Derenzo and Associates, Inc.
Environmental Consultants

Tammy McWade

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DIVISION OF AIR
RESOURCE MANAGEMENT

August 21, 2013

Mr. Syed Arif, P.E.
Bureau of Air Regulation
Division of Air Resource Management
Department of Environmental Protection
STATE OF FLORIDA
2600 Blair Stone Road, MS 5505
Tallahassee, FL 32399-2400

Subject: Sarasota Energy, LLC
PSD Air Construction Permit Application – Class II Air Quality Modeling Analysis

Dear Mr. Arif:

Derenzo and Associates, Inc. (Derenzo and Associates), on behalf of Sarasota Energy, LLC, is submitting to the Florida Department of Environmental Protection, Division of Air Resource Management the results of Class II Air Quality Modeling Analyses associated with the Air Construction Permit application (previously submitted under separate heading) for a new landfill gas (LFG) fueled internal combustion (IC) engine electricity generation facility at the Central County Solid Waste Disposal Complex in Sarasota County, Florida.

The results of the Class II modeling analyses demonstrate compliance with PSD increment and National Ambient Air Quality Standards for all regulated pollutants.

Sincerely,

DERENZO AND ASSOCIATES, INC.

Andy Rusnak
Senior Environmental Engineer

enclosures

c: Tammy McWade, FDEP – Permit Section

Derenzo and Associates, Inc.
Environmental Consultants

RESULTS OF AIR QUALITY MODELING ANALYSIS FOR SARASOTA ENERGY, L.L.C. LANDFILL GAS FIRED ELECTRICITY GENERATION PROCESSES AT THE CENTRAL COUNTY SOLID WASTE DISPOSAL COMPLEX

Sarasota Energy, L.L.C.
Nokomis, Sarasota County, Florida

August 19, 2013

DAI Project No. 1301043

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FOR
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AT THE
CENTRAL COUNTY SOLID WASTE DISPOSAL COMPLEX

1.0 INTRODUCTION TO AIR QUALITY IMPACT ANALYSES

Sarasota Energy L.L.C. (Sarasota Energy) plans to construct electricity generation processes that will result in the beneficial use, after treatment, of landfill gas (LFG) that is collected from the Central County Solid Waste Disposal Complex (the landfill). The proposed electricity generation facility will be located on a leased site within the boundaries of the landfill in Nokomis, Sarasota County, Florida.

Currently, landfill gas that is generated by the landfill as a result of the degradation of the solid wastes placed in the facility is directed by a voluntarily installed active LFG collection system to an open flare for control. Sarasota Energy plans to install four (4) LFG-fueled Caterpillar® Model G3520C reciprocating internal combustion engines (RICE) at the landfill which will have the potential to produce 6.4 megawatts (MW) of electricity.

The air quality modeling results have been prepared for regulatory agency review for the performance of source impact analyses to support plans to install four (4) additional CAT® Model No. G3520C reciprocating IC engines at the proposed facility for the beneficial use of LFG that is expected to be generated by the landfill.

1.1 Class II Area Criteria Pollutant Modeling

The proposed Sarasota Energy LFG-fueled electricity generation facility will be a major source of carbon monoxide and will be subject federal Prevention of Significant Deterioration (PSD) regulations. Results of significant impact level analyses performed for the proposed facility indicate that maximum criteria pollutant emission rates have the potential to produce air quality impacts that exceed specified PSD significant impact level concentrations.

Multisource air quality impact analyses were performed to compare calculated impacts to PSD Increment values and applicable National Ambient Air Quality Standards (NAAQS). Results of the PSD increment and NAAQS modeling demonstrations are presented in Section 3.0 of this document.

1.2 Class I Area Significant Impact

PSD sources that have the potential to impact Class I areas are required to perform analyses to evaluate criteria pollutant impacts within the Class I area and demonstrate that the plume of the proposed air pollutant emission processes will not have an adverse impact on visibility within the Class I area.

The Sarasota Energy facility in Nokomis, Florida is located approximately 160 kilometers from an area designated as a Federal Class I Area (national parks, wilderness or refuge areas, and national memorials). The nearest Class I Area is the Chassahowitzka National Wildlife Refuge in Crystal River, a distance of approximately 157 km from the landfill.

Based on its location relative to federal Class I areas, Class I criteria pollutant analyses will be performed for the proposed LFG fueled facility. Results of these analyses will be submitted under a separate heading.

1.3 Visibility Screening Analysis

A screening analysis to determine the impacts on visibility caused by the proposed Sarasota Energy facility at surrounding Class I areas was performed. The VISCREEN model provided by the USEPA was used to determine the visual effect parameters (color difference parameter and plume contrast against a background) from the proposed Sarasota Energy facility modification exhaust gas plume from a given vantage point.

The proposed Sarasota Energy facility will be located in Sarasota County, approximately eight (8) miles northeast of the city of Nokomis and fifteen (15) kilometers southeast of the city of Sarasota. The Chassahowitzka National Wildlife Refuge is the nearest Class I Area located approximately 157 km north of the proposed Sarasota Energy facility.

A particulate matter emission rate of 4.74 lb/hr and NO_X emission rate of 11.86 lb/hr (sum of maximum proposed hourly emissions for the proposed Sarasota Energy facility) was entered into the model. The source-observer distance and minimum distance to the park were both set at 157 kilometers and the maximum distance to the park was set at 188.0 kilometers. A background range of 25.0 kilometers was used for the surrounding area, as presented in Figure 4-3 of the VISCREEN manual. Default particle size, particle density and worst-case meteorological conditions (F stability and wind speed) were selected from the model to provide a worst-case scenario (i.e., Level-1 screening analysis).

Execution of the VISCREEN model with the inputs specified above resulted in visual impacts at the Chassahowitzka National Wildlife Refuge (157 km from the facility) that are not considered objectionable or adverse (i.e., do not exceed screening criteria) inside or outside of the park.

Appendix A presents the VISCREEN model inputs and results.

2.0 SITE CHARACTERISTICS AND FACILITY INFORMATION

The following sections present detailed site characteristics and facility information that were considered in performing the air quality modeling analysis.

2.1 Site Characteristics and Topography

The proposed Sarasota Energy facility is located in an area that is surrounded by sparsely populated rural forest and grasslands (i.e., deciduous forest and pasture/hay landcover). The nearest residence is located approximately 2,800 meters south of the proposed Sarasota Energy facility.

The terrain of the land that surrounds the proposed Sarasota Energy facility is relatively flat. The base elevation for the proposed facility is approximately 20 ft. above sea level. The minimum release height for the proposed CAT® Model G3520C IC engine exhaust stacks (Engine Nos. 1 – 4) will be 30 ft. as measured from local grade, which results in a minimum exhaust stack release elevation of approximately 50 feet above sea level. Based on review of topography plots of the surrounding area, there is no terrain within 3 km of the source (landfill) that has elevations greater than 50 feet above sea level (i.e., simple terrain).

Appendix B provides a plot map of the landfill and proposed facility.

2.2 Facility Exhaust Parameters

The proposed Sarasota Energy facility will consist of four (4) CAT® G3520C IC engines (Engine Nos. 1 through 4). All engines are or will be fueled with treated LFG and designed to operate at base load (100% capacity) conditions.

The CAT® G3520C Gas Engine Technical Data Sheet provides a specification for exhaust gas flowrate based on an assumed LFG fuel quality and engine efficiency. Site-specific data collected by Derenzo and Associates at similar facilities operating the CAT® G3520C engine indicates that the engines exhaust up to 4,700 dscfm (dry gas flow corrected to standard temperature and pressure) at 8.0% oxygen. At actual operating conditions each of the proposed CAT® G3520C IC engines is expected to exhaust effluent gas at a rate of 13,700 acfm at 900°F through an 18-inch diameter stack.

Table 2.1 presents exhaust stack parameters that were used in the air quality impact analyses for Engine Nos. 1 through 4 (the proposed facility).

Appendix C provides manufacturer's specification sheets for the CAT® Model Nos. G3520C IC engines.

The existing open flare (considered a background source in the modeling demonstration) has an actual release height of 36.0 feet with a 12-inch diameter flare tip. The effective diameter and release height of the flare (for use in modeling as a point source) were determined using procedures specified in the USEPA document, "Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants." As described in the USEPA document an assumed stack gas exit velocity of 20 m/s and gas exit temperature of 1273 K were used with the open flare.

The effective flare stack diameter was calculated using the following equation:

$$D_{eff} = (9.88*10^{-4}) * (Q_H)^{0.5}$$

Where: D_{eff} = Effective flare stack diameter (m)
Q_H = Net heat available (cal/s) assuming 55% of total heat is lost to radiation

The effective flare release height was calculated using the following formula:

$$H_{eff} = (H_s) + [(0.00456) * (Q_T)^{0.478}]$$

Where: H_{eff} = Effective flare release height (m)
H_s = Physical flare stack height (m)
Q_T = Total heat released (J/s)

The open flare is designed to control a maximum of 4,700 dscfm of LFG, as a conservative analysis for the modeling analysis, the flare was operated as a backup device to the IC engines (i.e., combusting remainder of the maximum predicted LFG after IC engine operation, 2,102 dscfm). The existing open flare heat release used in the equations above for effective flare stack diameter and effective flare release height is 63.7 MMBtu/hr (based on flaring LFG with a heat content of 510 Btu/scf), which is equivalent to 18.7 million Joules per second (1.87 E+07 J/s) and 4.46 million calories per second (4.46E+06 cal/s).

Table 2.2 presents exhaust stack parameters for the existing open flare that was used in the air quality impact analyses.

2.3 Influencing Structure and GEP Stack Height Analysis

The proposed Sarasota Energy facility IC engines will be installed within a 60.0 ft. (width) by 98.0 ft. (length) building. The facility roof height is 17.0 ft. The proposed exhaust stacks will exhaust vertically and extend above the roof at least 13.0 ft. resulting in an overall exhaust release heights of 30.0 ft., as measured from grade of the land that surrounds the building.

