PSD-FL-151C

MALCOLM PIRNIE

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INDEPENDENT ENVIRONMENTAL ENGINEERS, SCIENTISTS & CONSULTANTS

February 19, 2003

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BUREAU OF AIR REGULATION

Hamilton S. Oven, Jr., P.E.
Administrator, Office of Siting Coordination
Department of Environmental Protection
2600 Blair Stone Road, MS: 48
Tallahassee, Florida 32399

Re: Lee County Solid Waste Energy Recovery Facility, PA 90-30;
Responses to Sufficiency Comments

Dear Mr. Oven:

On behalf of Lee County, we are submitting these responses to the sufficiency comments and questions that were provided by the United States Environmental Protection Agency (the "USEPA" or "EPA") dated December 27, 2003 and the January 17, 2003 comments provided by the United States Department of the Interior, National Parks Service (the "NPS"). These agency comments concern the Supplemental Application ("Application") filed by Lee County for the construction and operation of municipal waste combustor (MWC) Unit No. 3 at the Lee County Solid Waste Energy Recovery Facility ("Facility"). The following responses were prepared through a collaborative effort by Lee County's Project Team, which includes representatives from the County's staff, Malcolm Pirnie, Inc., RTP Environmental Associates, Inc., Landers and Parsons, P.A., Covanta of Lee, Inc., as well as Mr. William Vatavuk, the President of Vatavuk Engineering.

<u>Comments Received from: United States Environmental Protection Agency</u>
<u>Dated: December 27, 2002</u>

In the following items, the referenced page numbers are page numbers in the application.

1. *For several pollutants, the applicant has proposed the federal new source performance standards (NSPS) in subpart Eb as best available control technology (BACT). We support the comments made by the Florida Department of Environmental Protection's (FDEP's) Bureau of Air Regulation (memo from Mike Halpin to Buck Oven dated December 12, 2002) to the effect that an emissions level meeting an applicable NSPS is the minimum requirement and not necessarily the level representative of BACT. For all pollutants where the proposed BACT emissions levels are no better than the NSPS, we recommend that*

> *FDEP give careful consideration to the possibility of lower BACT levels. Reviewing actual emissions data from the existing Units 1 and 2 might be helpful in evaluating the feasibility of lower emissions.*

Response: The NSPS (40 CFR 60 Subpart Eb) at issue in this case is also a Maximum Achievable Control Technology (MACT) standard. Thus, the NSPS/MACT standard in Subpart Eb represents substantially more than the "minimum standards for which a facility must comply in order to be permitted for operation." Section 129 of the 1990 Clean Air Act Amendments (CAAA) states:

> Standards applicable to solid waste incineration units promulgated under section 111 and this section shall reflect the maximum degree of reduction in emissions of air pollutants listed under section (a)(4) that the Administrator, taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable for new or existing units in each category. The Administrator may distinguish among classes, types (including mass-burn, refuse-derived fuel, modular and other types of units), and sizes of units within a category in establishing such standards. The degree of reduction in emissions that is deemed achievable for new units in a category shall not be less stringent than the emissions control that is achieved in practice by the best controlled similar unit, as determined by the Administrator.[1]

These concepts were reiterated by EPA when EPA published notice in the Federal Register concerning promulgation of 40 CFR 60 Subpart Eb (60 FR 65387; December 19, 1995), as follows:

> Under sections 111 and 129 of the Clean Air Act, the EPA is required to develop and adopt performance standards and guidelines for MWC's. Congress specifically added section 129 to the Clean Air Act to address public concerns about MWC's and other solid waste combustion units. Under section 111, performance standards and guidelines must be developed for new and existing stationary sources that may contribute to air pollution and that may reasonably be anticipated to endanger public health or welfare. Under section 129 of the Clean Air Act, the standards and guidelines adopted for MWC's must be based on MACT. (60 FR 65390; December 19, 1995)
>
> Section 129(a)(2) of the Clean Air Act requires the revised standards for new MWC's and revised guidelines for existing MWC's to reflect the maximum degree of reduction in emissions of designated air pollutants, taking into consideration the cost of achieving such emission reduction, and any non-air-quality health and environmental impacts and energy

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[1] Any underlining in this document has been added for emphasis, unless otherwise noted.

> requirements that the Administrator determines are achievable for a particular category of sources. (This control level is commonly referred to as the maximum achievable control technology, or "MACT".) Section 129 also provides that standards for new sources may not be less stringent than the emissions control achieved in practice by the best controlled similar units. (60 FR 65391)
>
> Today's notice promulgates revised standards and guidelines that are fully consistent with sections 111 and 129 of the Clean Air Act and extend coverage of the revised standards and guidelines to MWC units located at MWC plants with aggregate plant capacity above 35 Mg/day. (60 FR 65390)

A given control technology and emission limit (e.g., the NSPS/MACT limit for NOx in Subpart Eb) can represent BACT for a considerable time period (e.g., 10 years or more). Indeed, on December 31, 2002, EPA published its latest rules for improving the NSR program, and those rules create a 10-year exemption from NSR permitting requirements for "clean units."

It is also important to note that the Section 129 MACT standards for MWCs cover not only hazardous air pollutants, but also address "particulate matter (total and fine), opacity (as appropriate), sulfur dioxide, hydrogen chloride, oxides of nitrogen, carbon monoxide, lead, cadmium, mercury, and dioxins and dibenzo furans." (§ 129 CAAA, 1990) EPA expended considerable effort to establish MACT standards that address the entire array of potential emissions from MWCs.

Thus, it is apparent that 40 CFR 60 Subpart Eb is more than a typical NSPS, and represents what USEPA considers the maximum achievable control technology for that source category. We are not aware of any subsequent ruling or promulgation from USEPA since promulgation of 40 CFR 60 Subpart Eb that has changed this determination.

Actual data from the existing Lee County units have been reviewed and considered in setting the proposed emission limits contained in the Application. See the response to Comment Number 4, below.

2. *On page 1-4 the following statement appears: "There are no PSD significant changes planned for Units 1 and 2 at this time." Changes to Units 1 and 2 do not have to produce significant emissions increases in and of themselves to be included as part of the PSD review for Unit 3. Will there be changes to Units 1 and 2, and, if so, will these changes produce emissions increases of any quantity?*

Response: There are no physical or operational changes proposed to the existing MWCs, i.e., Units 1 and 2. Therefore, there will be no emissions increases from the existing MWCs.

3. *In a number of places the applicant makes a comment to the effect that the proposed emissions limits for Unit 3 are an overestimate of actual emissions that will occur. For example, on pages 1-4 and 1-5, the applicant qualitatively compares proposed emissions limits [for particulate matter (PM), sulfur dioxide (SO_2), volatile organic compounds (VOC), fluorides, carbon monoxide, cadmium, hydrogen chloride, lead, mercury, municipal waste combustor (MWC) organics, and nitrogen oxides (NO_x)] to federal new source performance standards (NSPS) and to the existing emissions limits for Units 1 and 2, and then goes on to state that "Actual emissions from Unit 3 are expected to be lower than the limits proposed by Lee County." If the applicant is confident that actual emissions will be lower than those proposed, it would seem reasonable to conclude that BACT emissions limits should be lower than those in the application. As a possible compromise for pollutants that will be measured continuously, dual emissions limits might be appropriate – a higher short-term limit to account for occasional elevated emissions and a lower long-term equivalent to the applicant's expectations of lesser actual emissions.*

Response: In all cases, permit limits must be established at a level higher than expected actual emissions from the source. Otherwise, the source and Lee County could be subjected to continuous permit violations and enforcement action.

Municipal solid waste (MSW) is a heterogeneous fuel that has significant variability. This variability in the fuel can cause significant variation in emissions. The margin between the proposed potential emission limit and the expected actual emission will fluctuate by pollutant, based on various factors including, but not limited to:

1. Waste characteristics;
2. Fuel characteristics;
3. Vendor/operator experience;
4. Transient spikes in concentration of pollutants; and
5. Changes in emissions as equipment ages.

A permit limit must be continuously achievable given known variations in facility operations. Therefore, a permit limit must be greater than typical or average emission limits. In either case, the modeled impacts are a conservative estimate of the potential impact of the facility.

The applicant has already reviewed test data from existing Units 1 and 2 and concluded that the proposed emission rates establish stringent limits that balance the factors presented above and will be continuously achievable throughout the life of the Facility. As noted in the USEPA's Comment number 5, "the results of a single test on new equipment are not necessarily indicative of long-term performance." Similarly, test data of actual emissions from the existing Facility from the first several years of its operation, when systems are new, may not be indicative of actual emissions throughout the

Facility's life. Therefore, the applicant has proposed stringent emissions limitations which are considered to be continuously achievable for the life of the Facility with well-run and well-maintained combustion and air pollution control equipment. In order to comply with these emissions limitations continuously, actual emissions must always be lower than the permitted emissions limits.

Lee County has already proposed Secondary Emission Levels for several pollutants as suggested in the comment.

4. *For assistance in assessing the reasonableness of the proposed emissions limits, a helpful comparison would be a summary of actual emissions measurement data for Units 1 and 2. If the applicant believes that actual emissions from Units 1 and 2 for a given pollutant are not likely to be representative of emissions from Unit 3, an explanation of why such measurements are not representative could be provided in the summary.*

Response: Lee County has provided extensive operational emissions data from existing Units 1 and 2 to the Florida of Environmental Protection (the "Department") for the past several years. Lee County has provided copies of annual emissions compliance tests in addition to Annual Operating Reports to the Department. Lee County and its project team have conducted an extensive review of existing unit operation over the past eight years. This analysis was provided to the Department in January 2002 in the form of a statistical report of Units 1 and 2 operations in support of proposed emission limits for the proposed Unit 3. In an effort to be responsive to the comment, we have attached a summarization of past test data for Units 1 and 2 See Attachment 2). The information provided in Attachment 2 is taken from annual compliance emissions tests for Units 1 and 2 and shows actual tested emission rates with respect to the permitted allowable emission rates for several pollutants covered under the Facility's Title V operating permit.

Past operating data is important in understanding the characteristics of a well-designed and operated MWC but they cannot be used to predict the future performance of a new third MWC. Past data does not fully recognize the variation in MSW characteristics and variations in equipment performance.

5. *On page 1-5 the applicant expresses intent to request at a future time the deletion of emissions limits for sulfuric acid mist, fluorides, arsenic, beryllium, VOC, and ammonia. (This request will depend on the results of initial compliance emission tests.) Although the merits of such a request are not an issue until the request (with supporting data) actually takes place, we wish to note that the procedure of deleting emissions limits based on a one-time test is not necessarily a good practice, for at least two reasons. One, the proposed emissions limits for VOC, fluorides, and beryllium serve as enforceable PSD-avoidance emissions rates for*

these pollutants. Second, the results of a single test on new equipment are not necessarily indicative of long-term performance.

Response: The permit application requires Lee County to determine which pollutants are applicable to regulation under the Prevention of Significant Deterioration (PSD) rules (e.g., BACT review, etc.). Therefore, emission rates must be estimated for the PSD applicability determination. For beryllium and VOC, estimated emissions are less than the PSD significant emission rates. The revised estimated emission rates for sulfuric acid mist (SAM) and fluorides, although greater than the PSD significant emission rates, are difficult to measure at these levels for MWCs based on the USEPA reference stack testing methods.. Ammonia and arsenic are not PSD pollutants, so regulation is not strictly required for these pollutants under PSD. As noted in the attached data (Attachment 2), stack test averages indicate actual emissions significantly below permit limits. Therefore, a single stack test is proposed only to establish the suitability of the estimated emission rates for purposes of the PSD permit application. The estimated emission rates for these pollutants are not expected to be imposed as permit conditions, especially since "compliance" with these estimated emissions is expected to be demonstrated by a wide margin for all these pollutants.

