wide						**349,273**			**1.27**

Note:
Emissions from Lime Kilns are based on Mandatory Reporting of Greenhouse Gases Rule, 40 CFR Part 98, Subpart S.
Emissions from Other Combustion Sources are based on Mandatory Reporting of Greenhouse Gases, 40 CFR Part 98, Subpart C.
*Based on global warming potential of 1 for CO_2, 25 for methane, and 298 for N_2O.

Sources: Jacksonville Lime.
ECT, 2014.

APPENDIX D

FDEP APPLICATION FOR AIR PERMIT – LONG FORM

Department of
Environmental Protection

Division of Air Resource Management

APPLICATION FOR AIR PERMIT - LONG FORM

I. APPLICATION INFORMATION

Air Construction Permit – Use this form to apply for an air construction permit:

- For any required purpose at a facility operating under a federally enforceable state air operation permit (FESOP) or Title V air operation permit;
- For a proposed project subject to prevention of significant deterioration (PSD) review, nonattainment new source review, or maximum achievable control technology (MACT);
- To assume a restriction on the potential emissions of one or more pollutants to escape a requirement such as PSD review, nonattainment new source review, MACT, or Title V; or
- To establish, revise, or renew a plantwide applicability limit (PAL).

Air Operation Permit – Use this form to apply for:

- An initial federally enforceable state air operation permit (FESOP); or
- An initial, revised, or renewal Title V air operation permit.

To ensure accuracy, please see form instructions.

Identification of Facility

1. Facility Owner/Company Name: **Jacksonville Lime, LLC**	
2. Site Name: **Jacksonville Lime, LLC**	
3. Facility Identification Number: **0310583**	
4. Facility Location... Street Address or Other Locator: **1915 Wigmore Street** City: **Jacksonville** County: **Duval** Zip Code: **32206**	
5. Relocatable Facility? ☐ Yes ☒ No	6. Existing Title V Permitted Facility? ☐ Yes ☒ No

Application Contact

1. Application Contact Name: **William Harris/Jackie Padgett**
2. Application Contact Mailing Address... Organization/Firm: **Jacksonville Lime, LLC** Street Address: **1915 Wigmore Street** City: **Jacksonville** State: **Florida** Zip Code: **32206**
3. Application Contact Telephone Numbers... Telephone: (**404**) **626 – 2990** ext. (**205**) **664 – 7129**
4. Application Contact E-mail Address: **Jackie.padgett@carmeusena.com**

Application Processing Information (DEP Use)

1. Date of Receipt of Application:	3. PSD Number (if applicable):
2. Project Number(s):	4. Siting Number (if applicable):

APPLICATION INFORMATION

Purpose of Application

This application for air permit is being submitted to obtain: (Check one)

Air Construction Permit

- [x] Air construction permit.
- [ ] Air construction permit to establish, revise, or renew a plantwide applicability limit (PAL).
- [ ] Air construction permit to establish, revise, or renew a plantwide applicability limit (PAL), and separate air construction permit to authorize construction or modification of one or more emissions units covered by the PAL.

Air Operation Permit

- [ ] Initial Title V air operation permit.
- [ ] Title V air operation permit revision.
- [ ] Title V air operation permit renewal.
- [ ] Initial federally enforceable state air operation permit (FESOP) where professional engineer (PE) certification is required.
- [ ] Initial federally enforceable state air operation permit (FESOP) where professional engineer (PE) certification is not required.

Air Construction Permit and Revised/Renewal Title V Air Operation Permit (Concurrent Processing)

- [ ] Air construction permit and Title V permit revision, incorporating the proposed project.
- [ ] Air construction permit and Title V permit renewal, incorporating the proposed project.

Note: By checking one of the above two boxes, you, the applicant, are requesting concurrent processing pursuant to Rule 62-213.405, F.A.C. In such case, you must also check the following box:

- [ ] I hereby request that the department waive the processing time requirements of the air construction permit to accommodate the processing time frames of the Title V air operation permit.

Application Comment

APPLICATION INFORMATION

Scope of Application

Emissions Unit ID Number	Description of Emissions Unit	Air Permit Type	Air Permit Processing Fee
KILN1	**Lime Kiln 1**	**AC1A**	**N/A**
KILN2	**Lime Kiln 2**	**AC1A**	**N/A**
FD-1	**Fuel Dryer**	**AC1A**	**N/A**

Application Processing Fee

Check one: ☒ Attached - Amount: $ 7,500 ☐ Not Applicable

Application processing fee of $7,500 is required pursuant to Rule 62-4.050(4)(a)1, Florida Administrative Code (F.A.C.).

APPLICATION INFORMATION

Owner/Authorized Representative Statement

Complete if applying for an air construction permit or an initial FESOP.

1.	Owner/Authorized Representative Name : **Nick Caggiano**
2.	Application Contact Mailing Address... Organization/Firm: **Jacksonville Lime, LLC** Street Address: **P.O. Box 37** City: **Saginaw** State: **Alabama** Zip Code: **35137-0037**
3.	Owner/Authorized Representative Telephone Numbers... Telephone: (**412**) **225 – 3148** ext. Fax: (**895**) **472 – 8110**
4.	Owner/Authorized Representative E-mail Address: **nick.caggiano@carmeusena.com**
5.	Owner/Authorized Representative Statement: *I, the undersigned, am the owner or authorized representative of the corporation, partnership, or other legal entity submitting this air permit application. To the best of my knowledge, the statements made in this application are true, accurate and complete, and any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. I understand that a permit, if granted by the department, cannot be transferred without authorization from the department.* ____________________ ________________ Signature Date

APPLICATION INFORMATION

Application Responsible Official Certification

Complete if applying for an initial, revised, or renewal Title V air operation permit or concurrent processing of an air construction permit and revised or renewal Title V air operation permit. If there are multiple responsible officials, the "application responsible official" need not be the "primary responsible official."

1. Application Responsible Official Name:
   Nick Caggiano

2. Application Responsible Official Qualification (Check one or more of the following options, as applicable):

   ☒ For a corporation, the president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit under Chapter 62-213, F.A.C.

   ☐ For a partnership or sole proprietorship, a general partner or the proprietor, respectively.

   ☐ For a municipality, county, state, federal, or other public agency, either a principal executive officer or ranking elected official.