In general, air pollutant dispersion models consider the influence of building structures on exhaust stack plumes (i.e., downwash conditions) when the exhaust stack has a release height that is less than its Good Engineering Practice (GEP). According to the USEPA's Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for Stack Height Regulations) GEP means the greater of:

a. 65 meters, measured from ground level elevation at the base of the stack;

b. The height calculated by the following equation:

   $H_{GEP} = H_b + 1.5L$

   where: H_{GEP} = formula GEP stack height (meters)
   H_b = height of adjacent building (meters)
   L = lesser of height or maximum projected width of adjacent building (meters); or

c. The height demonstrated by a fluid model or field study approved by the EPA… Sarasota Energy does not plan to perform a fluid model in order to increase the stack height to mitigate excessive concentrations as provided by this option.

The roof height of the facility is less than the projected building width. Therefore, the calculated GEP stack height for this structure is 42.5 feet (12.95 meters).

Proposed facility: H_{GEP} = 17.0 ft. + 1.5 (17.0 ft.) = 42.5 ft.

Other nearby structures have the potential to influence the plume rise of the engine exhaust stacks if the distance between the stacks and the nearby structure is less than five times the L dimension (lesser of the building height or maximum projected width) of the structure.

There is one (1) other influencing structure, relative to the proposed Sarasota Energy facility engine stacks, a maintenance building. This one (1) influencing structure was included in the modeling demonstration. The maintenance building has a length of 107.0 ft., width of 60.0 ft. and height of 20.0 ft.

The release height for the proposed Sarasota Energy facility IC engine exhaust stacks are less than 65 meters. Therefore, emissions from the electricity generation facility exhaust stacks will have the potential to be influenced by aerodynamic downwash created primarily by the buildings that house the equipment. The influence of stack downwash on emission impacts will be included in the dispersion modeling analyses (the model will be executed with the 'include downwash' option).

2.4 Facility Criteria Air Pollutant Emission Rates

Criteria air pollutant emission rates for the proposed facility IC engines are presented in the air permit application document. The proposed IC engine emission rates are based on engine manufacturer guaranteed emissions rates, actual operations for similar engines, the application of best available control technology and USEPA AP-42 emission factors.

Table 2.3 presents criteria pollutant emission rates for the proposed CAT® G3520 LFG-fueled IC engines (Engine Nos. 1 through 4).

Table 2.4 presents criteria pollutant emission rates for the existing open flare

2.5 Landfill Gas Generation and Use

The operation of the proposed Sarasota Energy facility IC engines at normal base load operations will require the supply of approximately 2,216 cfm of LFG fuel (treated gas with a LHV of approximately 450 Btu/scf).

The landfill has a projected maximum LFG collection rate of 4,318 cfm. After the proposed Sarasota Energy facility is complete the existing 4,700 cfm open flare will be operated to provide redundant LFG control capacity or to control any LFG in excess of what the IC engines can control (i.e., combust a maximum of 2,102 cfm of LFG).

The modeling demonstration will be performed based on simultaneous operation of all of the proposed IC engines (Engine Nos. 1 – 4). The open flare will be operated as a background source at maximum potential capacity as described in the preceding paragraph. This operating scenario is considered to be the most conservative (i.e., worst-case) operating scenario (the current permitted waste placement volumes will not generate an amount of LFG to supply all of these devices simultaneously at full capacity).

2.6 Alternate Operating Conditions / Startup and Shutdown Emissions

The engines are designed to operate continuously with the exception of planned maintenance downtime or automatic engine shutdowns (instantaneous, automatic engine shutdowns if monitored operating parameters are outside of preset ranges). The amount of time required for an engine start-up is minimal (the IC engines ramp from cold start to full load within a matter of a few minutes). Since the engines are primarily operated at base load conditions and the durations of engine shutdown and startup times are minimal, no air emission estimates or air quality impact concentrations analyses will be performed for these specific events. The engines will not be operated for any appreciable amount of time at loads other than 100%; therefore, modeling startup/shutdown emission scenarios are not practical to this type of source.

Table 2.1 Exhaust stack parameters for the proposed Sarasota Energy facility

Source ID	Location (UTM) East (m)	North (m)	Base Elev. (m)	Stack Height (m)	(ft)	Stack Diameter (m)	(ft)	Temp. (^oF)	Exit Velocity (m/s)
ENGINE01	362840	3008954	6.10	9.14	30.0	0.46	1.50	900	129
ENGINE02	362845	3008954	6.10	9.14	30.0	0.46	1.50	900	129
ENGINE03	362850	3008954	6.10	9.14	30.0	0.46	1.50	900	129
ENGINE04	362855	3008954	6.10	9.14	30.0	0.46	1.50	900	129

Table 2.2 Exhaust stack parameters for the existing open flare

Source ID	Location (UTM) East (m)	North (m)	Base Elev. (m)	Stack Height (m)	(ft)	Stack Diameter (m)	(ft)	Temp. (^oF)	Exit Velocity (m/s)
OPENFLARE	362809	3008980	6.10	24.6	80.7	2.09	6.86	1831	20.0

Table 2.3 Criteria pollutant emission rates used in the air quality modeling analysis for the proposed Sarasota Energy CAT® G3520C LFG-fueled IC engines (Engine Nos. 1 through 4)

Pollutant	LFG-fueled IC engine emission factors		Modeled emission rate per IC engine[1] (lb/hr)	(g/s)	Emission rate for four (4) IC engines (lb/hr)	(ton/yr)
Nitrogen Oxides (NO_x)	0.60	g/bhp-hr	2.97	0.374	11.86	52.0
Carbon Monoxide (CO)	3.50	g/bhp-hr	17.30	2.180	69.2	303.1
Sulfur Dioxide (SO_2)	48.0	lb/MMscf	2.05	0.258	8.21	36.0
Particulates ($PM_{10}/PM_{2.5}$)	0.24	g/bhp-hr	1.19	0.150	4.76	20.8

1. Based on continuous operation of a single engine at base load (100% capacity) conditions; engine output of 2,242 hp and maximum fuel consumption of 713 scfm (42,753 scfh) LFG.

Table 2.4 Criteria pollutant emission rates used in the air quality modeling analysis for the existing open flare

Pollutant	Proposed Flare emission factors		Proposed emission rate[1] (g/s)	(lb/hr)	(ton/yr)
Nitrogen Oxides (NO_x)[2]	40.0	lb/MMcf CH_4	0.318	2.52	11.0
Carbon Monoxide (CO)[2]	750	lb/MMcf CH_4	5.96	47.3	207.2
Sulfur Dioxide (SO_2)[3]	48.0	lb/MMcf LFG	0.762	6.05	26.5
Particulates ($PM_{10}/PM_{2.5}$)[2]	17.0	lb/MMcf CH_4	0.135	1.07	4.70

1. Based on flaring rate of 2,102 scfm and LFG with a heat content of 505 Btu/ft^3.

2. USEPA AP-42 emission factor for flares.

3. Sulfur dioxide emission factor based on 274.2 ppm H_2S in the recovered LFG.

3.0 CLASS II AREA MULTISOURCE MODELING ANALYSIS

3.1 Purpose

Sarasota Energy is requesting authorization to install and operate four (4) CAT® G3520C IC engine generators in a proposed building located at the Central County Solid Waste Disposal Complex.

The proposed IC engines potentially make the facility a major source of regulated criteria pollutants relative to 40 CFR §52.21(b), Prevention of Significant Deterioration of Air Quality (PSD). The CO emission rates associated with the proposed Sarasota Energy facility exceeds the PSD significant emission threshold of 250 tons per year (TpY). The potential NO_x, PM_{10} and $PM_{2.5}$ emission rates exceed the PSD significant emissions increase threshold of 40, 15 and 10 TpY, respectively. Potential SO_2 emissions for the proposed facility are less than the PSD significant emissions threshold of 40 TpY.

Pursuant to 40 CFR §52.21(m), Air Quality Analysis, an application for a permit under the PSD program *shall contain an analysis of ambient air quality in the area that the major stationary source or major modification would affect for each of the following pollutants:*

(a) *For the source, each pollutant that it would have the potential to emit in a significant amount;*

(b) *For the modification, each pollutant for which it would result in a significant net emissions increase*

Additionally, the modeling analysis must demonstrate that emissions will not cause or significantly contribute to a violation of National Ambient Air Quality Standards (NAAQS) or exceed allowable PSD increment consumption values for all pollutants that exceed the significant emission increase value.

Based on the PSD air quality analysis requirements, CO, NO_x, PM_{10} and $PM_{2.5}$ emissions for the proposed Sarasota Energy facility are subject to PSD air quality analysis requirements pursuant to 40 CFR §52.21(m). Potential SO_2 emissions are less than the PSD significant emissions threshold (40 TpY) and not subject to PSD air quality analysis requirements. However, SO_2 emissions were modeled to determine impacts caused by the proposed emission source.

A multisource modeling analysis was performed to determine the cumulative impact caused by the proposed emission sources, background emission sources (to demonstrate compliance with PSD increment consumption) and regional air pollutant background concentrations (to demonstrate compliance with applicable NAAQS).

3.2 Significant Impact Level Analysis Results

Results from the significant impact level analysis for the proposed Sarasota Energy facility indicate that maximum NO_2 (1-hour) and $PM_{2.5}$ (24-hour) impact concentrations exceed the PSD Class II significant impact levels. The maximum radius of significant impact determined using refined modeling procedures is 2.0 kilometers (km).

Calculated CO (1-hour and 8-hour values), NO_2 (annual value), $PM_{2.5}$ (annual value), SO_2 (1-hour, 3-hour, 24-hour and annual values) and PM_{10} (24-hour and annual value) impacts from the proposed facility are below their respective PSD Class II significant impact levels (i.e., insignificant and do not require a refined modeling analysis).

Table 3.1 presents predicted criteria pollutant emission impacts for the proposed Sarasota Energy facility.

3.3 Background Air Quality (Monitoring Data)

For the NAAQS demonstration, representative background pollutant concentrations will be added to the predicted air pollutant impacts determined by the multisource modeling analysis.