The request to delete the estimated emission rates from the PSD permit after initial testing is based primarily on the results of the stack testing data available for the two existing MWCs. These stack test data are shown below (where "<" indicates that the measured concentration is less than the detection limit of the stack testing method; and bolded values represent maximum measured emissions from Unit 1 and Unit 2):

Stack Test Results for Lee County ERF								
Pollutant /Year	**Unit 1**				**Unit 2**			
	Run 1	**Run 2**	**Run 3**	**Average**	**Run 1**	**Run 2**	**Run 3**	**Average**
VOC	**(ppmdv@7%O_2)**				**(ppmdv@7%O_2)**			
2000	2.40	**3.10**	2.20	2.60	2.05	2.30	2.30	2.20
1999	1.70	1.00	0.70	1.10	**6.80**	3.10	2.10	4.00
1998	<0.366	<0.366	<0.366	<0.366	<0.378	<0.378	<0.378	<0.378
1997	<0.344	<0.331	<0.331	<0.335	<0.325	<0.366	<0.362	<0.351
1996	<1.70	<1.70	<1.70	<1.70	<1.60	<1.60	<1.60	<1.60
1995	2.61	1.55	1.57	1.91	2.48	1.73	1.90	2.04
1994	<2	<2	<2	<2	2.20	<2	<2	<2
Average				<1.430				<1.796

HF	**(ppmdv@7%O_2)**				**(ppmdv@7%O_2)**			
2000	**<0.19**	<0.18	<0.18	<0.19	**<0.19**	<0.18	<0.18	<0.18
1999	<0.11	<0.10	<0.08	<0.10	<0.09	<0.10	<0.09	<0.09
1998	<0.11	<0.12	<0.10	<0.11	<0.11	<0.10	<0.12	<0.11
1997	<0.109	<0.102	<0.101	<0.104	<0.127	<0.114	<0.108	<0.116
1996	<0.048	0.18	<0.05	0.18	<0.049	<0.047	<0.048	<0.048
1995	<0.0309	<0.0335	<0.0266	<0.0303	<0.0339	<0.03	<0.0295	<0.0311
1994	<0.045	<0.043	<0.045	<0.044	<0.047	<0.054	<0.059	<0.053
Average				<0.108				<0.09

Ammonia	(ppmdv@7%O_2)				(ppmdv@7%O_2)			
2000	0.76	1.08	0.82	0.88	0.79	1.33	1.12	1.08
1999	0.48	0.39	1.33	0.73	1.17	0.75	0.44	0.79
1998	0.94	1.10	0.73	0.93	0.50	0.41	0.66	0.52
1997	1.64	0.99	**1.65**	1.43	1.88	0.82	0.74	1.15
1996	1.50	0.80	0.29	0.86	**2.37**	1.90	2.11	2.12
1995	0.82	0.80	0.65	0.76	1.26	0.45	0.40	0.71
1994	0.90	1.05	0.76	0.91	1.02	1.39	1.35	1.25
Average				0.93				1.09

Stack Test Results for Lee County ERF

Pollutant /Year	**Unit 1**				**Unit 2**			
	Run 1	**Run 2**	**Run 3**	Average	**Run 1**	**Run 2**	**Run 3**	Average
Be	**(mg/dscm@7%O_2)**				**(mg/dscm@7%O_2)**			
2000	4.00E-05	4.00E-05	4.00E-05	4.00E-05	1.00E-05	1.00E-05	6.00E-05	3.00E-05
1999	<1.98E-05	<2.00E-05	<2.04E-05	<2.01E-05	<1.94E-05	<1.96E-05	<1.91E-05	<1.94E-05
1998	<8.58E-05	<8.55E-05	<9.57E-05	<8.90E-05	<8.70E-05	<8.78E-05	<9.29E-05	<8.92E-05
1997	<9.51E-05	**<1.02E-04**	<9.66E-05	<9.79E-05	<9.80E-05	<9.90E-05	**<1.00E-04**	<9.90E-05
1996	<4.78E-05	<4.95E-05	<5.01E-05	<4.91E-05	<5.22E-05	<4.98E-05	<5.21E-05	<5.14E-05
Average				<5.92E-05				<5.78E-05

SAM	**(ppmdv@7%O_2)**				**(ppmdv@7%O_2)**			
2000	<8.13E-03	<5.91E-03	<2.96E-03	<5.91E-03	0.0	1.74E-02	<8.72E-03	<8.72E-03
1999	3.37	2.79	3.27	3.14	1.72	2.64	3.03	2.46
1998	4.47	3.58	3.54	3.86	2.57	2.48	2.90	2.65
1997	0.22	0.22	0.43	0.29	0.21	0.41	0.41	0.34
1996	0.45	0.22	0.44	0.37	0.37	0.48	0.62	0.49
1995	<2.46E-02	<2.41E-02	<3.28E-02	<2.72E-02	<2.70E-02	<3.10E-02	<2.00E-02	<2.60E-02
1994	3.03	2.44	1.70	2.36	2.25	2.32	2.25	2.25
Average				<1.44				<1.18

Arsenic	**(mg/dscm@7%O_2)**				**(mg/dscm@7%O_2)**			
2000	<3.49E-04	<3.13E-04	<3.53E-04	<3.37E-04	8.28E-04	<5.95E-04	<1.80E-03	<8.08E-04
1999	<3.61E-04	7.66E-04	4.84E-04	<5.37E-04	4.54E-04	4.32E-04	<3.49E-04	<4.11E-04
1998	6.29E-04	4.11E-04	<3.83E-04	<4.70E-04	5.81E-04	5.87E-04	8.04E-04	6.58E-04
1997	<3.69E-04	<3.96E-04	<3.73E-04	<3.82E-04	6.46E-04	8.06E-04	<3.87E-04	<6.14E-04
1996	1.91E-04	<1.98E-04	2.01E-04	<1.96E-04	<2.09E-04	8.29E-05	<2.09E-04	<1.65E-04
1995	<4.35E-04	<4.60E-04	<4.59E-04	<4.50E-04	<4.36E-04	<4.41E-04	<4.37E-04	<4.42E-04
1994								
Average				<3.95E-04				<5.16E-04

Thus, the measurements for the existing units support the deletion of the permit limits after the initial performance evaluation. In fact, the Department reduced the testing schedule for the two existing MWCs for these six pollutants as part of the PSD permit modification embodied in PSD-FL-151B (March 2000) based on the above stack test data. Similarly, the Department has reduced the testing schedule frequency for other MWC facilities throughout Florida.

6. *Table 2-1 on page 2-4 contains a comparison of emissions from Unit 3 to the PSD significant emissions increases levels. Will there be any emissions increases from emissions units or activities other than Unit 3? If so, those increases should be added to the Unit 3 increases for PSD applicability purposes.*

Response: As noted in our response to Comment 2 above, there will be no increase in emissions for the existing MWC Units 1 and 2. However, there will be an additional lime storage silo constructed for the spray dry absorber (SDA) system for the new unit. As shown on the air permit forms attached to the permit application as Attachment A, silo emissions are 0.0281 tons/year. A revised Table 2-1 is attached which includes these silo emissions (See Attachment 3).

7. *The estimated sulfuric acid mist emissions increase from Unit 3 is approximately 74 tons per year (tpy). This seems very high, especially in light of the statement on page 1-5 that the applicant will probably request deletion of the sulfuric acid mist emissions limit at some future date. We recommend that FDEP review any sulfuric acid emissions measurement data for Units 1 and 2 to assess whether the proposed Unit 3 rate is excessive.*

Response: The proposed sulfuric acid mist (SAM) emission limit was based on an assumed percentage of the proposed SO_2 emission rate as was done for the permit application for existing Units 1 and 2. Test data from existing Units 1 and 2 have demonstrated consistently low emissions of SAM as shown in the attached table (Attachment 4). Despite the generally low emissions values, several data points are over 60% of the permitted limit for Units 1 and 2. Thus, Lee County proposes to reduce the proposed SAM emission limit for Unit 3 to the levels currently in effect for the existing Units 1 and 2. The current permit level for SAM is 9.85 lbs SAM/hour (per existing MWC unit) or 39.3 tons SAM per year (per existing MWC unit). Because SAM emissions are a function of SO_2 concentration, temperature and water vapor content of the flue gas, this emission limit is proportional to the maximum allowable SO_2 stack emission limit of 100 ppmdv. The new SAM limit would be proportional to an outlet concentration of approximately 10 ppmdv (7% O_2).[2] Revised application forms are provided as Attachment 5. The modeling section will not be revised at this time as it represents a conservative assessment of SAM impacts.

8. *In Table 2-1 on page 2-4, the applicant shows the MWC metals emission rate (as PM) as equal to the total PM emission rate. Is the applicant assuming that all particles emitted from the facility are made up entirely of metals?*

Response: No. Although MWC metals are defined in the NSPS (40 CFR 60.51b, Subpart Eb) as "metals and metal compounds emitted in the exhaust gases from MWC

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[2] Personal Communication between Brian Bahor, Covanta Projects, Inc. and Michael Hober, RTP Environmental Associates, Inc., February 2003.

units," the definition of "significant" in the Prevention of Significant Deterioration (PSD) regulations differs. Significant emission rates for PSD applicability purposes are defined at *40 CFR 52.21(b)(23)(i) for MWC metals as* particulate matter emission rates greater than 15 tons per year. This is similar to the use of VOC emissions to determine PSD applicability for the criteria pollutant O_3. Therefore, Table 2-1 is correct in listing the PM emission rate when determining whether MWC metals are PSD applicable.

In addition, as noted in the NSPS at 40 CFR 60.52b, Subpart Eb, there are separate standards for cadmium, lead, and mercury. However, the standard for MWC metals in 40 CFR 60.52b(a)(1) states:

> On and after the date on which the initial performance test is completed or is required to be completed under 60.8 of subpart A of this part, no owner or operator of an affected facility shall cause to be discharged into the atmosphere from that affected facility any gases that contain particulate matter in excess of 24 milligrams per dry standard cubic meter, corrected to 7 percent oxygen.

Thus, the MWC metals emission standard is expressed as a total particulate matter emissions standard without an assumed percentage of metal content.

9. *In Table 2-1 on page 2-4, the applicant shows the fluorides emission rate from Unit 3 to be 2.986 tpy which is just slightly less than the PSD significant emissions increase level of 3 tpy. The estimate of 2.986 tpy is derived from an estimate of total hydrogen fluoride (HF) emissions (3.145 tpy) by removing the hydrogen component. Our reading of Florida's PSD rules does not indicate that this is an allowed procedure for calculating fluorides emissions. We recommend that FDEP assess whether in fact emissions of fluorides are exempt from PSD review.*

Response: The proposed emission value for fluorides (3.5 ppmdv at 7% O_2, 2.986 tons per year [tpy]) is very low. Tested fluorides emissions from existing Units 1 and 2 are very low. Our reading of Florida's PSD rules does not indicate that the procedure used to calculate fluoride emissions is not allowed. Nonetheless, Lee County wishes to be responsive to EPA's comment, so the County is willing to restate fluoride emissions as hydrogen fluorides (HF) (3.145 tpy). This would result in proposed fluoride emissions that exceed the PSD significance threshold. Accordingly, additional language has been added to the Best Available Control Technology (BACT) section (Section 4) of the PSD application for fluorides. See Attachment 6. A revised Table 2-1 reflecting this change is provided as Attachment 3. The application forms and modeling analyses were completed conservatively, with the higher fluoride emission rate as hydrogen fluoride (3.145 tpy).