   ☐ The designated representative at an Acid Rain source or CAIR source.

3. Application Responsible Official Mailing Address...
   Organization/Firm: **Jacksonville Lime, LLC**
   Street Address: **P.O. Box 37**
   City: **Saginaw** State: **Alabama** Zip Code: **35137-0037**

4. Application Responsible Official Telephone Numbers...
   Telephone: (**412**) **225** – **3148** ext. Fax: (**895**) **472** – **8110**

5. Application Responsible Official E-mail Address: **nick.caggiano@carmeusena.com**

6. Application Responsible Official Certification:

   I, the undersigned, am a responsible official of the Title V source addressed in this air permit application. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof and all other applicable requirements identified in this application to which the Title V source is subject. I understand that a permit, if granted by the department, cannot be transferred without authorization from the department, and I will promptly notify the department upon sale or legal transfer of the facility or any permitted emissions unit. Finally, I certify that the facility and each emissions unit are in compliance with all applicable requirements to which they are subject, except as identified in compliance plan(s) submitted with this application.

   ______________________________ ______________________
   Signature Date

APPLICATION INFORMATION

Professional Engineer Certification

1.	Professional Engineer Name: **Thomas W. Davis** Registration Number: **36777**
2.	Professional Engineer Mailing Address... Organization/Firm: **Environmental Consulting & Technology, Inc.** Street Address: **3701 Northwest 98th Street** City: **Gainesville** State: **Florida** Zip Code: **32606**
3.	Professional Engineer Telephone Numbers... Telephone: **(352) 332 – 0444** ext. Fax: **(352) 332 – 6722**
4.	Professional Engineer E-mail Address: **tdavis@ectinc.com**
5.	Professional Engineer Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this application for air permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

(3) If the purpose of this application is to obtain a Title V air operation permit (check here ☐, if so), I further certify that each emissions unit described in this application for air permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance plan and schedule is submitted with this application.

(4) If the purpose of this application is to obtain an air construction permit (check here ☒, if so) or concurrently process and obtain an air construction permit and a Title V air operation permit revision or renewal for one or more proposed new or modified emissions units (check here ☐, if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

(5) If the purpose of this application is to obtain an initial air operation permit or operation permit revision or renewal for one or more newly constructed or modified emissions units (check here , if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

[signature] Signature — 3/18/14 Date

(seal) STATE OF

* Attach any exception to certification statement.

II. FACILITY INFORMATION

A. GENERAL FACILITY INFORMATION

Facility Location and Type

1. Facility UTM Coordinates... Zone **17** East (km) **439.330** North (km) **3,359.622**		2. Facility Latitude/Longitude... Latitude (DD/MM/SS) **30° 22′ 01″** Longitude (DD/MM/SS) **81° 37′ 53″**	
3. Governmental Facility Code: **0**	4. Facility Status Code: **C**	5. Facility Major Group SIC Code: **32**	6. Facility SIC(s): **3274**
7. Facility Comment :			

Facility Contact

1. Facility Contact Name: **Jackie Padgett**
2. Facility Contact Mailing Address... Organization/Firm: **Jacksonville Lime, LLC** Street Address: **P.O. Box 37** City: **Saginaw** State: **Alabama** Zip Code: **35137-0037**
3. Facility Contact Telephone Numbers... Telephone: (**205**) **612 – 6770** ext. Fax: (**205**) **664 – 7138**
4. Facility Contact E-mail Address: **jackie.padgett@carmeusena.com**

Facility Primary Responsible Official

Complete if an "application responsible official" is identified in Section I that is not the facility "primary responsible official." Same as Section I

1. Facility Primary Responsible Official Name:
2. Facility Primary Responsible Official Mailing Address... Organization/Firm: Street Address: City: State: Zip Code:
3. Facility Primary Responsible Official Telephone Numbers... Telephone: ( ) - ext. Fax: ( ) -
4. Facility Primary Responsible Official E-mail Address:

FACILITY INFORMATION

Facility Regulatory Classifications

Check all that would apply following completion of all projects and implementation of all other changes proposed in this application for air permit. Refer to instructions to distinguish between a "major source" and a "synthetic minor source."

1. ☐ Small Business Stationary Source	☐ Unknown
2. ☐ Synthetic Non-Title V Source	
3. ☒ Title V Source	
4. ☒ Major Source of Air Pollutants, Other than Hazardous Air Pollutants (HAPs)	
5. ☐ Synthetic Minor Source of Air Pollutants, Other than HAPs	
6. ☒ Major Source of Hazardous Air Pollutants (HAPs)	
7. ☐ Synthetic Minor Source of HAPs	
8. ☒ One or More Emissions Units Subject to NSPS (40 CFR Part 60)	
9. ☐ One or More Emissions Units Subject to Emission Guidelines (40 CFR Part 60)	
10. ☒ One or More Emissions Units Subject to NESHAP (40 CFR Part 61 or Part 63)	
11. ☐ Title V Source Solely by EPA Designation (40 CFR 70.3(a)(5))	
12. Facility Regulatory Classifications Comment: **New Source Performance Standards (NSPS), Subpart OOO, Nonmetallic Mineral Processing Plants** **National Emissions Standards for Hazardous Air Pollutants (NESHAPs), Subpart AAAAA, Lime Manufacturing Plants**	

FACILITY INFORMATION

List of Pollutants Emitted by Facility

1. Pollutant Emitted	2. Pollutant Classification	3. Emissions Cap [Y or N]?
Greenhouse gas (GHG)	**A**	**N**

B. EMISSIONS CAPS

Facility-Wide or Multi-Unit Emissions Caps **Not applicable**

1. Pollutant Subject to Emissions Cap	2. Facility-Wide Cap [Y or N]? (all units)	3. Emissions Unit ID's Under Cap (if not all units)	4. Hourly Cap (lb/hr)	5. Annual Cap (ton/yr)	6. Basis for Emissions Cap