Preliminary air quality impact and radius of significant impact results are presented in the previous section. Maximum predicted air quality impacts associated with the air pollutant emissions from the proposed facility are:

- Less than the PSD significance impact level concentrations for carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (PM_{10}), annual nitrogen dioxide (NO_2) and annual fine particulate matter ($PM_{2.5}$).

- Greater than the PSD significance impact level concentrations for 1-hour nitrogen dioxide (NO_2) and 24-hour fine particulate matter ($PM_{2.5}$).

The proposed Sarasota Energy facility (located at 4000 Knight's Trail Rd., Nokomis, Florida) is located in a rural area (less than 50 persons per square kilometer) and the land cover for the surrounding area consists mainly of deciduous forest and pasture / hay. The area surrounding the facility has a relatively low density of regulated facilities (i.e., facilities that have the potential to affect the surrounding environment in an adverse manner).

For the modeling demonstration an appropriate background concentration of each pollutant is added to the predicted impact resulting from the proposed emission sources to determine the potential cumulative ambient air pollutant concentration.

The FDEP was contacted to provide an appropriate background ambient air concentration for NO_2, and $PM_{2.5}$. The FDEP provided the measured air pollutant concentration data for the appropriate monitoring stations.

Table 3.2 presents representative maximum background concentrations that will be used in the NAAQS demonstration for each criteria pollutant.

Appendix D presents air monitoring data that was provided by the FDEP.

3.3.1 Background Concentration Data for NO_2

The NO_2 monitor (AQS Monitor ID: 12-115-1006-42602-1) provided by the FDEP is located at Paw Park in Sarasota County (Site ID: L1151006). Data for the years 2010-2012 provide a high 98^{th} percentile 1-hr. NO_2 concentration of 24.0 ppb, which equates to 45.9 $\mu g/m^3$.

3.3.2 Background Concentration Data for $PM_{2.5}$

The $PM_{2.5}$ monitor (AQS Monitor ID: 12-115-0013-88101-1) provided by the FDEP is located at Bee Ridge Park in Sarasota County (Site ID: L1150013). Data for the years 2010-2012 provide a high 98^{th} percentile 24-hr. $PM_{2.5}$ concentration of 18.0 $\mu g/m^3$.

3.4 Background Emission Sources

An inventory of background emission sources for the multisource PSD increment and NAAQS modeling analyses was obtained from the FDEP. The databases were reviewed and screened to include only those sources in the NAAQS and PSD increment inventories that are located within 50 km of the proposed Sarasota Energy location and had listed potential, allowable or actual emissions. Sources which had multiple emission units were combined into a representative stack for the facility. Facility elevations were obtained from a review of topography maps for the area surrounding each facility.

Appendix D contains a list of background sources that will be included in the multisource modeling analysis.

3.5 Summary of Refined Modeling Parameters and Procedures

The following sections present a summary of the refined modeling parameters and procedures that were used in the multisource modeling analysis.

3.5.1 Model Selection

The AERMOD (American Meteorological Society/Environmental Protection Agency Regulatory Model) air pollutant dispersion model (Version No. 12345) was used to calculate ground-level pollutant concentrations resulting from the proposed facility air pollutant emission rates and exhaust configuration. AERMOD is the most recent Gaussian steady-state plume dispersion model released by USEPA for use in assessing ambient air impacts associated with air pollutant releases and was adopted by the USEPA as the preferred general purpose dispersion model (Federal Register Notice November 9, 2005). The USEPA *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W) specifies that impacts calculated with most steady-state Gaussian plume models are applicable at distances up to 50 km from the origin of the emission source.

The use of the AERMOD model was determined appropriate because it can be used to determine cumulative pollutant concentrations at both simple and complex terrain receptors resulting from the operation of multiple sources.

The following sections present input data and processing options that were used for the AERMOD air pollutant dispersion modeling. The AERMOD input files were prepared by entering appropriate data (applicable to the specific emission process) and model operating parameters into a Windows-based graphical user interface (GUI) developed by BEE-Line Software / Oris Solutions (BEEST for Windows, current version 10.06). BEEST for Windows uses the unmodified regulatory AERMOD program.

3.5.2 Model Options

The AERMOD dispersion model was executed with regulatory default options for all pollutants. Stack-tip downwash was considered due to the height of the exhaust stacks relative to the influencing structures. In regulatory default mode, no calculations are performed for deposition or plume depletion.

The land use for the area surrounding the proposed electricity generation facility is predominantly classified as rural (as opposed to urban). Therefore, no options for urban dispersion were used to calculate air quality impact concentrations produced by the proposed and existing LFG combustion processes.

3.5.3 Meteorological Data

Meteorological data files (hourly surface measurements and upper-air soundings) for the five-year period 2008 through 2012 were used to characterize the dispersion of air pollutants. The data were obtained from the meteorological station nearest the project site; the Sarasota Bradenton International Airport (Station No. 12871). The preprocessed data were obtained from the FDEP.

3.5.4 *Receptor Network*

Ground-level pollutant impact concentrations were calculated for all nearby areas within 5.0 km of the proposed facility. The receptor network (locations at which air pollutant impact concentrations were calculated) used in the AERMOD modeling analyses were developed as described in the following text.

The proposed Sarasota Energy facility and Central County Solid Waste Disposal Complex are part of a single stationary source. The landfill property is surrounded by a fence that adequately delineates the property and precludes public access. Therefore, the landfill property line was used as the ambient air boundary. The receptor network was developed by creating a grid of receptors on a Cartesian coordinate system having a spacing of 70 meters (so that no adjacent receptors in the near field are separated by more than 100 meters) to determine off-site impacts up to 5.0 km from the proposed facility (i.e., receptors placed at the landfill fenceline and extended to 5.0 km from the facility in all directions). Receptors located on the fenceline had a spacing of 25 meters.

No flagpole receptors, for use in the air quality impact analyses, were identified in the area surrounding the facility location.

3.5.5 *Terrain Data*

USGS 30-meter (7.5 minute) ASCII Digital Elevation Models (DEM) files were created from the SDTS data using the sdts2dem data extraction computer program. The DEM data were based on the North American Datum of 1973 (NAD73). USEPA's AERMAP computer program (Version No. 11103) was used to extract data from the DEM files and calculate source base elevations and receptor elevations using the default algorithm (inverse distance squared of the nearest four terrain nodes).

3.5.6 *Pollutant Impact Averaging Times*

For the PSD increment consumption demonstration, the impact of the proposed emission sources at the stationary source and background sources were based on the highest-high $PM_{2.5}$ (24-hour) impact (there is no PSD increment value for the 1-hour NO_2 averaging time period).

For the NAAQS refined modeling analyses, background concentrations (monitoring data) were added to the predicted impact for the proposed and existing emission sources at the stationary source based on the:

- Highest eighth-high $PM_{2.5}$ impact (98^{th} percentile) for the 24-hr period.

- 5-year average of the 8th highest (98th percentile) of the daily maximum 1-hr average NO_2 impacts at each receptor.

3.6 Results

3.6.1 Maximum Impacts from the Proposed Sarasota Energy Facility

As presented in Section 3.2 and Table 3.1 the maximum predicted Sarasota Energy impacts exceed the PSD significant impact level for NO_2 (1-hour) and $PM_{2.5}$ (24-hour) (i.e., all other calculated impacts are insignificant).

3.6.2 PSD Increment Consumption

The combined impact of the proposed source and all increment-consuming sources cannot exceed the PSD increment concentration. The FDEP identified the off-site increment-consuming sources to include in the modeling analysis. As a conservative estimate, maximum predicted impacts were based on the simultaneous operation (pollutant emission rates) of all proposed IC engines and the open flare at the landfill at the maximum landfill gas production rate (i.e., all IC engines at full load and open flare combusting 2,102 scfm of LFG).

Table 3.3 presents results of the PSD increment consumption analysis.

The impact concentrations calculated by the AERMOD computer program for the proposed Sarasota Energy emission sources and provided background sources were less than the allowable Class II PSD increment concentrations.

3.6.3 NAAQS

Table 3.4 presents results of the federal ambient air quality standards analysis.

The impact concentrations calculated by the AERMOD computer program for the combination of the proposed Sarasota Energy and background emission sources were added to the representative air pollutant background concentration data. The sum of these impacts do not exceed the NAAQS.

Appendix E provides AERMOD input and output summary files.

Table 3.1 Predicted criteria pollutant emission impacts for Sarasota Energy

Pollutant	Model 3520 Emission Rate[1] (g/s per ICE)	Averaging Period	PSD Significance Level ($\mu g/m^3$)	Maximum Predicted Impact ($\mu g/m^3$)	Year
CO	2.180	1-hr	2000	64.29	2009
CO	2.180	8-hr	500	46.08	2009
NO_2	0.374	1-hr	7.6	11.03	2009
NO_2	0.374	Annual	1.0	0.21	2009
SO_2	0.258	1-hr	7.9	7.61	2009
SO_2	0.258	3-hr	25.0	6.83	2009
SO_2	0.258	24-hr	5.0	2.93	2009
SO_2	0.258	Annual	1.0	0.14	2009
PM_{10}	0.150	24-hr	5.0	1.70	2009
PM_{10}	0.150	Annual	1.0	0.08	2009
$PM_{2.5}$	0.150	24-hr	1.2	1.70	2009
$PM_{2.5}$	0.150	Annual	0.3	0.08	2009

1. Emission rates from Table 2.3.

Table 3.2 Monitoring data that were used to establish background air quality for the NAAQS demonstration

Pollutant	Averaging Time	Maximum Concentration [1] (ppm)	Maximum Concentration [1] (μg/m^3)	Monitoring Site	Year(s)
NO_2	1-hour	0.024	45.9	Paw Park	10 – 12
$PM_{2.5}$	24-hour	-	18.0	Bee Ridge Park	10 - 12

1. For gaseous pollutants the monitoring data are reported in the USEPA AIRS database in ppm and converted to μg/m^3 using an ideal gas relationship (0.02405 m^3/g-mol) at 25°C and 760 mmHg, and the molecular weight for the pollutant (46 for NO_2 and 64 for SO_2).