10. *The applicant is proposing a higher NO_x emission rate during the first year compared to succeeding years as allowed by federal NSPS. Since the applicant already has operating experience on two similar units at the same site burning essentially the same waste material, we question whether the higher first-year emission rate is needed in this case.*

Response: The existing Lee County Units 1 and 2 operate under an air permit limiting NOx emissions to 180 ppmdv at 7% O_2, based on a 24-hour average as required in 40 CFR 60, Subpart Ea. These MWC units utilize anhydrous ammonia in their Selective Non-Catalytic Reduction (SNCR) DeNOx system. Thus, Lee County has experience operating a facility utilizing anhydrous ammonia to achieve NOx levels of 180 ppmdv at 7% O_2 or less. Lee County is proposing for Unit 3 a NOx limit of 150 ppmdv at 7% O_2 (after the first year) based on a 24-hour average utilizing an aqueous ammonia SNCR DeNOx system. As Lee County has no experience with an aqueous ammonia DeNOx system to achieve a lower NOx emission level than the existing units, it is necessary to allow the higher (180 ppmdv at 7% O_2) NOx emission level for the first year. The initial year should provide sufficient operational time with the new NOx control system to maintain continuous NOx levels below 150 ppmdv at 7% O_2 (24-hour average) during subsequent years. This is the very reason the USEPA included the allowance of first year higher NOx levels when promulgating 40 CFR 60, Subpart Eb. In the promulgation of the Subpart Eb standard, EPA states that:

> Applications of SNCR typically require some site-specific fine-tuning to achieve optimum performance levels. Based on the revised data, a two-phase standard is being adopted. The final NOx standard for MWC's at large plants allows time to "fine-tune" the SNCR system. The final standard for MWC's at large plants is 180 ppmv (24-hour averaging period) for the first year of operation, and 150 ppmv (24-hour averaging period) thereafter (60 FR 65396; December 19, 1995).

11. *On page 3-4, the applicant proposes "Secondary Emissions Limits" for lead and cadmium. Although FDEP might find useful the concept of intermediate emission rates as benchmarks that trigger certain actions, we do not favor the concept of secondary "limits." There should be only one set of values that has the designation "limits."*

Response: Comment noted. If the Department desires, we can change "Secondary Emission Limits" to read "Secondary Emission Levels". The activities required by the Action Plan referenced on page 3-6 of the PSD Application will be triggered if there were an exceedance of a Secondary Emission Level.

12. *On page 3-9, the applicant proposes use of the 80 percent removal approach for setting allowable SO_2 emissions. Based on this approach, the applicant proposes a maximum allowable SO_2 emissions limit of 100 ppmdv (7 percent oxygen).*

> *Unless the applicant is absolutely sure that the maximum uncontrolled SO_2 emission rate will be as high as 500 ppmdv (7 percent oxygen), we do not see how a maximum allowable rate of 100 ppmdv can be set as verification that 80 percent removal efficiency has been achieved.*

Response: The combined MWC NSPS/EG emission limit proposed as BACT for SO_2 is 29 ppmdv or 80% control, whichever is least stringent. The vendor (Covanta) has provided documentation that uncontrolled short-term SO_2 emissions (3-hours or less) could approach 500 ppmdv corrected to 7% O_2. Therefore, the maximum controlled emission rate is 100 ppmdv (rather than the 29 ppmdv BACT limit). This maximum "not-to-exceed" (NTE) emission limit was conservatively used to perform all of the modeling analyses with ISCST3 and the initial modeling analyses with CALPUFF as required by the modeling guidelines since the shortest averaging time of concern for SO_2 is 3-hours. For 24-hour and longer averaging times, maximum SO_2 and sulfuric acid mist emission rates would most likely be approximately 66% of the 3-hour emission rates – or controlled SO_2 emissions of 66 ppmdv (as was discussed in the final CALPUFF visibility analyses).

The 100 ppmdv NTE emission limit is not proposed as a surrogate to demonstrate compliance with the 80% control requirement. The NSPS requires both inlet and outlet SO_2 continuous emission monitoring systems (CEMS) to demonstrate compliance with the 24-hour percent control limit. Therefore, 80% control will be required for all uncontrolled inlet SO_2 concentrations above 145 ppmdv corrected to 7% O_2 (below that, the 29 ppmdv limit would apply). The NTE limit was only provided for purposes of establishing a conservative emission rate for determining compliance with ambient air quality standards, PSD increments, and other measures of air quality.

13. *On page 3-18, the applicant discusses an ammonia slip level of 50 ppmdv (7 percent oxygen). Is this a vendor estimate from the company that will supply the selective non-catalytic reduction system? Are any ammonia slip measurements available for Units 1 and 2?*

Response: An ammonia slip level of 50 ppm has been provided by Covanta, the Facility operator and the SNCR system vendor. This emission estimate was selected to be consistent with the Facility's current PSD limit. Actual ammonia emissions are expected to be less than this limit. Note that the Facility's existing Units 1 and 2 are permitted for 180 ppm of NOx utilizing anhydrous ammonia reagent, whereas the proposed limit for Unit No. 3 is 150 ppm (after the first year) utilizing aqueous ammonia reagent. Consequently, we believe that the ammonia slip measurements from the Facility's existing Units 1 and 2 are not dispositive with regards to the ammonia slip from proposed Unit 3.

14. *The applicant proposes use of selective non-catalytic reduction (SNCR) as BACT for* NO_x *emissions with BACT emission rates equal to the NSPS (180 ppmdv the first year and 150 ppmdv thereafter). Based on Appendix F of the application, the proposed value of 150 ppmdv is based on an expected inlet concentration of 260 ppmdv and an estimated removal efficiency of 42 percent. We are unable to tell from the application what is the basis of the estimated removal efficiency or why a higher efficiency might not be achievable. For the current generation of SNCR control systems, we would expect that a higher efficiency might be possible. Additional information from the applicant on SNCR control efficiencies would be helpful.*

Response: Appendix F of the application contains cost-estimating sheets evaluating the capital and annual costs of NOx control, specifically SCR and SNCR. The expected inlet concentration of NOx specified on these sheets (260 ppmdv at 7% O_2) represents an annual average value from which estimates of overall NOx removal (tons per year) can be derived. It is expected that short-term NOx concentrations generated from combustion could be substantially higher. As stated previously, MSW is a heterogeneous fuel that can produce fluctuations in NOx concentrations produced from combustion.

The equipment vendor, Covanta, estimates that NOx generated from combustion can exceed 350 ppmdv at 7% O_2 for short duration periods (24-hour average). In these instances, the SNCR system will be achieving approximately 60% reduction to maintain levels at or below 150 ppmdv (7% O_2) continuously (24-hour average). It is important to note that in order to achieve compliance with this limit, the Facility must operate below 150 ppmdv (7% O_2). Also, please note that on Table 4-2 of the application, it is noted that expected control with SNCR systems with MWCs range from 35-60%. The control efficiency proposed represents the level that will be able to be continuously achieved. As noted in the response to Comment 3, a reasonable safety margin must exist between the actual emission and the permit limits. As stated in the response to Comment 10, a 150 ppmdv (7% O_2) limit for NOx is an aggressive limit.

15. *FDEP's Bureau of Air Regulation has requested several items of additional information related to the evaluation of selective catalytic reduction (SCR) for control of* NO_x *emissions (memo from Mike Halpin to Buck Oven dated December 12, 2002). We do not have any additional items to add to the Bureau's list at this time. However, we wish to comment on the applicant's statement on page 4-39 that no MWC facilities in the U.S. currently include use of SCR for* NO_x *control. Although this statement is correct, we also note that very few (if any) large MWCs have been installed in the U.S. since the relatively recent advent of improved SCR systems resulting from the greatly increased use of SCR in such varied applications as combustion turbines and coal-fired power plants.*

Response: We believe that the inclusion of a SCR system for other applications mentioned above is site specific, much less universal. In this respect it should be noted that the USEPA has determined that SCR is not BACT on oil fired combined cycle turbines as represented in changes made to the permit for the Puerto Rico Electric Power Authority (PREPA) repowering project in San Juan, Puerto Rico. In the March 1999 draft permit, the USEPA required SCR, however, the USEPA later determined, based on new data, that SCR cannot consistently achieve the expected reductions in NOx emissions. As a result, the USEPA removed the SCR requirement from PREPA's air permit. See Attachment 7. We believe we have sufficiently addressed the BACT issues for NOx control, including SCR in the Application and as further explained in our "Responses to FDEP's Sufficiency Comments" dated February 4, 2003, a copy of which was forwarded to the USEPA.

Comments Received from: United States Department of the Interior's National Parks Service (NPS) Dated: January 17, 2003

The following comments concern the Best Available Control Technology analysis section.

1. *SO_2: We agree that a Spray Dry Absorber represents BACT. However, we question the emission limit proposed. The information presented in the LCERF applications, Table 4-1 shows that a Spray Dry Absorber is capable of 85-95% SO_2 removal, while 80% SO_2 control is proposed for LCERF. We recommend that at least 90% SO_2 removal is BACT.*

Response: The proposed SO_2 emission limit for the Facility's Unit 3 is 29 ppmdv (7% O_2) or 80% control, whichever is less stringent. SO_2 is formed from the oxidation (combustion) of sulfur containing compounds in the MSW. Lee County has little ability to control the amount of sulfur-containing material in the MSW. The potential for a 'slug' of sulfur-containing material has been accepted by EPA in allowing SO_2 emission limits to be established as either an outlet concentration or percent control, whichever is least stringent, for numerous source categories.

While some data show that a spray dry adsorber/fabric filter (SDA/FF) is capable of 85-95% SO_2 removal, this control level cannot be guaranteed on a continuous basis, as discussed in Section 4.5 of the application. A review of the existing Lee County Units 1 and 2 emissions test data from 1994 to 2001 shows control efficiencies ranging from 70% to 99% plus. These results are based on eight single-day tests and show a variability of 30%. The Facility's Unit 3 will be required to continuously monitor stack gas emissions of SO_2. The permitted control efficiency must be established at a level with which the facility can continuously comply, yet still represent BACT. SO_2 concentrations at the inlet to the SDA/FF are expected to range from approximately 200 ppmdv (at 7% O_2 on a 24-hour average) to 500 ppmdv (at 7% O_2 on a 3-hour average). Lee County has proposed to continuously meet an outlet SO_2 concentration of 29 ppmdv (at 7% O_2) or 80% removal. This proposed emission limit is slightly lower than the NSPS level.

2. *NO_x: The proposed SNCR will reduce NO_x emissions by 42% from 260 ppm to 150 ppm. The LCERF PSD application identifies several MWCs in Europe and Canada, which are using the more efficient Selective Catalytic Reduction (SCR) technology to reduce emissions to 19-90 ppm. However, the application cites the cost of using SCR as being prohibitive. A review of the cost calculations provided in the PSD application, raises several questions. We question why the cost/benefit calculations were based on an SCR emission rate double that guaranteed by one of the potential vendors, while using the exact costs estimated by the same vendor. In the case of Babcock Borsig Power, its cost quotes to RTP dated 10/19/01 and 12/04/01, repeatedly asserts that its SCR system can reduce NO_x emission from 270 ppm at the SCR inlet to 50 ppm at the outlet, a removal efficiency of 82%.*

   Using SCR at 82% control efficiency could reduce NO_x emissions from the LCERF by an additional 214 tpy compared to the proposed 42% efficient SNCR system. We have estimated the costs and benefits of using SCR based upon Chapter 3 of the OAQPS Control Cost Manual. Based on our enclosed analysis, we estimate a cost of $6300 to reduce a ton of NO_x.

Response: Lee County has determined that SNCR control to a level of 150 ppmdv (7% O_2) outlet concentration is the BACT for NOx. The estimated uncontrolled inlet concentration of NOx (260 ppmdv at 7% O_2) is an annual average value representing the vendor's best estimate of annual average uncontrolled NOx emissions, based on data from older facilities without SNCR. Comparing the estimated NOx inlet concentration to the proposed outlet concentration yields an annual average NOx reduction of 42% based on the assumption of continuous NOx control at 150 ppmdv (7% O_2). Actual emissions are expected to be lower, thus increasing the actual efficiency.

Municipal solid waste, by nature, is a heterogeneous fuel which can produce short-term fluctuations in NOx generated from combustion. The vendor's best estimate of the short-term variation in uncontrolled NOx emissions is derived from older units without SNCR. Short duration NOx concentration spikes can reach levels in excess of 350 ppmdv (7% O_2) on a 24-hour basis. Therefore, in short-term situations, the SNCR system is expected to control NOx at approximately 60%.