7. Facility-Wide or Multi-Unit Emissions Cap Comment:

C. FACILITY ADDITIONAL INFORMATION

Additional Requirements for All Applications, Except as Otherwise Stated

1. Facility Plot Plan: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought) ☒ Attached, Document ID: **Section 2.0** ☐ Previously Submitted, Date:__________
2. Process Flow Diagram(s): (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought) ☒ Attached, Document ID: **Section 2.0** ☐ Previously Submitted, Date:__________
3. Precautions to Prevent Emissions of Unconfined Particulate Matter: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought) ☐ Attached, Document ID:__________ ☐ Previously Submitted, Date:__________ ☒ Not Applicable

Additional Requirements for Air Construction Permit Applications

1. Area Map Showing Facility Location: ☒ Attached, Document ID: **Section 2.0** ☐ Not Applicable (existing permitted facility)
2. Description of Proposed Construction, Modification, or Plantwide Applicability Limit (PAL): ☒ Attached, Document ID: **Section 2.0**
3. Rule Applicability Analysis: ☒ Attached, Document ID: **Section 3.0**
4. List of Exempt Emissions Units: ☐ Attached, Document ID:__________ ☒ Not Applicable (no exempt units at facility)
5. Fugitive Emissions Identification: ☐ Attached, Document ID:__________ ☒ Not Applicable
6. Air Quality Analysis (Rule 62-212.400(7), F.A.C.): ☐ Attached, Document ID:__________ ☒ Not Applicable
7. Source Impact Analysis (Rule 62-212.400(5), F.A.C.): ☐ Attached, Document ID:__________ ☒ Not Applicable
8. Air Quality Impact since 1977 (Rule 62-212.400(4)(e), F.A.C.): ☐ Attached, Document ID:__________ ☒ Not Applicable
9. Additional Impact Analyses (Rules 62-212.400(8) and 62-212.500(4)(e), F.A.C.): ☐ Attached, Document ID:__________ ☒ Not Applicable
10. Alternative Analysis Requirement (Rule 62-212.500(4)(g), F.A.C.): ☐ Attached, Document ID:__________ ☒ Not Applicable

C. FACILITY ADDITIONAL INFORMATION (CONTINUED)

Additional Requirements for FESOP Applications **Not applicable**

1. List of Exempt Emissions Units: ☐ Attached, Document ID:__________ ☐ Not Applicable (no exempt units at facility)	

Additional Requirements for Title V Air Operation Permit Applications **Not applicable**

1.	List of Insignificant Activities: (Required for initial/renewal applications only) ☐ Attached, Document ID:__________ ☐ Not Applicable (revision application)
2.	Identification of Applicable Requirements: (Required for initial/renewal applications, and for revision applications if this information would be changed as a result of the revision being sought) ☐ Attached, Document ID:__________ ☐ Not Applicable (revision application with no change in applicable requirements)
3.	Compliance Report and Plan: (Required for all initial/revision/renewal applications) ☐ Attached, Document ID:__________ Note: A compliance plan must be submitted for each emissions unit that is not in compliance with all applicable requirements at the time of application and/or at any time during application processing. The department must be notified of any changes in compliance status during application processing.
4.	List of Equipment/Activities Regulated under Title VI: (If applicable, required for initial/renewal applications only) ☐ Attached, Document ID:__________ ☐ Equipment/Activities Onsite but Not Required to be Individually Listed ☐ Not Applicable
5.	Verification of Risk Management Plan Submission to EPA: (If applicable, required for initial/renewal applications only) ☐ Attached, Document ID:__________ ☐ Not Applicable
6.	Requested Changes to Current Title V Air Operation Permit: ☐ Attached, Document ID:__________ ☐ Not Applicable

C. FACILITY ADDITIONAL INFORMATION (CONTINUED)

Additional Requirements for Facilities Subject to Acid Rain or CAIR Program

1.	Acid Rain Program Forms: Acid Rain Part Application (DEP Form No. 62-210.900(1)(a)): ☐ Attached, Document ID:__________ ☐ Previously Submitted, Date:__________ ☒ Not Applicable (not an Acid Rain source) Phase II NO_X Averaging Plan (DEP Form No. 62-210.900(1)(a)1.): ☐ Attached, Document ID:__________ ☐ Previously Submitted, Date:__________ ☒ Not Applicable New Unit Exemption (DEP Form No. 62-210.900(1)(a)2.): ☐ Attached, Document ID:__________ ☐ Previously Submitted, Date:__________ ☒ Not Applicable
2.	CAIR Part (DEP Form No. 62-210.900(1)(b)): ☐ Attached, Document ID:__________ ☐ Previously Submitted, Date:__________ ☒ Not Applicable (not a CAIR source)

Additional Requirements Comment

III. EMISSIONS UNIT INFORMATION

A. GENERAL EMISSIONS UNIT INFORMATION

Title V Air Operation Permit Emissions Unit Classification

1. Regulated or Unregulated Emissions Unit? (Check one, if applying for an initial, revised or renewal Title V air operation permit. Skip this item if applying for an air construction permit or FESOP only.)
   - ☐ The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.
   - ☐ The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in this Section: (Check one)
   - ☐ This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).
   - ☒ This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.
   - ☐ This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Description of Emissions Unit Addressed in this Section:
   Two identical parallel flow regenerative lime kilns. The information presented in the following sections is for each unit.

3. Emissions Unit Identification Number:

4. Emissions Unit Status Code:	5. Commence Construction Date:	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code:
C	**NA**	**NA**	**32**

8. Federal Program Applicability: (Check all that apply)
   - ☐ Acid Rain Unit
   - ☐ CAIR Unit

9. Package Unit:
   Manufacturer: Model Number:

10. Generator Nameplate Rating: MW

11. Emissions Unit Comment:

Emissions Unit Control Equipment/Method: Control __ of __

1. Control Equipment/Method Description:
2. Control Device or Method Code:

Emissions Unit Control Equipment/Method: Control __ of __

1. Control Equipment/Method Description:
2. Control Device or Method Code:

Emissions Unit Control Equipment/Method: Control __ of __

1. Control Equipment/Method Description:
2. Control Device or Method Code:

Emissions Unit Control Equipment/Method: Control __ of __

1. Control Equipment/Method Description:
2. Control Device or Method Code:

B. EMISSIONS UNIT CAPACITY INFORMATION
(Optional for unregulated emissions units.)

Emissions Unit Operating Capacity and Schedule

1.	Maximum Process or Throughput Rate: **792 tons per day (tpd) of stone feed (maximum)**
2.	Maximum Production Rate: **396 tpd of lime produced (maximum)**
3.	Maximum Heat Input Rate: **52.48** million Btu/hr **(based on petcoke)**
4.	Maximum Incineration Rate: pounds/hr tons/day
5.	Requested Maximum Operating Schedule: **24** hours/day **7** days/week **52** weeks/year **8,760** hours/year
6.	Operating Capacity/Schedule Comment:

C. EMISSION POINT (STACK/VENT) INFORMATION
(Optional for unregulated emissions units.)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram: **BM-19**		2. Emission Point Type Code: **1**
3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking: **Exhaust stack exit baghouses serving lime kilns.**		
4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common: **KILN1 (Emissions Unit [EU] BM-19) and KILN2 (EU BM-19)**		
5. Discharge Type Code: **V**	6. Stack Height: **213.2** feet	7. Exit Diameter: **4.78** feet
8. Exit Temperature: **294**°F	9. Actual Volumetric Flow Rate: **70,612** acfm	10. Water Vapor: **10**%
11. Maximum Dry Standard Flow Rate: **49,448** dscfm		12. Nonstack Emission Point Height: feet
13. Emission Point UTM Coordinates... Zone: East (km): North (km):		14. Emission Point Latitude/Longitude… Latitude (DD/MM/SS) Longitude (DD/MM/SS)
15. Emission Point Comment: **KILN1 and KILN2 Universal Transverse Mercator (UTM) 439.33919 km east, 3,359.61308 km north, Zone 17**		

D. SEGMENT (PROCESS/FUEL) INFORMATION

Segment Description and Rate: Segment 1 of 6

1. Segment Description (Process/Fuel Type): **Limestone (worst-case dolomitic lime at 54-percent calcium carbonate [$CaCO_3$] and 46-percent magnesium carbonate [$MgCO_3$])**		
2. Source Classification Code (SCC): **30501603**	3. SCC Units: **tons**	
4. Maximum Hourly Rate: **33 tons per hour (tph)**	5. Maximum Annual Rate: **289,080 tons per year (tpy)**	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur: **N/A**	8. Maximum % Ash: **N/A**	9. Million Btu per SCC Unit: **N/A**
10. Segment Comment:		

Segment Description and Rate: Segment 2 of 6

1. Segment Description (Process/Fuel Type): **Lignite**		
2. Source Classification Code (SCC): **30501603**	3. SCC Units: **tons**	
4. Maximum Hourly Rate: **4.1 tph**	5. Maximum Annual Rate: **35,916 tpy**	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit: **14.21**
10. Segment Comment:		

D. SEGMENT (PROCESS/FUEL) INFORMATION

Segment Description and Rate: Segment 3 of 6

1. Segment Description (Process/Fuel Type): **Coal**		
2. Source Classification Code (SCC): **30501603**	3. SCC Units: **tons**	
4. Maximum Hourly Rate: **2.3 tph**	5. Maximum Annual Rate: **20,148 tpy**	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit: **24.93 (bituminous)**
10. Segment Comment:		

Segment Description and Rate: Segment 4 of 6

1. Segment Description (Process/Fuel Type): **Coke**		
2. Source Classification Code (SCC): **30501603**	3. SCC Units: **tons**	
4. Maximum Hourly Rate: **2.2 tph**	5. Maximum Annual Rate: **19,272 tpy**	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur: **5.2**	8. Maximum % Ash:	9. Million Btu per SCC Unit: **24.80**
10. Segment Comment:		

D. SEGMENT (PROCESS/FUEL) INFORMATION

Segment Description and Rate: Segment 5 of 6

1. Segment Description (Process/Fuel Type): **Natural gas**		
2. Source Classification Code (SCC): **30501603**	3. SCC Units: **Million cubic feet (MMcf)**	
4. Maximum Hourly Rate: **56,592 cubic feet per hour**	5. Maximum Annual Rate: **495.7 MMcf per year**	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit: **1,020**
10. Segment Comment:		

Segment Description and Rate: Segment 6 of 6

1. Segment Description (Process/Fuel Type): **Wood chips**		
2. Source Classification Code (SCC): **3-99-999-99**	3. SCC Units: **Tons**	
4. Maximum Hourly Rate: **3.1 tph**	5. Maximum Annual Rate: **27,156 tpy**	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit: **17.48**
10. Segment Comment:		

E. EMISSIONS UNIT POLLUTANTS

List of Pollutants Emitted by Emissions Unit

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
GHG			**EL**

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions

1. Pollutant Emitted: **GHG (measured as CO_2e)**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **39,666** lb/hour **173,739** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: Reference: **40 CFR 98, Subparts C and S**	7. Emissions Method Code: **5**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years
10. Calculation of Emissions: **Based on dolomite limestone and lignite. See Appendix C for GHG emissions calculations.**	
11. Potential, Fugitive, and Actual Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: **RULE**	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units: **1.3 ton CO_2e/ton lime (12-month rolling average)**	4. Equivalent Allowable Emissions: **39,600** lb/hour **173,739** tons/year
5. Method of Compliance: **Production and fuel monitoring and recordkeeping.**	
6. Allowable Emissions Comment (Description of Operating Method): **Proposed BACT, Rule 62-212.400(10)(b), F.A.C.**	

Allowable Emissions Allowable Emissions __ of ___

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions __ of ___

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

G. VISIBLE EMISSIONS INFORMATION

Complete Subsection G if this emissions unit is or would be subject to a unit-specific visible emissions limitation.

Visible Emissions Limitation: Visible Emissions Limitation __ of ____ **Not applicable**

1. Visible Emissions Subtype:	2. Basis for Allowable Opacity: ☐ Rule ☐ Other
3. Allowable Opacity: Normal Conditions: % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour	
4. Method of Compliance:	
5. Visible Emissions Comment:	

Visible Emissions Limitation: Visible Emissions Limitation __ of ____

1. Visible Emissions Subtype:	2. Basis for Allowable Opacity: ☐ Rule ☐ Other
3. Allowable Opacity: Normal Conditions: % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour	
4. Method of Compliance:	
5. Visible Emissions Comment:	

H. CONTINUOUS MONITOR INFORMATION

Complete Subsection H if this emissions unit is or would be subject to continuous monitoring.