Table 3.3 Results of PSD Increment consumption analyses

Pollutant	Averaging Period	Met. Year	Maximum Impact PSD Increment Consuming Sources[1] (μg/m³)	Allowable PSD Class II Increment (μg/m³)
$PM_{2.5}$	24-hr (highest high)	2009	1.74	9.0

1. Includes the proposed Sarasota Energy facility, existing landfill flare and off-site increment-consuming sources.

Table 3.4 Results of federal ambient air quality standards analysis

	Averaging Period	Met. Year	Multisource Impact (µg/m^3)	Representative Background Concentration[1] (µg/m^3)	Combined Ambient Air Concentration (µg/m^3)	NAAQS (µg/m^3)
NO_2	1-hr (8th high)	2012	94.4	45.9	140.3	188
$PM_{2.5}$	24-hr (8th high)	2009	0.91	18.0	18.9	35

1. Background monitoring data provided by the FDEP and presented in Table 3.2.

4.0 SPECIAL MODELING CONSIDERATIONS

4.1 Particle Deposition

Based on the design and operation of the proposed Sarasota Energy facility IC engines and the treatment (dewatering, compression and filtration) of LFG prior to its use as a fuel and combustion, the amount of particulates emitted from the combustion process are expected to be relatively small. Therefore, compliance with the particulate matter ambient air quality standards can be achieved without considering particle deposition (i.e., the removal of particulates from the exhaust plume over the distance of maximum ground-level impacts due to deposition are expected to be minimal).

4.2 Fugitive Emissions

The proposed Sarasota Energy facility electricity generation equipment will use LFG that is supplied by the Central County Solid Waste Disposal Complex active gas collection system. The electricity generation facility is not a source of fugitive emissions (the installation of engines at the site does not affect fugitive emissions for the stationary source).

4.3 Impacts on Soils and Vegetation

The effects that air pollutants have on soils and vegetation can be classified into three general categories: acute, chronic and long term. Acute effects are those that result from relatively short exposures (i.e., less than one month) to high concentrations of pollutant emissions. Chronic effects occur when organisms are exposed for months or even years to certain threshold levels of pollutants. Long-term effects include abnormal changes in ecosystems and subtle physiological alterations in organisms. Acute and chronic effects are caused by pollutants acting directly on the organism, whereas, long-term effects can be indirectly caused by secondary agents such as changes in the pH of the soil.

The USEPA Air Quality Planning and Standards, Air Strategies and Standards Division, has developed secondary NAAQS for the protection of *the public welfare from any known or anticipated adverse effects associated with the presence of such air pollutant in the ambient air.* The values set for the secondary NAAQS incorporate the protection of ecosystems, which includes vegetation and soil.

The proposed Sarasota Energy facility will be located within the boundaries of an existing active landfill. The addition of four (4) CAT® G3520C IC engine generators will not disturb vegetation, soils or wildlife habitats that are not already being affected by the existing landfill facility and no land clearing of forested or heavily vegetated area will be required. The engines at the facility will, to some extent, replace air pollutant emissions that would otherwise be released by the existing flaring system to control LFG that is generated by the landfill.

Predicted impacts caused by proposed Sarasota Energy facility are well below the secondary NAAQS levels, which are meant to take into account the protection of ecosystems, which includes vegetation and soil.

Based on the information presented above, operation of the proposed Sarasota Energy facility is expected to have minimal impact on the surrounding soils and vegetation in the area. Installation of the facility will not physically disturb areas exterior to the landfill property and off-site ambient air impacts have been compared to levels that have been established for the protection of these systems.

4.4 Growth Impacts

The potential regulated air pollutant emissions from the four (4) LFG fueled CAT® G3520C IC engine - generator sets at Sarasota Energy will have no effect on commercial growth in the Nokomis, Florida area at levels greater than normal rates, which are dependent on general economical conditions.

The facility interconnects with the local utility through an existing nearby power distribution line and power generated by the facility is used to satisfy electricity demands within the general area.

No air pollutant emissions from residential and commercial construction and growth, and other activities will occur as a result of the potential regulated air pollutant emissions from the four (4) LFG fueled CAT® G3520C IC engine - generator sets.

APPENDIX A

VISCREEN MODEL INPUTS AND RESULTS

SARASOTA

Visual Effects Screening Analysis for
Source: SarasotaEnergy
Class I Area: Chassahowitzka

*** Level-1 Screening ***

Input Emissions for

Particulates	4.74	LB /HR
NOx (as NO2)	11.86	LB /HR
Primary NO2	.00	LB /HR
Soot	.00	LB /HR
Primary SO4	.00	LB /HR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	25.00 km
Source-Observer Distance:	157.00 km
Min. Source-Class I Distance:	157.00 km
Max. Source-Class I Distance:	188.00 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

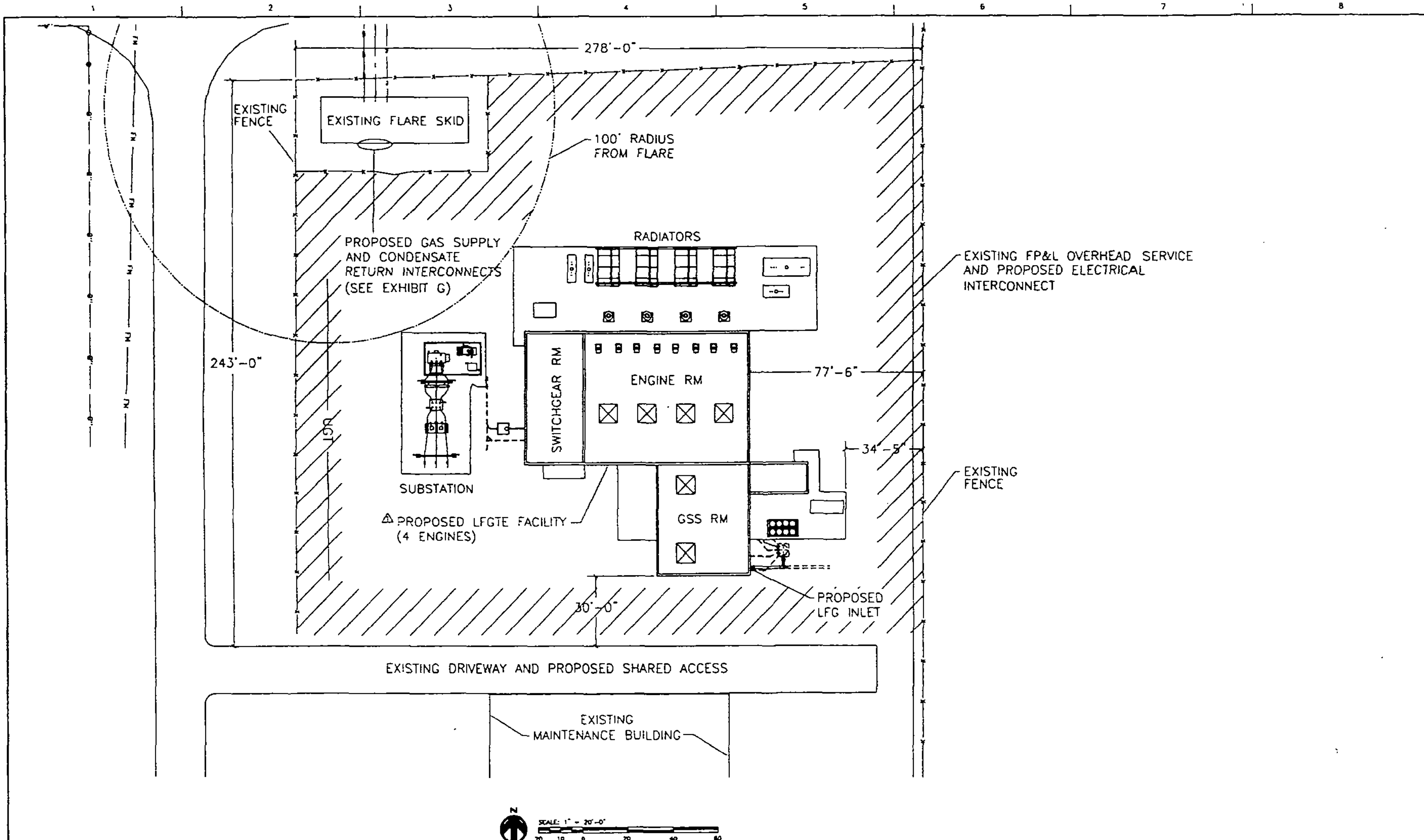
					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	84.	157.0	84.	2.00	.000	.05	.000
SKY	140.	84.	157.0	84.	2.00	.000	.05	.000
TERRAIN	10.	95.	162.9	74.	2.00	.000	.05	.000
TERRAIN	140.	95.	162.9	74.	2.00	.000	.05	.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	80.	154.7	89.	2.00	.000	.05	.000
SKY	140.	80.	154.7	89.	2.00	.000	.05	.000
TERRAIN	10.	40.	129.4	129.	2.00	.000	.05	.000
TERRAIN	140.	40.	129.4	129.	2.00	.000	.05	.000