The Facility's PSD application does cite the cost of installing and operating SCR as being prohibitive. However, the cost effectiveness is just one of many reasons provided for rejecting SCR as BACT, all of which contribute to the overall determination. As presented in the PSD application Section 4, pages 4-29 through 4-33, Lee County notes that SCR now operates on several facilities in Europe and Japan and one facility in Canada. Lee County expended considerable effort in trying to obtain performance and operational data from these foreign facilities. Information sought on the operation of the SCR systems included the following items:

1. Operational history of the SCR units (installation date, life of unit, catalyst life expectancy, problems with unit, catalyst poisoning problems, etc.);

2. Specific capital, installation, operating, and miscellaneous costs of SCR on waste incinerators;
3. Maximum/Minimum/Average flue gas concentrations for 1-hour, 3-hours, 24-hours, and annual time periods for nitrogen oxides, sulfur dioxide, volatile organic compounds, and carbon monoxide; and
4. Estimated system upset or downtime from SCR malfunction.

In most cases, the County received invitations to visit their facilities, but no useful operational data. The Canadian facility has only recently begun operation, so no real operational data relative to the SCR was available. Foreign facilities are not subject to the same regulatory requirements, and potential enforcement action, to continuously achieve permitted levels. As a result of this effort, it was determined that long-term performance of SCR systems on MWCs could not be demonstrated due to a lack of data from foreign facilities.

The SCR system suppliers that provided budgetary cost estimates for SCR systems all asserted that costs would be the same whether the system was required to achieve an outlet NOx emission level of 50 ppmdv or 100 ppmdv (7% O_2). One system supplier, Haldor-Topsoe, provided a higher budgetary estimate for a SCR system that achieves 100 ppmdv (7% O_2) than a SCR system that provides an outlet concentration of 50 ppmdv (7% O_2). This item is discussed in more detail in Section 4 of the PSD application on pages 4-39 through 4-45.

Regarding the question of "why the cost/benefit calculations were based on a SCR emission rate double that guaranteed by one of the potential vendors", we assume this refers to using 100 ppmdv (7% O_2) rather than the system supplier 'guaranteed' emission rate of 50 ppmdv (7% O_2). This response is based upon the understanding that there are different levels of responsibility and accountability in achieving compliance with any permit limit. An equipment supplier is not responsible for long-term performance and variability in its equipment nor can the supplier be held accountable, because it is not on-site operating the equipment. The Facility operator ("Covanta") and owner (i.e., Lee County) are the accountable parties and they must ensure that the permit limit is continuously achievable. They must also know how it will be achieved.

The BBP proposal states the controlled outlet emission as 50 ppm NOx (7% O_2). It is appropriate that the SCR equipment is designed for this level of performance when attempting to meet an enforceable emission limit of 100 ppm (7% O_2). A design condition or guarantee from an equipment supplier should never, however, by itself be the basis of a permit limit or BACT analysis. As mentioned above, the supplier's responsibility is limited and typically ends when the vendor has completed compliance with the initial performance guarantees. Please note that this occurs at the initial startup of the facility, when everything is in a "new and clean" condition, and the supplier has its startup staff on-site. This initial test is not a guarantee of how the equipment will perform over time, especially when one considers: 1) the variability in equipment performance; 2) the variability in flue gas conditions and uncontrolled NOx; and 3) unforeseen events that may occur due to the new nature of this technology applied to a MWC and the complete absence of operating experience in the United States.

Based on our experience with various plant equipment components and associated guarantees, we believe that a one-time equipment guarantee from a vendor cannot be automatically translated into a long-term performance guarantee for the entire useful life of the equipment. This is particularly true for a waste-to-energy facility using SCR, since there is not a full-scale SCR unit operating continuously on a MWC in the United States. Although SCR technology has been demonstrated in other combustion oriented industries, there are significant differences that need to be considered including:

1. MSW is heterogeneous by nature, as opposed to the homogeneous nature of oil, natural gas, and even coal. Variations in the higher heating value and fuel components of MSW will yield different concentrations of uncontrolled NOx, with typical values ranging from 200 to 350 ppmdv (7 % O_2) as a daily average.

2. The furnace region of the combustion system and all downstream heat exchanger components are subject to the formation of buildup that adversely effects heat transfer. As the buildup develops, the transfer of heat to steam goes down and, consequently, the flue gas temperature goes up. The changing isotherms in the furnace contribute to a variable formation of thermal NOx.

We consider the 100 ppmdv (7 % O_2) standard to be stringent and aggressive, given the cited variables and unknowns and the simple fact that Lee County is accountable for compliance, not the equipment manufacturer.

From a regulatory perspective, the Department should not establish an emission limit unless the Department has data demonstrating that a standard is continuously achievable. Statements and budgetary proposals from salesmen do not provide sufficient proof that a proposed emission limit (e.g., 50 ppmdv at 7 % O_2) is continuously achievable.

Regarding the second paragraph of the NPS's comment, the assumption that utilization of SCR at 82% control efficiency would reduce NOx emissions from the Facility by an additional 214 tpy could be a substantial over-statement of potential benefits from the technology. We also question why the NPS used Chapter 3 of the OAQPS Control Cost Manual (Thermal and Catalytic Incinerators) to estimate costs for a SCR system. The only similarity between these incinerators and a SCR system (assuming the NPS used catalytic incinerator costing provisions) is that both a catalytic incinerator and a SCR system utilize some form of catalyst. In the case of a catalytic incinerator, the catalyst takes part in oxidation reactions. In the case of a SCR system, the catalyst takes part in reduction reactions.

Also, it is difficult to estimate NOx removal cost estimates using the EPA's Control Cost Manual. Mr. William Vatavuk was intimately involved in the development of EPA's New Source Review program. In this case, Mr. Vatavuk offered the following comments:

> both the SCR and SNCR chapters in the EPA Air Pollution Control Cost Manual (Sixth Edition, January 2002) are seriously deficient in quality, especially when compared to the Manual chapters that cover other control devices. Both chapters contain too many technical and editorial errors and omissions to mention. Moreover, both chapters were based on cost data and procedures developed for hot-side SCR installations on coal-fired utility boilers. Hence, their applicability to other combustion emission sources (not to say non-combustion sources) is questionable. Finally, neither chapter is thoroughly consistent with the other Manual chapters regarding estimating procedures, cost factors, assumptions, and other areas. For these reasons, neither the SCR nor the SNCR chapter should be given credence - at least until each has been thoroughly improved.[3]

This is an extremely important project for Lee County, and it is extremely sensitive, because it involves the first new MWC proposed in the United States in over eight (8) years. The primary BACT issue relates to the NOx control technology. Prior to this time, a SCR system has never been utilized in the United States on a MWC. Consequently, the County and the Project Team have spent a great deal of time and energy evaluating SCR technology and its suitability for MWCs. The BACT analyses presented in the PSD application were prepared and reviewed by engineers at (1) RTP Environmental Associates, Inc., (2) Malcolm Pirnie, Inc., (3) Covanta Energy, and (4) Lee County. The application was based on the experience and sound engineering judgment of these professionals. The Project Team simply was unwilling to blindly accept a supplier's claims about the cost and performance of a system that the supplier is trying to sell in a new market, especially when the supplier is not responsible for the Facility's long term performance, and there is no experience of any kind within the United States for an SCR system on a MWC.

3. *PM: A baghouse at 0.009 gr/dscf is proposed for the LCERF. However, because it is the baghouse that ultimately must capture particulates, toxic heavy metals, and the reaction products of acid gases, maximizing the collection efficiency of the baghouse becomes extremely important. Based on the Environmental Agency's RACT/BACT/LAER Clearinghouse for MWCs, we believe that the LCERF should be capable of reducing baghouse emissions to the same outlet concentration as a well-controlled boiler or electric arc furnace. For example, the Northhampton Generating station in Pennsylvania has a limit of 0.010 lb/mmBtu using a fabric filter and recently was tested at 0.0041-0.0045 lb/mmBtu. By comparison, the LCERF would emit PM at a rate of 0.018 lb/mmBtu. If we compare LCERF's*

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[3] Communication of Mr. William Vatavuk dated January 17, 2003.

proposed emissions to an electric arc furnace, its outlet concentration would exceed that of an electric arc furnace (i.e., Nucor, Darlington, SC @ 0.0018 gr/dscf) by a factor of five times.

In summary, LCERF should revise its cost analysis for SCR to reflect the actual capabilities to further limit NO_x *emissions through the use of SCR. LCERF should also document and justify any deviations in its cost/benefit analysis from the OAQPS Cost Manual. LCERF should also propose lower limits for* SO_2 *and PM to better reflect emission levels achievable with the chosen technology.*

Response: Lee County agrees with the NPS that the baghouse ultimately captures particulates, toxic heavy metals and the reaction products of acid gases. However, we must draw attention to the distinction between the flue gas and fly ash generation characteristics for a MWC and that of a "well-controlled boiler or electric arc furnace". The inherent variability of municipal waste combustion does limit control capability, when compared to an electric generating station boiler. The uncontrolled particulate characteristics (i.e., the condition before the baghouse) are significantly different when comparing a MWC with an electric generating facility, an arc furnace or any other source. Every source must be considered on its own merits. As an example, the relative high ash loading and fine particulates typical of a municipal waste combustor lead to a particularly challenging environment in the baghouse. Operating experience associated with a conservative baghouse design lead us to select a proposed PM emission limit with due consideration of combustion variability, and long-term operation. Since the primary purpose of Lee County's Facility is the disposal of waste, and waste heat recovery is only secondary, we question the appropriateness of comparing PM emission from an MWC with a traditional power generation facility in terms of pound per million Btu. Even if we do this for argument's sake, the 1994 – 2002 stack test data for Units 1 and 2 show an average PM emission of 0.0017 gr/dscf, which translates to approximately 0.0035 pounds per million Btu, which is in the comparable range of the examples NPS cited. However, when we consider individual stack test data, the County's records show a high variability – the maximum is almost six times higher than the average emission. Consequently, the requested permit limit is set at a reasonable level, which will allow the Facility's personnel to operate at varying operating conditions without risking undue permit violations.

Regarding the second part of NPS' comment, Lee County recently submitted additional analyses to the FDEP (February 4, 2003). Finally, Lee County does not intend to propose lower limits for PM or SO_2. The proposed limits are reasonable and appropriate.

If you should have any questions or require additional information please do not hesitate to contact us.

Very truly yours,

MALCOLM PIRNIE, INC.

Sam M. Rosania, R.E.M.
Associate, Project Manager

MALCOLM PIRNIE, INC.

Amit Chattopadhyay

Amit Chattopadhyay, P.E.
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enclosures

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ATTACHMENT 1

William M. Vatavuk, P.E.
(Updated *January 2003*)

I. RESUME OVERVIEW

*** General:**

- Address: 3512 Angus Rd., Durham, NC 27705
- Phone: (919)-489-8810
- E-fax: (413)-638-1336
- E-mail: w*illiam.vatavuk@verizon.net*
- Date of birth: 1/30/47
- Birthplace: Sharon, PA
- Marital status: married, one child

*** Education:** B.E., Youngstown State University, 1969

*** Experience:**

- January 1999-present: President, Vatavuk Engineering
- 1970-December 1999: U.S. Environmental Protection Agency (Rockville, MD and Research Triangle Park, NC)
- 1969-70: DuPont, Inc. (Wilmington, DE; Richmond, VA)

*** Professional activities and accomplishments:**

- Creator of "Vatavuk Air Pollution Control Cost Indexes" (updates published in *Chemical Engineering* magazine)
- Professional engineer (North Carolina)
- Environmental journals peer reviewer
- Twice past president of North Carolina Branch, U.S. Public Health Service Commisioned Officers Association

*** Publications:** Two books, two book chapters, and over 50 journal articles and book reviews. Books--*Estimating Costs of Air Pollution Control* (CRC Press/Lewis Publishers) and *Marketing Yourself With Technical Writing* (CRC Press/Lewis Publishers). (Complete list of publications is attached.)