Continuous Monitoring System: Continuous Monitor ___ of ___ **Not applicable**

1. Parameter Code:	2. Pollutant(s):
3. CMS Requirement:	☐ Rule ☐ Other
4. Monitor Information... Manufacturer: Model Number:	Serial Number:
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment:	

Continuous Monitoring System: Continuous Monitor ___ of ___

1. Parameter Code:	2. Pollutant(s):
3. CMS Requirement:	☐ Rule ☐ Other
4. Monitor Information... Manufacturer: Model Number:	Serial Number:
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment:	

I. EMISSIONS UNIT ADDITIONAL INFORMATION

Additional Requirements for All Applications, Except as Otherwise Stated

1. Process Flow Diagram: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☒ Attached, Document ID: **Section 2.0** ☐ Previously Submitted, Date ___________
2. Fuel Analysis or Specification: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☒ Attached, Document ID: **Section 2.0** ☐ Previously Submitted, Date ___________
3. Detailed Description of Control Equipment: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☐ Attached, Document ID: __________ ☐ Previously Submitted, Date ___________
   ☒ Not Applicable
4. Procedures for Startup and Shutdown: (Required for all operation permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☐ Attached, Document ID: __________ ☐ Previously Submitted, Date ___________
   ☒ Not Applicable (construction application)
5. Operation and Maintenance Plan: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☐ Attached, Document ID: __________ ☐ Previously Submitted, Date ___________
   ☒ Not Applicable
6. Compliance Demonstration Reports/Records:
   ☐ Attached, Document ID: __________
   Test Date(s)/Pollutant(s) Tested: ____
   ☐ Previously Submitted, Date: _______
   Test Date(s)/Pollutant(s) Tested: ____
   ☐ To be Submitted, Date (if known):___________
   Test Date(s)/Pollutant(s) Tested: ____
   ☒ Not Applicable
   Note: For FESOP applications, all required compliance demonstration records/reports must be submitted at the time of application. For Title V air operation permit applications, all required compliance demonstration reports/records must be submitted at the time of application, or a compliance plan must be submitted at the time of application.
7. Other Information Required by Rule or Statute:
   ☐ Attached, Document ID: __________ ☒ Not Applicable

I. EMISSIONS UNIT ADDITIONAL INFORMATION (CONTINUED)

Additional Requirements for Air Construction Permit Applications

1. Control Technology Review and Analysis (Rules 62-212.400(10) and 62-212.500(7), F.A.C.; 40 CFR 63.43(d) and (e)): ☒ Attached, Document ID: **Section 4.0** ☐ Not Applicable	
2. Good Engineering Practice Stack Height Analysis (Rules 62-212.400(4)(d) and 62-212.500(4)(f), F.A.C.): ☐ Attached, Document ID: ___________ ☒ Not Applicable	
3. Description of Stack Sampling Facilities: (Required for proposed new stack sampling facilities only) ☐ Attached, Document ID: ___________ ☒ Not Applicable	

Additional Requirements for Title V Air Operation Permit Applications

1. Identification of Applicable Requirements: ☐ Attached, Document ID: ___________ ☒ Not Applicable	
2. Compliance Assurance Monitoring: ☐ Attached, Document ID: __________ ☒ Not Applicable	
3. Alternative Methods of Operation: ☐ Attached, Document ID: __________ ☒ Not Applicable	
4. Alternative Modes of Operation (Emissions Trading): ☐ Attached, Document ID: __________ ☒ Not Applicable	

Additional Requirements Comment

Kiln 1 (EU 1 of 3) and Kiln 2 (EU 2 of 3) are identical; therefore, Sections 1 and 2 of the application are the same except for the identification IDs.

III. EMISSIONS UNIT INFORMATION

A. GENERAL EMISSIONS UNIT INFORMATION

Title V Air Operation Permit Emissions Unit Classification

1. Regulated or Unregulated Emissions Unit? (Check one, if applying for an initial, revised or renewal Title V air operation permit. Skip this item if applying for an air construction permit or FESOP only.)
   - ☐ The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.
   - ☐ The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in this Section: (Check one)
   - ☒ This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).
   - ☐ This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.
   - ☐ This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.
2. Description of Emissions Unit Addressed in this Section:
   Coke processing with fuel dryer
3. Emissions Unit Identification Number:

4. Emissions Unit Status Code:	5. Commence Construction Date:	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code:
C	**N/A**	**N/A**	**32**

8. Federal Program Applicability: (Check all that apply)
   - ☐ Acid Rain Unit
   - ☐ CAIR Unit
9. Package Unit:
   Manufacturer: Model Number:
10. Generator Nameplate Rating: MW
11. Emissions Unit Comment:

Emissions Unit Control Equipment/Method: Control __ of __ **Not applicable**

1. Control Equipment/Method Description:
2. Control Device or Method Code:

Emissions Unit Control Equipment/Method: Control __ of __

1. Control Equipment/Method Description:
2. Control Device or Method Code:

Emissions Unit Control Equipment/Method: Control __ of __

1. Control Equipment/Method Description:
2. Control Device or Method Code:

Emissions Unit Control Equipment/Method: Control __ of __

1. Control Equipment/Method Description:
2. Control Device or Method Code:

B. EMISSIONS UNIT CAPACITY INFORMATION
(Optional for unregulated emissions units.)

Emissions Unit Operating Capacity and Schedule

1. Maximum Process or Throughput Rate:		
2. Maximum Production Rate:		
3. Maximum Heat Input Rate: **3.5** million Btu/hr		
4. Maximum Incineration Rate: pounds/hr tons/day		
5. Requested Maximum Operating Schedule:	**24** hours/day **52** weeks/year	**7** days/week **8,760** hours/year
6. Operating Capacity/Schedule Comment:		

C. EMISSION POINT (STACK/VENT) INFORMATION
(Optional for unregulated emissions units.)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram: **BM-30**		2. Emission Point Type Code: **1**
3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking:		
4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common:		
5. Discharge Type Code: **V**	6. Stack Height: **57.0** feet	7. Exit Diameter: **2.0** feet
8. Exit Temperature: **TBD** °F	9. Actual Volumetric Flow Rate: **11,000** acfm	10. Water Vapor: %
11. Maximum Dry Standard Flow Rate: dscfm		12. Nonstack Emission Point Height: feet
13. Emission Point UTM Coordinates... Zone: **17** East (km): **439.348** North (km): **3,359.649**		14. Emission Point Latitude/Longitude… Latitude (DD/MM/SS) Longitude (DD/MM/SS)
15. Emission Point Comment:		