APPENDIX B

PLOT MAPS OF THE LANDFILL AND PROPOSED FACILITY



REVISION	DATE	DESCRIPTION
1	4/25/13	ROTATED PROPOSED LFGTE FACILITY 90 DEG CW

HDR

ISSUE	DATE	DESCRIPTION
A	7 APR 11	EXHIBIT D ISSUE

PROJECT MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	125411

Central County Solid Waste Disposal Complex

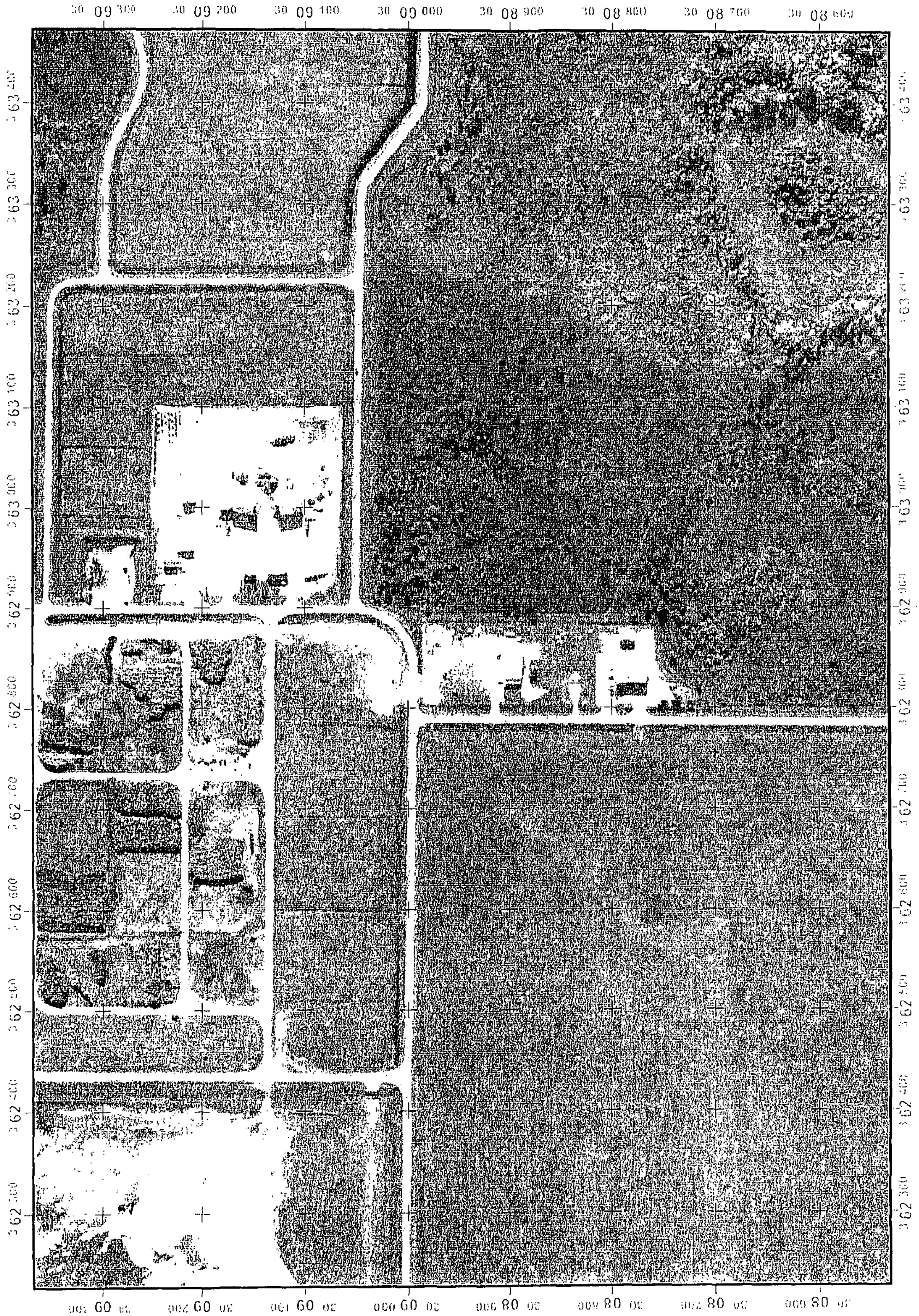
PRELIMINARY

SARASOTA COUNTY FLORIDA

EXHIBIT D
PROPOSED FACILITY SITE
AND
INTERCONNECTIONS

FILENAME	125411-CCA-M1001
SCALE	1" = 20'-0"

SHEET M1001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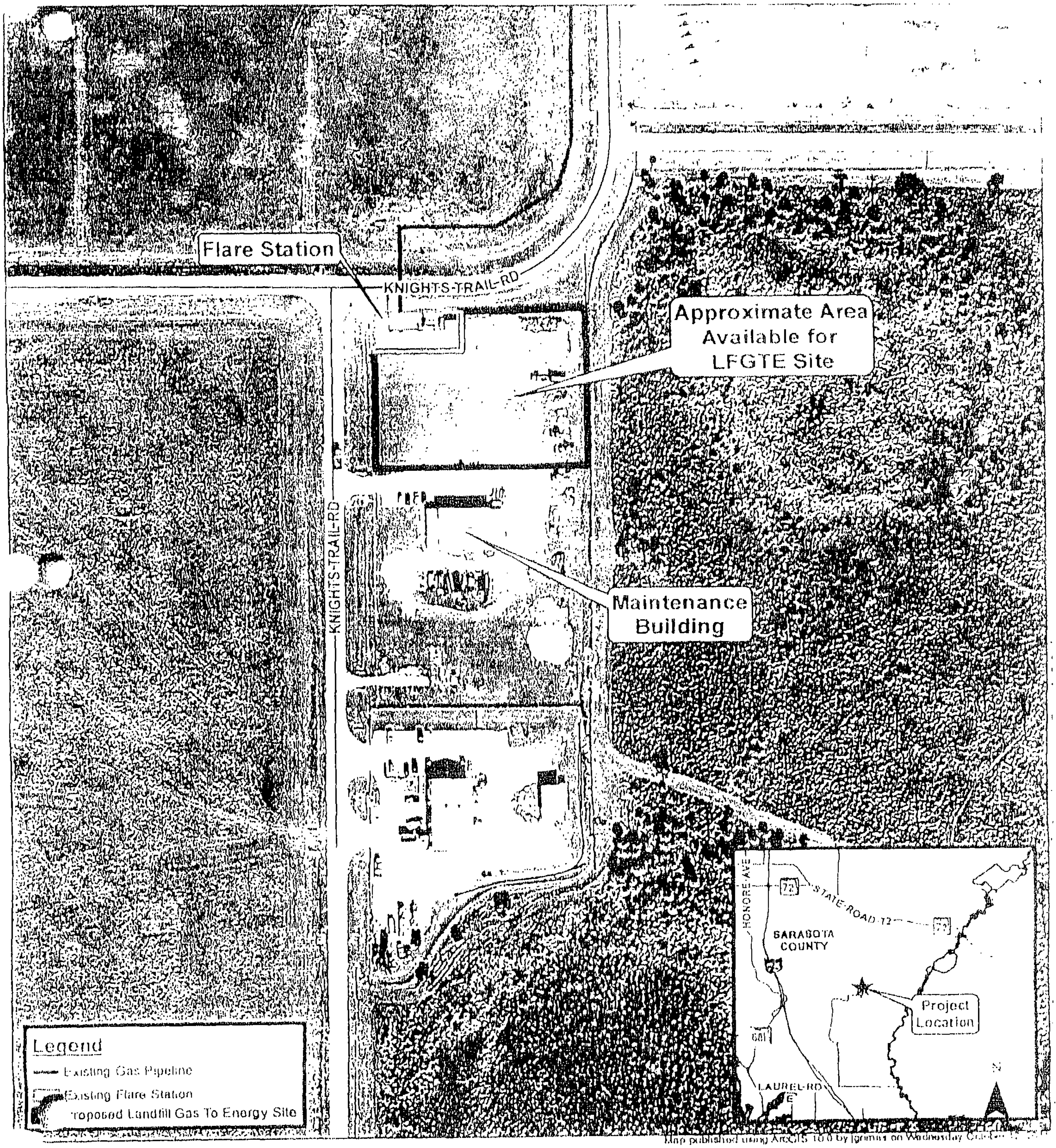
30 08 600