*** Awards and Activities:**

- Listed in Marquis': *Who's Who in America, Who's Who in the World, Who's Who in Science and Engineering, Who's Who in the South and Southwest, Who's Who in Finance and Industry.*
- PHS Commendation Medal
- EPA Bronze Medals (2)
- Commendation Letters from EPA and U.S. Public Health Service Surgeon General
- EPA "Special Achievement Award"
- Nominated for 1990 Pulitzer Prize for American History
- Nominated for 1990 North Carolina Mayflower Award
- Board of Directors, Bennett Place State (NC) Historic Site
- Licensed real estate broker (North Carolina)

II. DETAILED RESUME

General:

- * Address: 3512 Angus Road, Durham, North Carolina 27705
- * Phone: (919)-489-8810
- * Fax: (413)-638-1336
- * E-mail: *william.vatavuk@verizon.net*
- * Date of birth: January 30, 1947
- * Birthplace: Sharon, Pennsylvania
- * Marital status: married (one child)

Education: Bachelor of Engineering in Chemical Engineering (First in class; Magna Cum Laude); Youngstown State University, Youngstown, Ohio (1969)

Experience:

January 1999 to present: President, Vatavuk Engineering, an engineering consulting firm providing services in air pollution control technology and cost analysis. Satisfied clients include:

- Air Sciences, Inc.
- *Chemical Engineering* magazine
- The McIlvaine Company
- Parsons, Behle & Latimer, LLP
- Pitney, Hardin, Kipp & Szuch, LLP
- RTP Environmental Associates

In addition, Vatavuk Engineering is presently under retainer to two other environmental law firms. However, confidentiality agreements preclude revealing the names of these firms.

May 1970 to December 1999: U.S. Public Health Service (USPHS) officer permanently detailed to U.S. Environmental Protection Agency from USEPA's creation (December 1970) through retirement (December 1999). From May 1970 to December 1970, assigned to USPHS, National Air Pollution Control Administration.

* <u>September 1974 to December 1999</u>: Senior chemical engineer, USEPA, Office of Air Quality Planning and Standards (OAQPS), Innovative Strategies and Economics Group, Research Triangle Park, North Carolina. Duties included:

- o Preparing guidance documents and acting as *the* consultant for OAQPS and EPA regional offices on the development, collection, review, and usage of cost data and cost-estimating methodologies, to provide uniformity of cost analyses. An example guidance document is the *OAQPS Control Cost Manual*, which provides data and procedures for sizing and costing air pollution control systems
- o Developing and presenting seminars and courses on control cost estimating to EPA personnel.
- o Providing air pollution control cost analysis support to national emissions and air quality standards development and preparation of guideline documents for State/local air pollution control agencies.

* October 1971 to September 1974: Chemical engineer, USEPA, OAQPS, National Air Data Branch. Duties included:

- Development and maintenance of computerized air pollution source test data system.
- Preparation of new and revised sections for *Compilation of Air Pollutant Emission Factors* ("AP-42")

* May 1970 to October 1971: Staff engineer, USEPA, Office of Regional Activities, Rockville, Maryland. Duties included:

- Preparation of reports for consultations to designate Federal air quality control regions (AQCR's)
- Representation of USEPA at AQCR consultations.

* June 1969 to May 1970: Chemical engineer, E.I. duPont de Nemours, Inc., Engineering Service Division (Wilmington, DE and Richmond, VA). Duties included:

- Participation in experimentation designed to improve Tyvek® product quality.
- Development of mathematical models for application to Tyvek® development problems.
- Participation in experimentation designed to improve quality of other textile fibers products.

* June to September 1968: USPHS COSTEP assignee. Assigned to USEPA, Office of Solid Waste, Cincinnati, Ohio. Duties included research for, and writing of, a report on oil waste disposal methods.

* June to September 1967: USPHS COSTEP assignee. Assigned to USEPA, Office of Air Programs, Cincinnati, Ohio. Duties included assisting in laboratory evaluation of sulfur dioxide monitoring instruments.

Professional Activities:

* USPHS Commissioned Officers Association, North Carolina Branch, past president (1975-76; 1984-85).

* Registered Professional Engineer (North Carolina, 1975 to present)

* Peer reviewer for two environmental journals (1984 to present)

* Listed in *Marquis' Who's Who in the World*

* Listed in *Marquis' Who's Who in Science and Engineering*

* Listed in *Marquis' Who's Who in the South and Southwest*

* Listed in *Marquis' Who's Who in Finance and Industry*

* Listed in *Who's Who Environmental Registry*

* Listed in *Dictionary of International Biography*

Publications: Two books, one book chapter, and approximately fifty journal articles and book reviews. (See publications list, below.)

Professional Awards (year awarded):

* PHS Commendation Medal (1996)

* OAQPS Human Resources Mini-Council Plaque (1990)

* Surgeon General's Commendation Letter (1988)

* EPA Bronze Medals (two: 1988 and 1989)

* EPA "Special Achievement Award" (1986)

* *Chemical Engineering* magazine "Certificates of Achievement" (1980-83; 1983; 1986)

* EPA Commendation Letter (1970)

*American Institute of Chemists Award (1969)

* DuPont academic scholarship (1968)

Other Activities and Awards:

* Author of *Dawn of Peace*, book nominated for 1990 Pulitzer Prize for History and North Carolina Mayflower Award

* Board of Directors, Bennett Place State (NC) Historic Site

* Licensed real estate broker (North Carolina)

LIST OF PUBLICATIONS

Books and Book Chapters:

* Vatavuk, William M. "Cost Engineering," in: *Handbook of Chemical Engineering Calculations* (Third Edition) Nicholas Chopey (ed). New York: McGraw-Hill (to be published late 2003/early 2004).

* Vatavuk, William M. *Marketing Yourself with Technical Writing.* Boca Raton, Florida: Lewis Publishers/CRC Press, 1992.

* Vatavuk, William M. *Estimating Costs of Air Pollution Control.* Boca Raton, Florida: Lewis Publishers/CRC Press, 1990.

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[1] This article documents my revision of the Chemical Engineering Plant Cost Index (CEPCI) in 2001. The CEPCI has been a key element in the design of chemical process industry plants for since 1963. This revision of the CEPCI was the first made in 20 years.

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ATTACHMENT 2

Stack Test Results for Lee County ERF

Pollutant	Unit 1				Unit 2				Max. Permitted
Year	Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average	Emission Limit
NO_x	($ppmdv@7\%O_2$)				($ppmdv@7\%O_2$)				180
2002	148	153	158	153	163	158	168	163	
2001	161	155	161	159	160	161	157	159	Overall Average
2000	164	**168**	166	166	165	**171**	164	167	161.48
1999	161	154	159	158	164	166	**171**	167	
1998	164	165	157	162	164	165	164	165	Max. Obs.
1997	164	166	161	164	164	169	**171**	168	171
1996	167	**168**	165	167	166	162	160	162	
1995	163	169	165	166	164	169	163	166	
1994	146	149	144	146	149	146	151	149	
Average for Unit				160				163	
VOC/NMHC	($ppmdv@7\%O_2$)				($ppmdv@7\%O_2$)				37
2002									
2001	--	--	--	--	--	--	--	--	Overall Average
2000	2.40	**3.10**	2.20	2.60	2.05	2.30	2.30	2.20	<1.613
1999	1.70	1.00	0.70	1.10	**6.80**	3.10	2.10	4.00	
1998	<0.366	<0.366	<0.366	<0.366	<0.378	<0.378	<0.378	<0.378	Max. Obs.
1997	<0.344	<0.331	<0.331	<0.335	<0.325	<0.366	<0.362	<0.351	6.80
1996	<1.70	<1.70	<1.70	<1.70	<1.60	<1.60	<1.60	<1.60	
1995	2.61	1.55	1.57	1.91	2.48	1.73	1.90	2.04	
1994	<2	<2	<2	<2	2.20	<2	<2	<2	
Average for Unit				<1.430				<1.796	
HF	($ppmdv@7\%O_2$)				($ppmdv@7\%O_2$)				5
2002									
2001	--	--	--	--	--	--	--	--	Overall Average
2000	**<0.19**	<0.18	<0.18	<0.19	**<0.19**	<0.18	<0.18	<0.18	<0.099
1999	<0.11	<0.10	<0.08	<0.10	<0.09	<0.10	<0.09	<0.09	
1998	<0.11	<0.12	<0.10	<0.11	<0.11	<0.10	<0.12	<0.11	Max. Obs.
1997	<0.109	<0.102	<0.101	<0.104	<0.127	<0.114	<0.108	<0.116	<0.19
1996	<0.048	0.18	<0.05	0.18	<0.049	<0.047	<0.048	<0.048	
1995	<0.0309	<0.0335	<0.0266	<0.0303	<0.0339	<0.03	<0.0295	<0.0311	
1994	<0.045	<0.043	<0.045	<0.044	<0.047	<0.054	<0.059	<0.053	
Average for Unit				<0.108				<0.09	

Bolded values indicate maximum of each pollutant concentration and minimum of removal efficiency for each unit.
Complete 2002 test data has yet to be provided to RTP.

Stack Test Results for Lee County ERF

Pollutant	Unit 1				Unit 2				Max. Permitted Emission Limit
Year	Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average	
Total PCDD/F	ng/dscm@7%O_2				ng/dscm@7%O_2				30
2002	3.3	3	6.5	4.3					
2001[a]	7.8	5.7	6.0	6.5	7.8	7.4	8.0	7.6	Overall Average
2000	7.9	7.1	13.0	9.3	14.3	5.5	3.2	7.6	11.123
Retest **1999**	25.0	30.0	29.0	28.0	--	--	--	--	
Original **1999**	30.0	**31.0**	28.0	29.0	17.5	18.9	18.0	18.1	Max. Obs.
1998	4.3	4.0	3.7	4.0	3.54	3.16	2.63	3.11	44.2
1997	2.6	1.3	2.3	2.1	2.5	3.1	2.5	2.7	
1996	21.4	17.7	13.5	17.5	10.9	11.0	**44.2**	22.1	
1995	28.4	18.6	11.8	19.6	14.0	6.4	2.9	7.8	
1994	6.1	5.0	3.7	4.9	8.2	5.1	4.7	6.0	
Average for Unit				12.5				9.4	
NH3	ppmdv				ppmdv				50
2002									
2001	--	--	--	--	--	--	--	--	Overall Average
2000	0.76	1.08	0.82	0.88	0.79	1.33	1.12	1.08	1.008
1999	0.48	0.39	1.33	0.73	1.17	0.75	0.44	0.79	
1998	0.94	1.10	0.73	0.93	0.50	0.41	0.66	0.52	Max. Obs.
1997	1.64	0.99	**1.65**	1.43	1.88	0.82	0.74	1.15	2.37
1996	1.50	0.80	0.29	0.86	**2.37**	1.90	2.11	2.12	
1995	0.82	0.80	0.65	0.76	1.26	0.45	0.40	0.71	
1994	0.90	1.05	0.76	0.91	1.02	1.39	1.35	1.25	
Average for Unit				0.93				1.09	

[a] Average for Unit 2 (2001) includes Runs 1 and 2 only; thermal degradation of Run 3 sample is believed to have occurred during lab analysis.

Bolded values indicate maximum of each pollutant concentration and minimum of removal efficiency for each unit.
Complete 2002 test data has yet to be provided to RTP.