D. SEGMENT (PROCESS/FUEL) INFORMATION

Segment Description and Rate: Segment 1 of 1

1. Segment Description (Process/Fuel Type): **Natural gas**		
2. Source Classification Code (SCC): **10200603**	3. SCC Units: **MMcf**	
4. Maximum Hourly Rate: **0.0034**	5. Maximum Annual Rate: **29.8**	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur: **N/A**	8. Maximum % Ash: **N/A**	9. Million Btu per SCC Unit: **1,028**
10. Segment Comment:		

Segment Description and Rate: Segment __ of

1. Segment Description (Process/Fuel Type):		
2. Source Classification Code (SCC):	3. SCC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment:		

E. EMISSIONS UNIT POLLUTANTS

List of Pollutants Emitted by Emissions Unit

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
GHG			**EL**

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

<u>Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions</u>

1. Pollutant Emitted: **GHG (measured as CO_2e)**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **409.4** lb/hour **1,795** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: **See Appendix C for emissions factors used.** Reference: **40 CFR 98, Subpart C**	7. Emissions Method Code: **5**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years
10. Calculation of Emissions: **See Appendix C for GHG emissions calculations.**	
11. Potential, Fugitive, and Actual Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: **RULE**	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: **409.4** lb/hour **1,795** tons/year
5. Method of Compliance: **Efficient use of natural gas and efficient combustion**	
6. Allowable Emissions Comment (Description of Operating Method): **Proposed BACT, Rule 62-212.400(10)(b), F.A.C.**	

Allowable Emissions Allowable Emissions __ of ___

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions __ of ___

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

G. VISIBLE EMISSIONS INFORMATION

Complete Subsection G if this emissions unit is or would be subject to a unit-specific visible emissions limitation.

Visible Emissions Limitation: Visible Emissions Limitation __ of ____ **Not applicable**

1. Visible Emissions Subtype:	2. Basis for Allowable Opacity: ☐ Rule ☐ Other
3. Allowable Opacity: Normal Conditions: % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour	
4. Method of Compliance:	
5. Visible Emissions Comment:	

Visible Emissions Limitation: Visible Emissions Limitation __ of ____

1. Visible Emissions Subtype:	2. Basis for Allowable Opacity: ☐ Rule ☐ Other
3. Allowable Opacity: Normal Conditions: % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour	
4. Method of Compliance:	
5. Visible Emissions Comment:	

H. CONTINUOUS MONITOR INFORMATION

Complete Subsection H if this emissions unit is or would be subject to continuous monitoring.

Continuous Monitoring System: Continuous Monitor ___ of ___ **Not applicable**

1. Parameter Code:	2. Pollutant(s):
3. CMS Requirement:	☐ Rule ☐ Other
4. Monitor Information... Manufacturer: Model Number:	Serial Number:
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment:	

Continuous Monitoring System: Continuous Monitor ___ of ___

1. Parameter Code:	2. Pollutant(s):
3. CMS Requirement:	☐ Rule ☐ Other
4. Monitor Information... Manufacturer: Model Number:	Serial Number:
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment:	

I. EMISSIONS UNIT ADDITIONAL INFORMATION

Additional Requirements for All Applications, Except as Otherwise Stated

1. Process Flow Diagram: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☒ Attached, Document ID: **Appendix E** ☐ Previously Submitted, Date ________________
2. Fuel Analysis or Specification: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☐ Attached, Document ID: ____________ ☐ Previously Submitted, Date _____________
   ☒ Not Applicable
3. Detailed Description of Control Equipment: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☐ Attached, Document ID: ____________ ☐ Previously Submitted, Date _____________
   ☒ Not Applicable
4. Procedures for Startup and Shutdown: (Required for all operation permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☐ Attached, Document ID: ____________ ☐ Previously Submitted, Date _____________
   ☒ Not Applicable (construction application)
5. Operation and Maintenance Plan: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☐ Attached, Document ID: ____________ ☐ Previously Submitted, Date _____________
   ☒ Not Applicable
6. Compliance Demonstration Reports/Records:
   ☐ Attached, Document ID: ____________
   Test Date(s)/Pollutant(s) Tested: ____
   ☐ Previously Submitted, Date: _________
   Test Date(s)/Pollutant(s) Tested: ____
   ☐ To be Submitted, Date (if known):______________
   Test Date(s)/Pollutant(s) Tested: ____
   ☒ Not Applicable
   Note: For FESOP applications, all required compliance demonstration records/reports must be submitted at the time of application. For Title V air operation permit applications, all required compliance demonstration reports/records must be submitted at the time of application, or a compliance plan must be submitted at the time of application.
7. Other Information Required by Rule or Statute:
   ☐ Attached, Document ID: ____________ ☒ Not Applicable

I. EMISSIONS UNIT ADDITIONAL INFORMATION (CONTINUED)

Additional Requirements for Air Construction Permit Applications

1. Control Technology Review and Analysis (Rules 62-212.400(10) and 62-212.500(7), F.A.C.; 40 CFR 63.43(d) and (e)):
   ☒ Attached, Document ID: **Section 4.0** ☐ Not Applicable
2. Good Engineering Practice Stack Height Analysis (Rules 62-212.400(4)(d) and 62-212.500(4)(f), F.A.C.):
   ☐ Attached, Document ID: ____________ ☒ Not Applicable
3. Description of Stack Sampling Facilities: (Required for proposed new stack sampling facilities only)
   ☐ Attached, Document ID: ____________ ☒ Not Applicable

Additional Requirements for Title V Air Operation Permit Applications

1. Identification of Applicable Requirements:
   ☐ Attached, Document ID: ____________ ☒ Not Applicable
2. Compliance Assurance Monitoring:
   ☐ Attached, Document ID: ___________ ☒ Not Applicable
3. Alternative Methods of Operation:
   ☐ Attached, Document ID: ___________ ☒ Not Applicable
4. Alternative Modes of Operation (Emissions Trading):
   ☐ Attached, Document ID: ___________ ☒ Not Applicable