Central County Solid Waste Disposal Complex
Landfill Gas to Energy Facility

CIP# 95215



Map published using ArcGIS 10.0 by

Aerial Imagery Provided by PhotoScience
Sarasota County, FL

0 100 200

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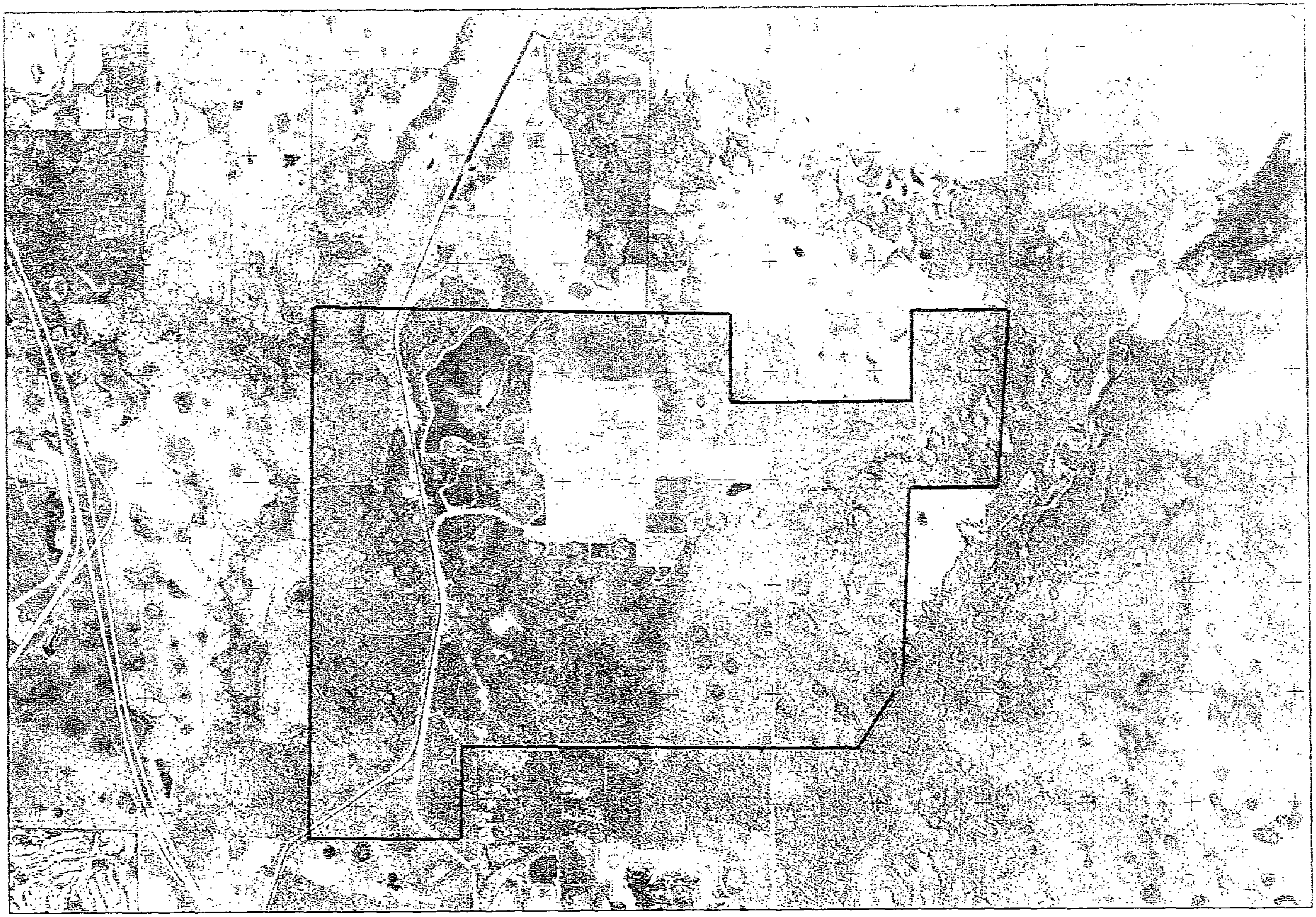
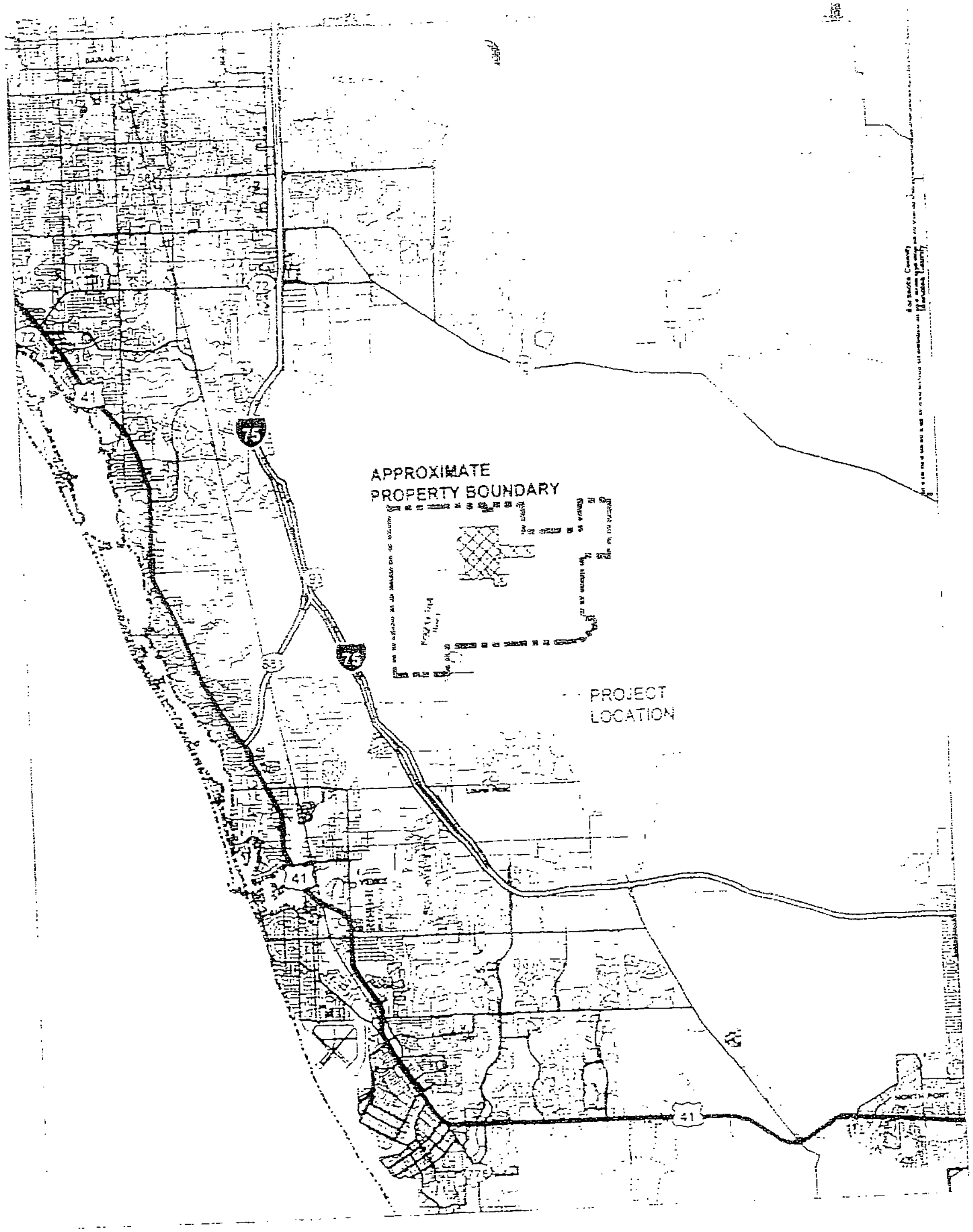
and is representative information only.
The County does not warrant or guarantee





APPROXIMATE
PROPERTY BOUNDARY
PROJECT
LOCATION

APPENDIX C

CAT® ENGINE / GENERATOR
TECHNICAL DATA

G3520C

GAS ENGINE TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED (rpm):	1200	FUEL:	Low Energy
COMPRESSION RATIO:	11.3	FUEL SYSTEM:	CAT LOW PRESSURE WITH AIR FUEL RATIO CONTROL
AFTERCOOLER - STAGE 2 INLET (°F):	130		
AFTERCOOLER - STAGE 1 INLET (°F):	217	FUEL PRESSURE RANGE(psig):	1.5-5.0
JACKET WATER OUTLET (°F):	230	FUEL METHANE NUMBER:	140
ASPIRATION:	TA	FUEL LHV (Btu/scf):	500
COOLING SYSTEM:	JW+1AC, OC+2AC	ALTITUDE CAPABILITY AT 77°F INLET AIR TEMP. (ft):	1378
IGNITION SYSTEM:	ADEM3	APPLICATION:	Genset
EXHAUST MANIFOLD:	DRY	POWER FACTOR:	0.8
COMBUSTION:	Low Emission	VOLTAGE(V):	480-4160
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.5		

RATING		NOTES	LOAD	100%	75%	50%
GENSET POWER	(WITHOUT FAN)	(1)(2)	ekW	1600	1200	800
GENSET POWER	(WITHOUT FAN)	(1)(2)	KVA	2000	1500	1000
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	2242	1683	1128
GENERATOR EFFICIENCY		(1)	%	95.7	95.6	95.1
GENSET EFFECIENCY	(ISO 3046/1)	(3)	%	38.3	37.0	34.5
GENSET EFFECIENCY	(NOMINAL)	(3)	%	37.4	36.1	33.7
ENGINE EFFICIENCY	(NOMINAL)	(3)	%	39.1	37.8	35.4
THERMAL EFFICIENCY	(NOMINAL)	(4)	%	39.8	39.1	40.5
TOTAL EFFICIENCY	(NOMINAL)	(5)	%	77.2	75.2	74.2

ENGINE DATA						
GENSET FUEL CONSUMPTION	(ISO 3046/1)	(6)	Btu/ekW-hr	8907	9221	9895
GENSET FUEL CONSUMPTION	(NOMINAL)	(6)	Btu/ekW-hr	9124	9446	10137
ENGINE FUEL CONSUMPTION	NOMINAL	(6)	Btu/bhp-hr	6511	6734	7189
AIR FLOW (77°F, 14.7 psia)	(WET)	(7)	scfm	4441	3372	2284
AIR FLOW	(WET)	(7)	lb/hr	19691	14952	10130
COMPRESSOR OUT PRESSURE			in Hg(abs)	107.2	80.7	54.8
COMPRESSOR OUT TEMPERATURE			°F	378	304	218
AFTERCOOLER AIR OUT TEMPERATURE			°F	142	138	136
INLET MAN. PRESSURE		(8)	in Hg(abs)	93.5	71.0	49.1
INLET MAN. TEMPERATURE	(MEASURED IN PLENUM)	(9)	°F	142	138	136
TIMING		(10)	°BTDC	28	28	28
EXHAUST TEMPERATURE - ENGINE OUTLET		(11)	°F	903	949	986
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(12)	ft3/min	12723	10008	7001
EXHAUST GAS MASS FLOW	(WET)	(12)	lb/hr	21863	16638	11336
MAX INLET RESTRICTION		(13)	in H2O	10.04	10.04	10.04
MAX EXHAUST RESTRICTION		(13)	in H2O	20.07	20.07	20.07

EMISSIONS DATA - ENGINE OUT					
NOx (as NO2)	(14)(15)	g/bhp-hr	0.50	0.50	0.50
CO	(14)(16)	g/bhp-hr	4.22	4.35	4.49
THC (mol. wt. of 15.84)	(14)(16)	g/bhp-hr	5.63	6.37	7.49
NMHC (mol. wt. of 15.84)	(14)(16)	g/bhp-hr	0.85	0.96	1.12
NMNEHC (VOCs) (mol. wt. of 15.84)	(14)(16)(17)	g/bhp-hr	0.56	0.64	0.75
HCHO (Formaldehyde)	(14)(16)	g/bhp-hr	0.42	0.43	0.43
CO2	(14)(16)	g/bhp-hr	747	773	794
EXHAUST OXYGEN	(14)(18)	% DRY	8.8	8.5	8.4
LAMBDA	(14)(18)		1.68	1.64	1.55

ENERGY BALANCE DATA					
LHV INPUT	(19)	Btu/min	243311	188925	135157
HEAT REJECTION TO JACKET WATER (JW)	(20)(27)	Btu/min	29209	23554	22109
HEAT REJECTION TO ATMOSPHERE	(21)	Btu/min	7210	6013	4823
HEAT REJECTION TO LUBE OIL (OC)	(22)(28)	Btu/min	7791	6995	6197
HEAT REJECTION TO EXHAUST (LHV TO 77°F)	(23)	Btu/min	80267	67378	48301
HEAT REJECTION TO EXHAUST (LHV TO 350°F)	(23)	Btu/min	54199	44836	32646
HEAT REJECTION TO A/C - STAGE 1 (1AC)	(24)(27)	Btu/min	13343	5446	7
HEAT REJECTION TO A/C - STAGE 2 (2AC)	(25)(28)	Btu/min	8434	6176	3904
PUMP POWER	(26)	Btu/min	1977	1977	1977

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1. (Standard reference conditions of 77°F, 29.60 in Hg barometric pressure, 500 ft. altitude.) No overload permitted at rating shown. Consult altitude curves for applications above maximum rated altitude and/or temperature.