Stack Test Results for Lee County ERF

Pollutant	Unit 1				Unit 2				Max. Permitted
Year	Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average	Emission Limit
Cd[b]	**mg/dscm@7%O$_2$**				**mg/dscm@7%O$_2$**				**0.04**
2002	1.10E-03	7.60E-04	**1.90E-03**	1.20E-03	3.70E-03	2.80E-03	**4.30E-03**	3.60E-03	
2001	1.12E-03	1.26E-03	1.54E-03	1.31E-03	1.14E-03	1.34E-03	1.24E-03	1.24E-03	Overall Average
2000	2.70E-04	5.40E-04	1.70E-04	3.30E-04	7.00E-05	8.40E-04	2.70E-04	3.90E-04	1.13E-03
1999	6.40E-04	9.42E-04	9.01E-04	8.28E-04	1.25E-03	6.33E-04	3.87E-04	7.58E-04	
1998	9.87E-04	1.35E-03	1.42E-03	1.25E-03	9.87E-04	1.35E-03	1.42E-03	3.55E-04	Max. Obs.
1997									4.30E-03
1996									
1995									
1994									
Average for Unit				9.84E-04				1.27E-03	
Pb	**mg/dscm@7%O$_2$**				**mg/dscm@7%O$_2$**				**0.440/EG**
2002	**5.20E-02**	1.60E-02	1.90E-02	2.90E-02	3.10E-02	3.60E-02	**4.20E-02**	3.60E-02	
2001	1.02E-02	1.36E-02	1.54E-02	1.31E-02	1.04E-02	2.74E-02	9.07E-03	1.56E-02	Overall Average
2000	8.99E-03	1.28E-02	8.75E-03	1.02E-02	2.11E-03	2.25E-03	1.49E-03	1.95E-03	1.03E-02
1999	7.02E-03	3.79E-02	1.18E-02	1.89E-02	1.03E-02	5.41E-03	4.37E-03	6.69E-03	
1998	1.40E-02	4.79E-03	1.53E-03	6.77E-03	7.20E-03	9.01E-03	1.14E-02	9.20E-03	Max. Obs.
1997	3.57E-03	6.78E-03	5.04E-03	5.13E-03	8.37E-03	9.09E-03	7.27E-03	8.24E-03	5.20E-02
1996	6.89E-04	1.91E-03	3.59E-04	9.86E-04	1.36E-03	1.70E-03	1.47E-03	1.51E-03	
1995	5.79E-04	8.38E-04	5.25E-04	6.47E-04	5.23E-04	1.11E-03	5.22E-04	7.18E-04	
1994									
Average for Unit				1.06E-02				9.99E-03	

[b] RTP does not have Cadmium data for 1994 through 1997.

Bolded values indicate maximum of each pollutant concentration and minimum of removal efficiency for each unit.
Complete 2002 test data has yet to be provided to RTP.

Stack Test Results for Lee County ERF									
Pollutant	**Unit 1**				**Unit 2**				**Max. Permitted**
Year	**Run 1**	**Run 2**	**Run 3**	**Average**	**Run 1**	**Run 2**	**Run 3**	**Average**	**Emission Limit**
PM	**gr/dscf@7%O$_2$**				**gr/dscf@7%O$_2$**				**0.010**
2002[c]	3.10E-03	2.00E-03	2.10E-03	2.40E-03	**9.80E-03**	3.90E-03	2.40E-03	5.40E-03	
2001[c]	1.84E-04	2.24E-04	3.64E-04	2.67E-04	9.30E-04	4.90E-04	8.00E-04	8.20E-04	Overall Average
2000	1.23E-03	5.72E-04	1.54E-04	6.54E-04	6.40E-04	5.30E-04	5.60E-04	5.80E-04	1.66E-03.
1999	3.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	1.00E-03	3.00E-03	2.00E-03	
1998	2.00E-03	4.00E-03	**6.00E-03**	4.00E-03	3.00E-03	2.00E-03	3.00E-03	3.00E-03	Max. Obs.
1997	1.59E-03	1.71E-03	1.56E-03	1.62E-03	2.42E-03	2.20E-03	1.36E-03	1.99E-03	9.80E-03
1996	4.00E-04	7.00E-04	2.00E-04	5.00E-04	8.00E-04	2.40E-03	2.10E-03	1.80E-03	
1995	4.94E-04	1.75E-03	1.02E-03	1.09E-03	1.52E-04	6.16E-04	7.47E-04	5.05E-04	
1994	6.00E-04	6.00E-04	5.00E-04	6.00E-04	7.00E-04	8.00E-04	4.00E-04	7.00E-04	
Average for Unit				1.46E-03				1.87E-03	
Hg	**µg/dscm@7%O$_2$**				**µg/dscm@7%O$_2$**				**70/FAC**
2002	16	9.8	10	12	16	8.5	8.4	11	
2001	22	25	21	23	29	31	24	28	Overall Average
2000	<1.35	<1.36	<1.44	<1.39	30	15	<1.5	<15	<27.499
1999	31	43	<33	<36	<25	32	27	<28	
1998	27	32	26	28	34	32	**58**	41	Max. Obs.
1997	21	21	21	21	17	16	23	18	75
1996	42	38	44	42	53	54	49	52	
1995	53	44	**75**	57	26	38	52	39	
1994	14	14	17	15	27	26	30	28	
Average for Unit				<26.13				<28.87	

[c] The average for Unit 2 2002 PM includes a 4th run because Run 1 was invalid due to baghouse malfunction. The average for 2001 PM (gr/dscf@7%O2) includes a 4th run for both Unit 1 (2.98E-04) and Unit 2 (1.1E-03) that was conducted under normal soot blowing conditions.

Bolded values indicate maximum of each pollutant concentration and minimum of removal efficiency for each unit.
Complete 2002 test data has yet to be provided to RTP.

Stack Test Results for Lee County ERF

Pollutant **Year**	**Unit 1** **Run 1**	**Run 2**	**Run 3**	**Average**	**Unit 2** **Run 1**	**Run 2**	**Run 3**	**Average**	**Max. Permitted Emission Limit**
Hg	**% removal efficiency**				**% removal efficiency**				**>=85%/EG**
2002									
2001	92	87	82	87	76	72	80	76	Overall Average
2000	>99	>99	>98	>99	>79	>87	>99	>88	>80
1999	**49**	61	>57	>56	**>35**	>36	54	>42	
1998	89	91	84	89	83	87	81	83	Min. Obs.
1997	85	85	88	86	96	94	92	94	>35
1996	--	--	--	78	--	--	--	70	
1995	--	--	--	70	--	--	--	83	
1994	94	92	95	94	93	86	89	90	
Average for Unit				>82				>78	
SO$_2$	**ppmdv@7%O$_2$**				**ppmdv@7%O$_2$**				**29/EG**
2002	1.1	1.6	2	1.5	0.89	0.38	0.045	0.44	
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Overall Average
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.204
1999	2.7	0.0	1.4	1.4	**27.0**	13.0	13.0	18.0	
1998	9.8	2.6	8.0	6.8	15.0	11.0	6.1	11.0	Max. Obs.
1997	0.4	0.7	0.9	0.7	0.0	0.1	15.6	5.2	27.0
1996	**18.0**	6.9	4.2	9.7	10.0	16.5	1.4	9.3	
1995	4.5	5.1	3.2	4.3	1.0	14.1	4.2	6.4	
1994	2.0	11.0	11.0	7.9	8.0	9.0	17.0	11.0	
Average for Unit				3.6				6.8	
SO$_2$	**% removal efficiency**				**% removal efficiency**				**>=80%**
2002									
2001	100	100	100	100	100	100	100	100	Overall Average
2000	100	100	100	100	100	100	100	100	93
1999	97	100	98	98	74	87	88	83	
1998	94	98	93	95	**70**	82	89	80	Min. Obs.
1997	99	98	98	98	100	100	74	91	70
1996	--	--	--	91	--	--	--	92	
1995	--	--	--	93	--	--	--	90	
1994	97	**90**	93	93	90	84	83	86	
Average for Unit				96				90	

Bolded values indicate maximum of each pollutant concentration and minimum of removal efficiency for each unit.

Complete 2002 test data has yet to be provided to RTP.

Stack Test Results for Lee County ERF

Pollutant	**Unit 1**				**Unit 2**				**Max. Permitted Emission Limit**
Year	**Run 1**	**Run 2**	**Run 3**	**Average**	**Run 1**	**Run 2**	**Run 3**	**Average**	
HCl	**ppmdv@7%O_2**				**ppmdv@7%O_2**				**25**
2002	15	17	12	15	12	12	15	13	
2001	14	18	15	16	14	13	13	13	Overall Average
2000	11	10	13	11	25	19	13	19	19.38
1999	17	20	15	17	29	31	29	30	
1998	20	15	20	18	28	15	15	20	Max. Obs.
1997	15	15	15	15	13	16	15	15	46
1996	**27**	26	**27**	27	**46**	37	37	40	
1995	24	21	18	21	17	20	15	18	
1994	9	17	20	16	28	26	27	27	
Average for Unit				17				22	
HCl	**% removal efficiency**				**% removal efficiency**				**>=95%**
2002									
2001	97	97	98	98	98	98	98	98	Overall Average
2000	98	99	98	98	97	98	98	98	97
1999	97	97	98	97	96	97	97	97	
1998	**96**	97	97	97	97	98	98	98	Min. Obs.
1997	98	98	98	98	98	98	98	98	95
1996	**96**	**96**	97	96	96	96	**95**	96	
1995	--	--	--	96	--	--	--	97	
1994	99	98	98	98	97	96	97	97	
Average for Unit				97				97	
CO	**ppmdv@7%O_2**				**ppmdv@7%O_2**				**100**
2002	22.5	22.3	22.4	22.4	22.7	25.4	18.1	22.1	
2001	19.7	21.4	20.9	20.7	15.3	21.7	17.5	18.2	Overall Average
2000	24.1	25.8	24.8	24.9	24.6	26.2	24.0	24.9	25.011
1999	20.4	23.8	29.9	24.7	27.8	26.4	24.6	26.3	
1998	43.5	**60.5**	35.8	46.6	25.7	33.1	28.2	29.0	Max. Obs.
1997	21.1	24.1	25.0	23.4	18.6	15.2	13.2	15.7	60.5
1996	27.0	25.0	34.0	29.0	33.1	24.5	19.6	25.7	
1995	15.2	18.8	17.6	17.2	11.5	10.6	12.3	11.4	
1994	36	30	31	32	**40**	35	34	36	
Average for Unit				26.767				23.256	

Bolded values indicate maximum of each pollutant concentration and minimum of removal efficiency for each unit.
Complete 2002 test data has yet to be provided to RTP.