Additional Requirements Comment

APPENDIX E

BACT COST ANALYSIS

APPENDIX E

HIGH-CALCIUM LIMESTONE OPTION

DOLOMITIC LIMESTONE OPTION

Table EHC-1. Economic Comparison Natural Gas and Pet Coke for Control of GHGs (High-Calcium Lime)

Parameter		Value	Units		Annual Fuel Costs	
Natural Gas						
Fuel Usage		470,958,624	ft^3/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		0.001026	MMBtu/ft^3			
Heat Input		483,204	MMBtu/yr			
Natural Gas Prices	Low	6.35	$/MMBtu	EIA Natural Gas Monthly,	3,068,343	$/yr
(Florida)	High	9.57	$/MMBtu	Table 22, May, 2013.	4,624,258	$/yr
	Ave 2007-2011	7.70	$/MMBtu		3,720,667	$/yr
CO_2e Emissions		59,570	ton/yr			
Pet Coke						
Fuel Usage		18,871	ton/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		24.80	MMBtu/ton			
Heat Input		467,988	MMBtu/yr		Annual Fuel Costs	
	Low Sulfur	2.56	$/MMBtu	Carmeuse, 2011/2012	1,198,050	$/yr
Pet Coke Prices	High Sulfur	2.89	$/MMBtu	Carmeuse, 2011/2012	1,352,486	$/yr
	Ave 2007-2011	2.73	$/MMBtu	Carmeuse, 2011/2012	1,277,608	$/yr
CO_2e Emissions		118,074	ton/yr			
		40.48	$/ton CO_2e	Ave NG cost vs High S Pet Coke cost		
Cost Effectiveness (incremental)		55.92	$/ton CO_2e	High NG cost vs High S Pet Coke cost		
		43.12	$/ton CO_2e	Ave NG cost vs Low S Pet Coke cost		
		31.97	$/ton CO_2e	Low NG cost vs Low S Pet Coke cost		

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table EHC-2. Economic Comparison Natural Gas and Coal for Control of GHGs (High-Calcium Lime)

Parameter		Value	Units			
Natural Gas						
Fuel Usage		470,958,624	ft^3/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		0.001026	MMBtu/ft^3			
Heat Input		483,204	MMBtu/yr			
					Annual Fuel Costs	
Natural Gas Prices	Low	6.35	$/MMBtu	EIA Natural Gas Monthly,	3,068,343	$/yr
(Florida)	High	9.57	$/MMBtu	Table 22, May, 2013.	4,624,258	$/yr
	Ave 2007-2011	7.70	$/MMBtu		3,720,667	$/yr
CO_2e Emissions		59,570	ton/yr			
Coal						
Fuel Usage		19,973	ton/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		24.93	MMBtu/ton			
Heat Input		497,922	MMBtu/yr			
					Annual Fuel Costs	
	Florida Ave 2011	4.31	$/MMBtu	EIA, 2011.	2,146,043	$/yr
Coal Prices			$/MMBtu		0	$/yr
			$/MMBtu		0	$/yr
CO_2e Emissions		103,239	ton/yr			
		36.06	$/ton CO_2e	Ave NG cost vs Fl Ave Coal Cost		
Cost Effectiveness (incremental)		56.75	$/ton CO_2e	High NG cost vs Fl Ave Coal Cost		

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table EHC-3. Economic Comparison Natural Gas and Lignite for Control of GHGs (High-Calcium Lime)

Parameter		Value	Units			
Natural Gas						
Fuel Usage		470,958,624	ft^3/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		0.001026	MMBtu/ft^3			
Heat Input		483,204	MMBtu/yr			
					Annual Fuel Costs	
Natural Gas Prices	Low	6.35	$/MMBtu	EIA Natural Gas Monthly,	3,068,343	$/yr
(Florida)	High	9.57	$/MMBtu	Table 22, May, 2013.	4,624,258	$/yr
	Ave 2007-2011	7.70	$/MMBtu		3,720,667	$/yr
CO_2e Emissions		59,570	ton/yr			
Lignite						
Fuel Usage		35,741	ton/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		14.21	MMBtu/ton			
Heat Input		507,880	MMBtu/yr			
					Annual Fuel Costs	
	Florida Ave 2011	4.31	$/MMBtu		2,188,961	$/yr
Coal Prices			$/MMBtu		0	$/yr
			$/MMBtu		0	$/yr
CO_2e Emissions		110,275	ton/yr			
		30.21	$/ton CO_2e	Ave NG cost vs Fl Ave Lignite Cost		
Cost Effectiveness (incremental)		48.03	$/ton CO_2e	High NG cost vs Fl Ave Lignite Cost		
		17.34	$/ton CO_2e	Low NG cost vs Fl Ave Lignite Cost		

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table EHC-4. Economic Comparison Natural Gas and Wood Chips for Control of GHGs (High-Calcium Lime)

Parameter		Value	Units			
Natural Gas						
Fuel Usage		470,958,624	ft^3/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		0.001026	MMBtu/ft^3			
Heat Input		483,204	MMBtu/yr			
					Annual Fuel Costs	
Natural Gas Prices	Low	6.35	$/MMBtu	EIA Natural Gas Monthly,	3,068,343	$/yr
(Florida)	High	9.57	$/MMBtu	Table 22, May, 2013.	4,624,258	$/yr
	Ave 2007-2011	7.70	$/MMBtu		3,720,667	$/yr
CO_2e Emissions		59,570	ton/yr			
Wood Chips						
Fuel Usage		26,783	ton/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		17.48	MMBtu/ton			
Heat Input		468,169	MMBtu/yr			
					Annual Fuel Costs	
	Florida Ave 2011	2.72	$/MMBtu		1,273,421	$/yr
Wood/Biomass Prices			$/MMBtu		0	$/yr
			$/MMBtu		0	$/yr
CO_2e Emissions		98,124	ton/yr			
		63.48	$/ton CO_2e	Ave NG cost vs Fl Ave Wood Chips Cost		
Cost Effectiveness (incremental)		86.91	$/ton CO_2e	High NG cost vs Fl Ave Wood Chips Cost		
		46.56	$/ton CO_2e	Low NG cost vs Fl Ave Wood Chips Cost		