Emission levels are at engine exhaust flange prior to any after treatment. Values are based on engine operating at steady state conditions, adjusted to the specified NOx level at 100% load. Tolerances specified are dependent upon fuel quality. Fuel methane number cannot vary more than ± 3.

For notes information consult page three.

FUEL USAGE GUIDE

CAT METHANE NUMBER	110	120	130	140	150
SET POINT TIMING	-	24	26	28	30
DERATION FACTOR	0	1	1	1	1

ALTITUDE DERATION FACTORS AT RATED SPEED

INLET AIR TEMP °F \ ALTITUDE (FEET ABOVE SEA LEVEL)	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	0.96	0.93	0.89	0.86	0.83	0.79	0.76	0.73	0.70	0.68	0.65	0.62	0.60
120	0.98	0.94	0.91	0.87	0.84	0.81	0.78	0.75	0.72	0.69	0.66	0.64	0.61
110	1	0.96	0.92	0.89	0.85	0.82	0.79	0.76	0.73	0.70	0.67	0.65	0.62
100	1	0.98	0.94	0.90	0.87	0.84	0.80	0.77	0.74	0.71	0.69	0.66	0.63
90	1	0.99	0.96	0.92	0.89	0.85	0.82	0.79	0.76	0.73	0.70	0.67	0.64
80	1	1	0.97	0.94	0.90	0.87	0.83	0.80	0.77	0.74	0.71	0.68	0.65
70	1	1	0.99	0.96	0.92	0.88	0.85	0.82	0.79	0.75	0.72	0.69	0.67
60	1	1	1	0.97	0.94	0.90	0.87	0.83	0.80	0.77	0.74	0.71	0.68
50	1	1	1	0.99	0.96	0.92	0.88	0.85	0.82	0.78	0.75	0.72	0.69

AFTERCOOLER HEAT REJECTION FACTORS (ACHRF)

INLET AIR TEMP °F \ ALTITUDE (FEET ABOVE SEA LEVEL)	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	1.33	1.37	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39
120	1.26	1.31	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
110	1.19	1.24	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
100	1.13	1.17	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19
90	1.06	1.11	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
80	1	1.04	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
70	1	1	1	1	1	1	1	1	1	1	1	1	1
60	1	1	1	1	1	1	1	1	1	1	1	1	1
50	1	1	1	1	1	1	1	1	1	1	1	1	1

FUEL USAGE GUIDE:

This table shows the derate factor required for a given fuel. Note that deration occurs as the methane number decreases. Methane number is a scale to measure detonation characteristics of various fuels. The methane number of a fuel is determined by using the Caterpillar Methane Number Calculation program.

ALTITUDE DERATION FACTORS:

This table shows the deration required for various air inlet temperatures and altitudes. Use this information along with the fuel usage guide chart to help determine actual engine power for your site.

ACTUAL ENGINE RATING:

To determine the actual rating of the engine at site conditions, one must consider separately, limitations due to fuel characteristics and air system limitations. The Fuel Usage Guide deration establishes fuel limitations. The Altitude/Temperature deration factors and RPC (reference the Caterpillar Methane Program) establish air system limitations. RPC comes into play when the Altitude/Temperature deration is less than 1.0 (100%). Under this condition, add the two factors together. When the site conditions do not require an Altitude/Temperature derate (factor is 1.0), it is assumed the turbocharger has sufficient capability to overcome the low fuel relative power, and RPC is ignored. To determine the actual power available, take the lowest rating between 1) and 2).

1) Fuel Usage Guide Deration
2) 1-((1-Altitude/Temperature Deration) + (1-RPC))

AFTERCOOLER HEAT REJECTION FACTORS(ACHRF):

Aftercooler heat rejection is given for standard conditions of 77°F and 500 ft. altitude. To maintain a constant air inlet manifold temperature, as the inlet air temperature goes up, so must the heat rejection. As altitude increases, the turbocharger must work harder to overcome the lower atmospheric pressure. This increases the amount of heat that must be removed from the inlet air by the aftercooler. Use the aftercooler heat rejection factor (ACHRF) to adjust for inlet air temp and altitude conditions. See Notes 27 and 28 below for application of this factor in calculating the heat exchanger sizing criteria. Failure to properly account for these factors could result in detonation and cause the engine to shutdown or fail.

NOTES:

1. Generator efficiencies, power factor, and voltage are based on standard generator. [Genset Power (ekW) is calculated as: Engine Power (bkW) x Generator Efficiency], [Genset Power (kVA) is calculated as: Engine Power (bkW) x Generator Efficiency / Power Factor]
2. Rating is with two engine driven water pumps. Tolerance is (+)3, (-)0% of full load.
3. ISO 3046/1 Genset efficiency tolerance is (+)0, (-)5% of full load % efficiency value. Nominal genset and engine efficiency tolerance is ± 2.5% of full load % efficiency value.
4. Thermal Efficiency is calculated as: (Heat rejection to jacket water + Heat Rejection to A/C Stage 1 + Heat rejection to exhaust to 350°F) / LHV Input
5. Total efficiency is calculated as: Genset Efficiency + Thermal Efficiency. Tolerance is ±10% of full load data.
6. ISO 3046/1 Genset fuel consumption tolerance is (+)5, (-)0% of full load data. Nominal genset and engine fuel consumption tolerance is ± 2.5% of full load data.
7. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.
8. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.
9. Inlet manifold temperature is a nominal value with a tolerance of ± 9°F.
10. Timing indicated is for use with the minimum fuel methane number specified. Consult the appropriate fuel usage guide for timing at other methane numbers.
11. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.
12. Exhaust flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 6 %.
13. Inlet and Exhaust Restrictions are maximum allowed values at the corresponding loads. Increasing restrictions beyond what is specified will result in a significant engine derate.
14. Emissions data is at engine exhaust flange prior to any after treatment.
15. NOx tolerances are ± 18% of specified value.
16. CO, CO_2, THC, NMHC, NMNEHC, and HCHO values are "Not to Exceed" levels. THC, NMHC, and NMNEHC do not include aldehydes.
17. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ
18. Exhaust Oxygen tolerance is ± 0.5; Lambda tolerance is ± 0.05. Lambda and Exhaust Oxygen level are the result of adjusting the engine to operate at the specified NOx level.
19. LHV rate tolerance is ± 2.5%.
20. Heat rejection to jacket water value displayed includes heat to jacket water alone. Value is based on treated water. Tolerance is ± 10% of full load data.
21. Heat rejection to atmosphere based on treated water. Tolerance is ± 50% of full load data.
22. Lube oil heat rate based on treated water. Tolerance is ± 20% of full load data.
23. Exhaust heat rate based on treated water. Tolerance is ± 10% of full load data.
24. Heat rejection to A/C - Stage 1 based on treated water. Tolerance is ±5% of full load data.
25. Heat rejection to A/C - Stage 2 based on treated water. Tolerance is ±5% of full load data.
26. Pump power includes engine driven jacket water and aftercooler water pumps. Engine brake power includes effects of pump power.
27. Total Jacket Water Circuit heat rejection is calculated as: (JW x 1.1) + (1AC x 1.05) + [0.9 x (1AC + 2AC) x (ACHRF - 1) x 1.05]. Heat exchanger sizing criterion is maximum circuit heat rejection at site conditions, with applied tolerances. A cooling system safety factor may be multiplied by the total circuit heat rejection to provide additional margin.
28. Total Second Stage Aftercooler Circuit heat rejection is calculated as: (OC x 1.2) + (2AC x 1.05) + [(1AC + 2AC) x 0.1 x (ACHRF - 1) x 1.05]. Heat exchanger sizing criterion is maximum circuit heat rejection at site conditions, with applied tolerances. A cooling system safety factor may be multiplied by the total circuit heat rejection to provide additional margin.