Stack Test Results for Lee County ERF

Pollutant Year	Unit 1 Run 1	Run 2	Run 3	Average	Unit 2 Run 1	Run 2	Run 3	Average	Max. Permitted Emission Limit
Be	mg/dscm@7%O2				mg/dscm@7%O2				**1.59E-04**
2002									
2001	--	--	--	--	--	--	--	--	Overall Average
2000	4.00E-05	4.00E-05	4.00E-05	4.00E-05	1.00E-05	1.00E-05	6.00E-05	3.00E-05	<5.85E-05
1999	<1.98E-05	<2.00E-05	<2.04E-05	<2.01E-05	<1.94E-05	<1.96E-05	<1.91E-05	<1.94E-05	
1998	<8.58E-05	<8.55E-05	<9.57E-05	<8.90E-05	<8.70E-05	<8.78E-05	<9.29E-05	<8.92E-05	Max. Obs.
1997	<9.51E-05	**<1.02E-04**	<9.66E-05	<9.79E-05	<9.80E-05	<9.90E-05	**<1.00E-04**	<9.90E-05	<1.02E-04
1996	<4.78E-05	<4.95E-05	<5.01E-05	<4.91E-05	<5.22E-05	<4.98E-05	<5.21E-05	<5.14E-05	
1995	--	--	--	--	--	--	--	--	
1994									
Average for Unit				<5.92E-05				<5.78E-05	
Arsenic[d]	mg/dscm@7%O_2				mg/dscm@7%O_2				**1.07E-02**
2002									
2001									Overall Average
2000	<3.49E-04	<3.13E-04	<3.53E-04	<3.37E-04	8.28E-04	<5.95E-04	**<1.80E-03**	<8.08E-04	<4.56E-04
1999	<3.61E-04	**7.66E-04**	4.84E-04	<5.37E-04	4.54E-04	4.32E-04	<3.49E-04	<4.11E-04	
1998	6.29E-04	4.11E-04	<3.83E-04	<4.70E-04	5.81E-04	5.87E-04	8.04E-04	6.58E-04	Max. Obs.
1997	<3.69E-04	<3.96E-04	<3.73E-04	<3.82E-04	6.46E-04	8.06E-04	<3.87E-04	<6.14E-04	<1.80E-03
1996	1.91E-04	<1.98E-04	2.01E-04	<1.96E-04	<2.09E-04	8.29E-05	<2.09E-04	<1.65E-04	
1995	<4.35E-04	<4.60E-04	<4.59E-04	<4.50E-04	<4.36E-04	<4.41E-04	<4.37E-04	<4.42E-04	
1994									
Average for Unit				<3.95E-04				<5.16E-04	
SAM[e]	ppmdv@7%O2				ppmdv@7%O2				**10.35**
2002									
2001									Overall Average
2000	<8.13E-03	<5.91E-03	<2.96E-03	<5.91E-03	0.0	1.74E-02	<8.72E-03	<8.72E-03	<1.307
1999	3.37	2.79	3.27	3.14	1.72	2.64	**3.03**	2.46	
1998	**4.47**	3.58	3.54	3.86	2.57	2.48	2.90	2.65	Max. Obs.
1997	0.22	0.22	0.43	0.29	0.21	0.41	0.41	0.34	4.47
1996	0.45	0.22	0.44	0.37	0.37	0.48	0.62	0.49	
1995	<2.46E-02	<2.41E-02	<3.28E-02	<2.72E-02	<2.70E-02	<3.10E-02	<2.00E-02	<2.60E-02	
1994	3.03	2.44	1.70	2.36	2.25	2.32	2.25	2.25	
Average for Unit				<1.437				<1.177	

[d] Arsenic values in mg/dscm were calculated from lb/hr Arsenic values and the ratio of mg/dscm values to lbs/hr values for Pb.

[e] SAM values in ppmdv calculated from SAM lb/hr values using unit average flow rates from 1994 stack test (88600 dscfm for Unit 1 90110 dscfm for Unit 2).

Bolded values indicate maximum of each pollutant concentration and minimum of removal efficiency for each unit.

Complete 2002 test data has yet to be provided to RTP.

Stack Test Results for Lee County RRF

Pollutant	Unit 1				Unit 2				Max. Permitted
Year	Rep. 1	Rep. 2	Rep. 3	Average	Rep. 1	Rep. 2	Rep. 3	Average	Emission Limit
NO$_x$	lbs/hr				lbs/hr				80
2002									
2001	72	71	74	72	72	73	70	72	Overall Average
2000	77	77	78	77	78	**80**	77	78	75
1999	75	74	76	75	75	77	**80**	77	
1998	76	77	76	76	78	78	79	78	Max. Obs.
1997	78	**80**	78	79	77	78	79	78	80
1996	76	79	78	78	**80**	79	77	79	
1995	72	75	72	73	69	69	67	68	
1994	64	66	66	65	74	72	76	74	
Average for Unit				74				75	
VOC/NMHC	lbs/hr				lbs/hr				5.8
2002									
2001	--	--	--	--	--	--	--	--	Overall Average
2000	0.300	0.373	0.273	0.316	0.251	0.283	0.282	0.272	<0.356
1999	0.21	0.13	0.08	0.14	0.83	0.38	0.25	0.49	
1998	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	Max. Obs.
1997	<0.053	<0.054	<0.054	<0.054	<0.051	<0.053	<0.053	<0.052	1.00
1996	**<0.80**	**<0.80**	<0.70	<0.80	<0.70	<0.70	<0.70	<0.70	
1995	0.30	0.17	0.18	0.22	0.27	0.19	0.20	0.22	
1994	**<0.8**	**<0.8**	<0.7	<0.8	**1.00**	<0.8	<0.8	<0.8	
Average for Unit				<0.341				<0.371	
HF	lbs/hr				lbs/hr				0.96
2002									
2001	--	--	--	--	--	--	--	--	Overall Average
2000	**<3.80E-02**	<3.60E-02	<3.70E-02	<3.70E-02	**<3.70E-02**	**<3.70E-02**	**<3.70E-02**	<3.70E-02	<1.91E-02
1999	<2.00E-02	<1.90E-02	<1.60E-02	<1.80E-02	<2.00E-02	<2.00E-02	<2.00E-02	<2.00E-02	
1998	<2.10E-02	<2.10E-02	<1.90E-02	<2.00E-02	<2.00E-02	<2.00E-02	<2.00E-02	<2.00E-02	Max. Obs.
1997	<2.01E-02	<2.01E-02	<1.96E-02	<1.99E-02	<2.28E-02	<1.99E-02	<2.01E-02	<2.09E-02	<3.80E-02
1996	<1.00E-02	3.40E-02	<1.00E-02	3.40E-02	<1.00E-02	<9.00E-03	<9.00E-03	<9.00E-03	
1995	<5.60E-03	<6.30E-03	<4.61E-03	<5.41E-03	<5.65E-03	<5.38E-03	<4.89E-03	<5.31E-03	
1994	<8.90E-03	<7.90E-03	<8.60E-03	<8.50E-03	<1.10E-02	<1.10E-02	<1.20E-02	<1.20E-02	
Average for Unit				<2.04E-02				<1.77E-02	

Bolded values indicate maximum of each pollutant concentration and minimum of removal efficiency for each unit.
Complete 2002 test data has yet to be provided to RTP.

Stack Test Results for Lee County RRF

Pollutant	**Year**	**Unit 1**				**Unit 2**				**Max. Permitted Emission Limit**
		Rep. 1	**Rep. 2**	**Rep. 3**	**Average**	**Rep. 1**	**Rep. 2**	**Rep. 3**	**Average**	
Total PCDD/F		lbs/hr				lbs/hr				**7.00E-06**
	2002									
	2001	1.80E-06	1.40E-06	1.50E-06	1.60E-06	1.90E-06	1.90E-06	1.90E-06	1.90E-06	Overall Average
	2000	1.90E-06	1.80E-06	3.20E-06	2.30E-06	3.50E-06	1.30E-06	7.60E-07	1.90E-06	2.74E-06
Retest	**1999**	5.80E-06	6.90E-06	6.60E-06	6.40E-06	--	--	--	--	
Original	**1999**	7.40E-06	**7.50E-06**	6.90E-06	7.30E-06	4.20E-06	4.50E-06	4.50E-06	4.40E-06	Max. Obs.
	1998	1.10E-06	9.90E-07	9.30E-07	9.90E-07	8.30E-07	7.60E-07	6.30E-07	7.40E-07	1.06E-05
	1997	6.41E-07	3.24E-07	5.15E-07	4.93E-07	5.66E-07	7.11E-07	5.72E-07	6.16E-07	
	1996	4.88E-06	4.12E-06	3.17E-06	4.06E-06	2.63E-06	2.73E-06	**1.06E-05**	5.33E-06	
	1995	6.51E-06	4.07E-06	2.52E-06	4.37E-06	2.48E-06	1.35E-06	6.47E-07	1.49E-06	
	1994	1.48E-06	1.23E-06	9.44E-07	1.22E-06	1.94E-06	1.31E-06	1.11E-06	1.45E-06	
Average for Unit					3.19E-06				2.23E-06	
Pb		lbs/hr				lbs/hr				**0.165**
	2002									
	2001	2.50E-03	3.26E-03	3.76E-03	3.17E-03	2.57E-03	**6.40E-03**	2.14E-03	3.70E-03	Overall Average
	2000	9.31E-04	1.45E-03	8.98E-04	1.09E-03	1.06E-04	1.37E-04	2.91E-05	9.07E-05	<1.47E-03
	1999	1.68E-03	**8.86E-03**	2.66E-03	4.40E-03	2.43E-03	1.29E-03	1.05E-03	1.59E-03	
	1998	3.47E-03	1.20E-03	3.51E-04	1.67E-03	1.71E-03	2.12E-03	2.58E-03	2.14E-03	Max. Obs.
	1997	8.72E-04	1.53E-03	1.20E-03	1.20E-03	1.97E-03	2.11E-03	1.67E-03	1.92E-03	8.86E-03
	1996	1.71E-04	4.62E-04	8.62E-05	2.40E-04	3.14E-04	4.14E-04	3.45E-04	3.58E-04	
	1995	1.37E-04	1.95E-04	1.20E-04	1.51E-04	1.20E-04	2.50E-04	1.23E-04	1.64E-04	
	1994	<8.40E-04	<8.20E-04	<8.30E-04	<8.30E-04	<8.10E-04	<8.10E-04	<8.10E-04	<8.10E-04	
Average for Unit					<1.59E-03				<1.35E-03	

Bolded values indicate maximum of each pollutant concentration and minimum of removal efficiency for each unit.

Complete 2002 test data has yet to be provided to RTP.

Stack Test Results for Lee County RRF

Pollutant	**Unit 1**				**Unit 2**				**Max. Permitted Emission Limit**
Year	**Rep. 1**	**Rep. 2**	**Rep. 3**	**Average**	**Rep. 1**	**Rep. 2**	**Rep. 3**	**Average**	
PM	**lbs/hr**				**lbs/hr**				**5.34**
2002									
2001[f]	0.103	0.125	0.196	0.147	0.516	0.277	0.451	0.457	Overall Average
2000	0.71	0.33	0.09	0.37	0.37	0.30	0.30	0.32	0.746
1999	1.55	1.24	0.90	1.23	0.819	0.607	1.310	0.911	
1998	1.35	2.38	**3.14**	2.29	**1.78**	1.32	1.36	1.49	Max. Obs.
1997	0.89	0.96	0.87	0.91	1.25	1.21	0.74	1.07	3.14
1996	0.25	0.39	0.13	0.26	0.45	1.33	1.15	0.98	
1995	0.27	0.93	0.53	0.58	0.08	0.32	0.40	0.27	
1994	0.30	0.33	0.25	0.30	0.42	0.43	0.26	0.37	
Average for Unit				0.76				0.73	
Hg	**lbs/hr**				**lbs/hr**				**3.79E-02**
2002									
2001	5.39E-03	6.03E-03	5.03E-03	5.48E-03	6.94E-03	7.32E-03	5.67E-03	6.64E-03	Overall Average
2000	<3.23E-04	<3.38E-04	<3.42E-04	<3.34E-04	7.05E-03	3.75E-03	<3.39E-04	<3.71E-03	<6.95E-03
1999	7.39E-03	9.98E-03	<7.44E-03	<8.27E-03	<5.89E-03	<7.66E-03	6.41E-03	0.00666	
1998	6.67E-03	8.14E-03	5.97E-03	6.93E-03	8.01E-03	7.41E-03	**1.31E-02**	9.51E-03	Max. Obs.
1997	5.08E-03	4.71E-03	5.08E-03	4.96E-03	3.89E-03	3.58E-03	5.18E-03	4.22E-03	1.72E-02
1996	1.03E-02	9.18E-03	1.04E-02	9.94E-03	1.24E-02	1.29E-02	1.27E-02	1.27E-02	
1995	1.22E-02	9.70E-03	**1.72E-02**	1.30E-02	5.65E-03	8.17E-03	1.12E-02	8.34E-03	
1994	3.38E-03	3.59E-03	3.99E-03	3.65E-03	6.91E-03	6.08E-03	7.51E-03	6.83E-03	
Average for Unit				<6.57E-03				<7.33E-03	

[f] The average for PM 2001 (lbs/hr) includes a 4th Rep. For both Unit 1 (0.166) and Unit 2 (0.582) which was conducted under normal soot blowing conditions.

Bolded values indicate maximum of each pollutant concentration and minimum of removal efficiency for each unit.
Complete 2002 test data has yet to be provided to RTP.