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table EDL-1. Economic Comparison Natural Gas and Pet Coke for Control of Greenhouse Gases (Dolomitic Lime)

Parameter		Value	Units		Annual Fuel Costs	
Natural Gas						
Fuel Usage		470,958,624	ft^3/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		0.001026	MMBtu/ft^3			
Heat Input		483,204	MMBtu/yr			
Natural Gas Prices	Low	6.35	$/MMBtu	EIA Natural Gas Monthly,	3,068,343	$/yr
(Florida)	High	9.57	$/MMBtu	Table 22, May, 2013.	4,624,258	$/yr
	Ave 2007-2011	7.70	$/MMBtu		3,720,667	$/yr
CO_2e Emissions		60,914	ton/yr			
Pet Coke						
Fuel Usage		18,871	ton/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		24.80	MMBtu/ton			
Heat Input		467,988	MMBtu/yr			
					Annual Fuel Costs	
	Low Sulfur	2.56	$/MMBtu	Carmeuse, 2011/2012	1,198,050	$/yr
Pet Coke Prices	High Sulfur	2.89	$/MMBtu	Carmeuse, 2011/2012	1,352,486	$/yr
	Ave 2007-2011	2.73	$/MMBtu	Carmeuse, 2011/2012	1,277,608	$/yr
CO_2e Emissions		118,590	ton/yr			
		41.06	$/ton CO_2e	Ave NG cost vs High S Pet Coke cost		
Cost Effectiveness (incremental)		56.73	$/ton CO_2e	High NG cost vs High S Pet Coke cost		
		43.74	$/ton CO_2e	Ave NG cost vs Low S Pet Coke cost		
		32.43	$/ton CO_2e	Low NG cost vs Low S Pet Coke cost		

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table EDL-2. Economic Comparison Natural Gas and Coal for Control of Greenhouse Gases (Dolomitic Lime)

Parameter		Value	Units		Annual Fuel Costs	
Natural Gas						
Fuel Usage		470,958,624	ft^3/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		0.001026	MMBtu/ft^3			
Heat Input		483,204	MMBtu/yr			
Natural Gas Prices	Low	6.35	$/MMBtu	EIA Natural Gas Monthly,	3,068,343	$/yr
(Florida)	High	9.57	$/MMBtu	Table 22, May, 2013.	4,624,258	$/yr
	Ave 2007-2011	7.70	$/MMBtu		3,720,667	$/yr
CO_2e Emissions		60,914	ton/yr			
Coal						
Fuel Usage		19,973	ton/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		24.93	MMBtu/ton			
Heat Input		497,922	MMBtu/yr		Annual Fuel Costs	
Coal Price	Florida Ave 2011	4.31	$/MMBtu	EIA, SEDS, 2011.	2,146,043	$/yr
CO_2e Emissions		103,789	ton/yr			
		36.73	$/ton CO_2e	Ave NG cost vs Fl Ave Coal Cost		
Cost Effectiveness (incremental)		57.80	$/ton CO_2e	High NG cost vs Fl Ave Coal Cost		
		21.51	$/ton CO_2e	Low NG cost vs Fl Ave Coal Cost		

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table EDL-3. Economic Comparison Natural Gas and Lignite for Control of Greenhouse Gases (Dolomitic Lime)

Parameter		Value	Units			
Natural Gas						
Fuel Usage		470,958,624	ft^3/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		0.001026	$MMBtu/ft^3$			
Heat Input		483,204	MMBtu/yr			
					Annual Fuel Costs	
Natural Gas Prices	Low	6.35	$/MMBtu	EIA Natural Gas Monthly,	3,068,343	$/yr
(Florida)	High	9.57	$/MMBtu	Table 22, May, 2013.	4,624,258	$/yr
	Ave 2007-2011	7.70	$/MMBtu		3,720,667	$/yr
CO_2e Emissions		60,914	ton/yr			
Lignite						
Fuel Usage		35,741	ton/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		14.21	MMBtu/ton			
Heat Input		507,880	MMBtu/yr			
					Annual Fuel Costs	
Coal Price	Florida Ave 2011	4.31	$/MMBtu	EIA, SEDS, 2011.	2,188,961	$/yr
CO_2e Emissions		110,836	ton/yr			
		30.68	$/ton CO_2e	Ave NG cost vs Fl Ave Lignite Cost		
Cost Effectiveness (incremental)		48.78	$/ton CO_2e	High NG cost vs Fl Ave Lignite Cost		
		17.61	$/ton CO_2e	Low NG cost vs Fl Ave Lignite Cost		

Sources: Jacksonville Lime, 2014.
ECT, 2014.

Table EDL-4. Economic Comparison Natural Gas and Wood Chips for Control of Greenhouse Gases (Dolomitic Lime)

Parameter		Value	Units			
Natural Gas						
Fuel Usage		470,958,624	ft^3/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		0.001026	MMBtu/ft^3			
Heat Input		483,204	MMBtu/yr			
					Annual Fuel Costs	
Natural Gas Prices	Low	6.35	$/MMBtu	EIA Natural Gas Monthly,	3,068,343	$/yr
(Florida)	High	9.57	$/MMBtu	Table 22, May, 2013.	4,624,258	$/yr
	Ave 2007-2011	7.70	$/MMBtu		3,720,667	$/yr
CO_2e Emissions		60,914	ton/yr			
Wood Chips						
Fuel Usage		26,783	ton/yr			
Lime Produced		137,313	ton/yr			
Average Heat Content		17.48	MMBtu/ton			
Heat Input		468,169	MMBtu/yr			
					Annual Fuel Costs	
Wood/Biomass Price	Florida Ave 2011	2.72	$/MMBtu	EIA, SEDS, 2011.	1,273,421	$/yr
CO_2e Emissions		98,124	ton/yr			
		65.77	$/ton CO_2e	Ave NG cost vs Fl Ave Wood Chips Cost		
Cost Effectiveness (incremental)		90.05	$/ton CO_2e	High NG cost vs Fl Ave Wood Chips Cost		
		48.24	$/ton CO_2e	Low NG cost vs Fl Ave Wood Chips Cost		

Sources: Jacksonville Lime, 2014.
ECT, 2014.