FREE FIELD MECHANICAL & EXHAUST NOISE

MECHANICAL: Sound Power (1/3 Octave Frequencies)

Gen Power Without Fan	Percent Load	Engine Power	Overall	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz
ekW	%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1600	100	2242	116.6	77.2	87.0	87.7	90.3	96.5	98.1	98.9	101.2	93.8	102.6
1200	75	1683	115.5	76.3	84.2	84.9	88.9	93.3	97.2	94.3	99.0	92.5	100.8
800	50	1128	113.7	73.8	81.0	80.4	87.2	90.5	93.2	92.4	98.1	90.5	99.6

MECHANICAL: Sound Power (1/3 Octave Frequencies)

Gen Power Without Fan	Percent Load	Engine Power	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
ekW	%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1600	100	2242	107.9	105.6	108.6	105.6	103.2	102.6	101.3	101.0	101.1	106.1	109.8
1200	75	1683	107.9	103.4	105.7	104.3	101.2	101.1	100.1	100.1	100.7	110.6	99.2
800	50	1128	108.2	101.3	104.2	105.6	99.7	100.1	98.8	98.9	102.7	98.0	95.2

EXHAUST: Sound Power (1/3 Octave Frequencies)

Gen Power Without Fan	Percent Load	Engine Power	Overall	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz
ekW	%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1600	100	2242	117.6	107.2	98.1	98.0	88.1	106.8	97.7	106.0	100.2	94.2	102.5
1200	75	1683	117.1	106.8	96.7	96.0	92.9	110.8	99.0	105.5	97.8	95.8	102.1
800	50	1128	114.8	106.3	95.0	93.9	89.4	108.0	96.1	101.8	94.2	94.8	98.8

EXHAUST: Sound Power (1/3 Octave Frequencies)

Gen Power Without Fan	Percent Load	Engine Power	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
ekW	%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1600	100	2242	100.4	102.1	101.7	101.9	104.9	106.9	107.2	107.4	105.8	104.7	107.9
1200	75	1683	97.9	100.9	101.6	98.9	103.0	105.2	105.9	106.6	105.3	101.0	105.8
800	50	1128	94.7	97.6	98.5	95.1	101.0	103.9	103.9	103.9	101.3	101.5	100.8

SOUND PARAMETER DEFINITION:

Sound Power Level Data - DM8702-01

Sound power is defined as the total sound energy emanating from a source irrespective of direction or distance. Sound power level data is presented under two index headings:
Sound power level -- Mechanical
Sound power level -- Exhaust

Mechanical: Sound power level data is calculated in accordance with ISO 6798. The data is recorded with the exhaust sound source isolated.

Exhaust: Sound power level data is calculated in accordance with ISO 6798 Annex A.

Measurements made in accordance with ISO 6798 for engine and exhaust sound level only. No cooling system noise is included unless specifically indicated. Sound level data is indicative of noise levels recorded on one engine sample in a survey grade 3 environment.

How an engine is packaged, installed and the site acoustical environment will affect the site specific sound levels. For site specific sound level guarantees, sound data collection needs to be done on-site or under similar conditions.

APPENDIX D

BACKGROUND SOURCES AND BACKGROUND CONCENTRATION MONITORING DATA

Nitrogen Dioxide (42602) Units: ppb

Site:L1151006 - Paw Park County:Sarasota AQS Monitor ID:12-115-1006-42602-1

Year	Ranked 1-Hour Averages		98th Percentile Values		Annual	Design
	1st	2nd	Complete Days	Valid	Average	Value
2010	24 (11/09:19)	24 (11/11:19)	24	24	4.3	
2011	17 (12/29:21)	17 (12/30:08)	16	16	2.9	
2012	29 (01/05:09)	23 (01/04:19)	17	17	2.8	19

The primary and secondary ambient air quality standards for NO_2 are 53 ppb, an annual arithmetic mean concentration. The standards are attained when the annual arithmetic mean concentration in a calendar year is less than or equal to 53 ppb.

The 1-hour NAAQS standard for NO_2 is met when the design value (3-year average of the 98th percentile annual daily max) is less than or equal to 100 ppb.

$PM_{2.5}$ (88101,88500,88501,88502,88503) Units: $\mu g/m^3$

Site:L1150013 - Bee Ridge Park County:Sarasota AQS Monitor ID:12-115-0013-88101-1

Year	Quarterly Averages (#Valid 24-hour Observations)				Ranked 24hr Averages			98th Percentile	Weighted Annual Average	3-Year 98th Percentile Average	3-Year Annual Average
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st	2nd	3rd				
2010	7.78 [27]	7.03 [31]	5.18 [30]	8.36 [28]	15.5 (01/14)	14.3 (11/10)	14.2 (10/11)	14.2	7.1		
2011	7.8 [28]	8.28 [30]	5.92 [30]	5.41 [28]	20.5 (03/13)	17.3 (05/12)	14 (02/17)	14	6.9		
2012	8.1 [30]	6.19 [31]	6.3 [29]	7.06 [30]	32 (03/16)	18.3 (04/12)	18 (11/23)	18	6.9	15	7

The national ambient air quality standards for PM 2.5 are: (1) 35 micrograms per cubic meter for a 24-hour average concentration and (2) 12 micrograms per cubic meter for an annual mean concentration. The 24-hour standard is attained when the 3-year average of the annual 98th percentile values is less than or equal to the 24-hour standard. The annual standard is attained when the 3-year average of the annual means is less than or equal to the annual standard.

Elapsed time = 10 seconds

Facility ID	Owner / Company Name	UTM East(km)	UTM North(km)	Stack Height(ft)	Diam(ft)	Exit Temp(F)	ACFM	DSCFM	V EL(ft/s)	Pollutant	Emissions (g/s)
	Sarasota Energy	362.85	3008.954								
1150103	AJAX PAVING INDUSTRIES OF FLORIDA, LLC	362.2	3004	35	3.75	275	110629	56690	166.9	NOX	4.38
1150039	STEWART ENTERPRISES INC	351.4	3013.1	15	1.5	1000	2940	1060	27	NOX	0.005
7770143	WCA OF FLORIDA	360.87	3024.7	13	0.67	910	5720		270.4	NOX	4.65
1150169	MILLENNIUM COATING, LLC	361.03	3025.48	23	2.3	450	.	8000		NOX	0.05
7775055	WOODRUFF & SONS INC	367.61	2992.61	10	0.5	*70*			*20*	NOX	0.61
1150135	APAC-SOUTHEAST, INC.	362.89	3029.17	27	3.81	250	67000	34300	97.9	NOX	4.71
1150023	GENDRON FUNERAL & CREMATION SVCS INC	349.2	3024.9	14	1.7	700	2000		14	NOX	0.01
810193	BRASOTA SERVICES INC	347.01	3032.6	20	1.67	894	1490	568	11.3	NOX	0.04
810030	EATON AEROSPACE LLC	348.18	3033.52	*20*	*1*	70	586			NOX	0.01
810085	BELSPUR OAKS PET CREMATORY INC	350.35	3035.12	24	1	797	1443	555	30	NOX	0.01
7775052	WOODRUFF & SONS INC	349.06	3034.64	10	0.5	*70*			*20*	NOX	0.68
810164	FLOWERS BAKING COMPANY OF BRADENTON, LL	348.63	3034.79	37	1.5	270	2200	1400	20.8	NOX	0.15
810232	RATIONAL ENERGIES MC INC.	347.73	3034.38	16	2.6	1700		2200		NOX	0.21
810055	MANATEE COUNTY UTILITY OPERATIONS DEPT.	357.01	3039.08	65	1.8	183	6213		40.7	NOX	0.13
150015	VULCAN MATERIALS COMPANY	386.9	2988.85	30	1.5	75	550		.5	NOX	0.01
810201	SUPERIOR ASPHALT, INC.	348.73	3037.47	20	2.75	210	40000	23500	112.2	NOX	0.43
810087	SERVICE CORPORATION INTERNATIONAL	346.85	3036.99	17	1.7	1000	2600	900	19.1	NOX	0.13
810031	PIERCE MANUFACTURING	348.74	3038.83	*20*	*1*	*70*			*20*	NOX	0.87
810007	TROPICANA MANUFACTURING COMPANY, INC.	347.07	3040.92	67	12	268	343880		50.7	NOX	9.27
810174	ROCKTENN CP, LLC	346.8	3040.9	30	2.5	470	5723		19.4	NOX	0.07
150036	KING EXCAVATING, INC.	378.29	2974.43	15	*1*	2500	33300	7390		NOX	7.56
810200	BROWN & SONS FUNERAL HOMES	341.56	3042.09	15	1.5	1150	2100	700	19.8	NOX	0.03
810045	MANATEE CO BOARD OF CO COMMISSIONERS	346.83	3046.39	20	1.8	1396	3359	953	22	NOX	0.08
810010	FLORIDA POWER & LIGHT (PMT)	367.25	3054.15	120	22	1116	2389500	800000	104.8	NOX	48.03
810010	FLORIDA POWER & LIGHT (PMT)	367.15	3054.23	499	27.3	344	2739143	1608368	78	NOX	653.94
150046	REMEMBRANCE SERVICES OF FL LLC	400.83	2981.61	18	1.7	800	4114	1552	30	NOX	0.09
270003	PEACE RIVER CITRUS PRODUCTS	409.76	3010.45	30	2	400	12000		63.7	NOX	2.72
810215	GULFSTREAM NATURAL GAS SYSTEM, L.L.C.	350.35	3056.33	40	9	850	173600		45.5	NOX	3.41
150002	ASPHALT DEVELOPERS	400.7	2977.6	20	3.42	250	23400	18500	42.5	NOX	0.25
810024	FLORIDA POWER & LIGHT COMPANY	349.06	3056.51	20	3.33	650	4650		8.9	NOX	0.49
810063	AJAX PAVING INDUSTRIES, INC.	347.83	3056.59	34	2.31	300	84000		332.9	NOX	1.88
1150057	ELECTRO MECHANICAL SOUTH, INC.	356.4	302.25	15	0.83	1400		180		NOX	0.01

Notes:

1. In the event that stack height, diameter, temperature or exit velocity was missing the following values were used (20 ft., 1.0 ft., 70 °F, 20.0 ft/s, respectively). Assumed values are in italiacs.

Facility ID	Owner / Company Name	UTM East(km)	UTM North(km)	Stack Height(ft)	Diam(ft)	Exit Temp(F)	ACFM	DSCFM	VEL(ft/s)	Pollutant	Emissions (g/s))
1150131	PGT INDUSTRIES, LLC	362.29	3002.84	*20*	*1*	77			*20*	PM2.5	0.021
7770143	WCA OF FLORIDA	360.87	3024.7	*20*	*1*	77			*20*	PM2.5	0.002

Notes:

1. In the event that stack height, diameter, temperature or exit velocity was missing the following values were used (20 ft., 1.0 ft., 70 °F, 20.0 ft/s, respectively). Assumed values are in italiacs.

APPENDIX E

AERMOD MODELING FILES
(COMPACT DISC®)