Stack Test Results for Lee County RRF

Pollutant	Unit 1				Unit 2				Max. Permitted Emission Limit
Year	Rep. 1	Rep. 2	Rep. 3	Average	Rep. 1	Rep. 2	Rep. 3	Average	
SO_2	lbs/hr				lbs/hr				41
2002									
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Overall Average
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8
1999	1.7	0.0	0.95	0.88	**17.4**	8.6	8.7	11.6	
1998	6.3	1.7	5.4	4.5	10.1	7.4	4.1	7.2	Max. Obs.
1997	0.3	0.5	0.6	0.5	0.0	0.1	10.0	3.4	17.4
1996	**11.0**	4.5	2.7	6.2	6.7	11.2	1.0	6.3	
1995	2.7	3.1	1.9	2.6	0.6	8.2	2.4	3.7	
1994	1.4	8.0	7.5	5.6	5.5	6.0	12.1	7.9	
Average for Unit				2.5				5.0	
HCl	lbs/hr				lbs/hr				17.7
2002									
2001	5.27	6.71	5.58	5.85	5.18	4.48	4.53	4.73	Overall Average
2000	4.07	3.56	4.79	4.14	8.83	7.24	4.61	6.89	7.24
1999	5.87	7.09	5.35	6.10	10.30	11.20	10.50	10.70	
1998	7.39	5.57	7.47	6.81	10.30	5.62	5.45	7.12	Max. Obs.
1997	5.30	5.30	5.40	5.30	4.61	5.38	5.45	5.15	15.60
1996	**9.66**	**9.66**	**9.66**	9.66	**15.60**	12.50	13.60	13.90	
1995	8.14	7.19	6.13	7.15	5.79	6.39	4.96	5.71	
1994	3.72	6.83	7.63	6.10	10.70	10.00	10.80	10.50	
Average for Unit				6.39				8.09	
CO	lbs/hr				lbs/hr				27.2
2002									
2001	5.40	5.98	5.83	5.74	4.24	6.01	4.78	5.01	Overall Average
2000	6.89	7.16	7.06	7.04	7.05	7.52	6.87	7.15	7.28
1999	5.76	6.96	8.66	7.13	7.7	7.5	7.0	7.4	
1998	12.3	**17.2**	10.5	13.3	7.4	9.6	8.2	8.4	Max. Obs.
1997	6.1	7.1	7.4	6.9	5.3	4.2	3.7	4.4	17.2
1996	7.5	7.1	9.6	8.1	9.7	7.3	5.7	7.6	
1995	4.0	5.1	4.7	4.6	2.9	2.7	3.1	2.9	
1994	11.2	9.4	9.6	10.0	**12.0**	10.4	10.4	10.9	
Average for Unit				7.85				6.72	

Bolded values indicate maximum of each pollutant concentration and minimum of removal efficiency for each unit.
Complete 2002 test data has yet to be provided to RTP.

Stack Test Results for Lee County RRF

Pollutant	**Unit 1**				**Unit 2**				**Max. Permitted Emission Limit**
Year	**Rep. 1**	**Rep. 2**	**Rep. 3**	**Average**	**Rep. 1**	**Rep. 2**	**Rep. 3**	**Average**	
Arsenic	**lbs/hr**				**lbs/hr**				**2.50E-03**
2002									
2001									Overall Average
2000	<3.61E-05	<3.55E-05	<3.62E-05	<3.60E-05	4.16E-05	<3.62E-05	<3.51E-05	<3.76E-05	<8.41E-05
1999	<8.64E-05	**1.79E-04**	1.09E-04	<1.25E-04	1.07E-04	1.03E-04	<8.39E-05	<9.77E-05	
1998	1.56E-04	1.03E-04	<8.78E-05	<1.16E-04	1.38E-04	1.38E-04	1.82E-04	1.53E-04	Max. Obs.
1997	<9.01E-05	<8.93E-05	<8.88E-05	<8.94E-05	1.52E-04	**1.87E-04**	<8.88E-05	<1.43E-04	<1.87E-04
1996	4.74E-05	<4.78E-05	4.83E-05	<4.78E-05	<4.82E-05	2.02E-05	<4.90E-05	<3.92E-05	
1995	<1.03E-04	<1.07E-04	<1.05E-04	<1.05E-04	<1.00E-04	<9.93E-05	<1.03E-04	<1.01E-04	
1994	<4.33E-05	<4.33E-05	<4.39E-05	<4.35E-05	<4.28E-05	<4.30E-05	<4.27E-05	<4.29E-05	
Average for Unit				<8.04E-05				<8.78E-05	
SAM	**lb/hr**				**lb/hr**				**9.85**
2002									
2001									Overall Average
2000	<0.011	<0.008	<0.004	<0.008	0.0	0.024	<0.012	<0.012	<1.782
1999	4.56	3.77	4.42	4.25	2.37	3.64	**4.17**	3.39	
1998	**6.05**	4.84	4.79	5.23	3.54	3.41	3.99	3.65	Max. Obs.
1997	0.297	0.297	0.576	0.390	0.285	0.563	0.558	0.469	6.05
1996	0.61	0.30	0.60	0.50	0.51	0.66	0.86	0.68	
1995	<0.0333	<0.0326	<0.0444	<0.0368	<0.0372	<0.0427	<0.0275	<0.0358	
1994	4.1	3.3	2.3	3.2	3.1	3.2	3.1	3.1	
Average for Unit				<1.945				<1.620	

Bolded values indicate maximum of each pollutant concentration and minimum of removal efficiency for each unit.
Complete 2002 test data has yet to be provided to RTP.

ATTACHMENT 3

TABLE 2-1
PSD POLLUTANT APPLICABILITY FOR THE ADDITION OF MWC UNIT 3 TO THE LCERF

Name of PSD Pollutant	PSD Significant Emission Rates[a] (tpy)	Proposed Unit 3 Emission Rate (tpy)	PSD Applicable
Carbon Monoxide	100	125.8	Yes
Nitrogen Oxides	40	310.1	Yes
Sulfur Dioxide	40	287.8	Yes
Sulfuric Acid Mist	7	73.51	Yes
Particulate Matter (Total)	25	22.28	No
Particulate Matter (PM_{10})	15	22.28	Yes
Ozone (VOCs)	40	21.62	No
Lead	0.6	0.216	No
Beryllium	4E-4	1.73E-4	No
Mercury	0.1	0.187	Yes
Fluorides	3	3.145	Yes
MWC Acid Gases (as SO_2 & HCl)	40	492.7	Yes
MWC Metals (as PM)	15	22.25	Yes
Total Reduced Sulfur (Including H_2S)	10	Negligible	No
Reduced Sulfur Compounds (Including H_2S)	10	Negligible	No
Hydrogen Sulfide	10	Negligible	No
Vinyl Chloride	1	Negligible	No
MWC Organics (Total Dioxins and Furans)[b]	3.5E-6	1.41E-5	Yes

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[a] Source: Rule 61-212.400, F.A.C. Table 212.400-2 (Regulated Air Pollutants – Significant Emission Rates) and 40 CFR 52.21 (Prevention of Significant Deterioration of Air Quality).

[b] Measured as total tetra- through octa- chlorinated dibenzo-p-dioxins and dibenzo furans.

Deleted: February 10, 2003

ATTACHMENT 4

Comparison of Sulfuric Acid Mist (SAM) and Sulfur Dioxide Stack Test Results for Lee County ERF

	Pollutant	Unit 1				Unit 2			
Year		Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average
		lb/hr				lb/hr			
2000	SAM	<0.011	<0.008	<0.004	<0.008	0.0	0.024	<0.012	<0.012
	SO_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	% SAM of SO_2	--	--	--	--	--	--	--	--
1999	SAM	4.56	3.77	4.42	4.25	2.37	3.64	4.17	3.39
	SO_2	1.7	0.0	0.95	0.88	17.4	8.6	8.7	11.6
	% SAM of SO_2	268.24%	--	465.26%	482.95%	13.62%	42.33%	47.93%	29.22%
1998	SAM	6.05	4.84	4.79	5.23	3.54	3.41	3.99	3.65
	SO_2	6.3	1.7	5.4	4.5	10.10	7.40	4.10	7.20
	% SAM of SO_2	96.03%	284.71%	88.70%	116.22%	35.05%	46.08%	97.32%	50.69%
1997	SAM	0.297	0.297	0.576	0.390	0.285	0.563	0.558	0.469
	SO_2	0.3	0.5	0.6	0.5	0.0	0.1	10.0	3.4
	% SAM of SO_2	99.00%	59.40%	96.00%	78.00%	--	563.00%	5.58%	13.79%
1996	SAM	0.61	0.30	0.60	0.50	0.51	0.66	0.86	0.68
	SO_2	11.0	4.5	2.7	6.2	6.7	11.2	1.0	6.3
	% SAM of SO_2	5.55%	6.67%	22.22%	8.06%	7.61%	5.89%	86.00%	10.79%
1995	SAM	<0.0333	<0.0326	<0.0444	<0.0368	<0.0372	<0.0427	<0.0275	<0.0358
	SO_2	2.69	3.14	1.92	2.58	0.598	8.23	2.39	3.74
	% SAM of SO_2	<1.24%	<1.04%	<2.31%	<1.43%	<6.22%	<0.52%	<1.15%	<0.96%
1994	SAM	4.1	3.3	2.3	3.2	3.1	3.2	3.1	3.1
	SO_2	1.4	8.0	7.5	5.6	5.5	6.0	12.1	7.9
	% SAM of SO_2	292.86%	41.25%	30.67%	57.14%	56.36%	53.33%	25.62%	39.24%

ATTACHMENT 5

Department of
Environmental Protection

Division of Air Resources Management

APPLICATION FOR AIR PERMIT - TITLE V SOURCE

See Instructions for Form No. 62-210.900(1)

I. APPLICATION INFORMATION

Identification of Facility

1. Facility Owner/Company Name: Lee County Board of County Commissioners
2. Site Name: Lee County Energy Recovery Facility
3. Facility Identification Number: 0710119 [ ] Unknown
4. Facility Location:
   Street Address or Other Locator: 10500 Buckingham Road
   City: Fort Myers County: Lee Zip Code: 33905
5. Relocatable Facility? [ ] Yes [X] No
6. Existing Permitted Facility? [X] Yes [ ] No

Application Contact

1. Name and Title of Application Contact:
   Mr. Samuel M. Rosania, R.E.M./Project Scientist
2. Application Contact Mailing Address:
   Organization/Firm: Malcolm Pirnie, Inc.
   Street Address: 1715 East 9th Avenue
   City: Tampa State: FL Zip Code: 33605
3. Application Contact Telephone Numbers:
   Telephone: (813) 248 - 6900 Fax: (813) 248 - 8085

Application Processing Information (DEP Use)

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

Purpose of Application

Air Operation Permit Application

This Application for Air Permit is submitted to obtain: (Check one)

[ ] Initial Title V air operation permit for an existing facility which is classified as a Title V source.

[ ] Initial Title V air operation permit for a facility which, upon start up of one or more newly constructed or modified emissions units addressed in this application, would become classified as a Title V source.

Current construction permit number:____________________

[ ] Title V air operation permit revision to address one or more newly constructed or modified emissions units addressed in this application.

Current construction permit number:____________________

Operation permit number to be revised:____________________

[ ] Title V air operation permit revision or administrative correction to address one or more proposed new or modified emissions units and to be processed concurrently with the air construction permit application. (Also check Air Construction Permit Application below.)

Operation permit number to be revised/corrected:____________________

[ ] Title V air operation permit revision for reasons other than construction or modification of an emissions unit. Give reason for the revision; e.g., to comply with a new applicable requirement or to request approval of an "Early Reductions" proposal.

Operation permit number to be revised:____________________

Reason for revision:____________________

Air Construction Permit Application

This Application for Air Permit is submitted to obtain: (Check one)

[X] Air construction permit to construct or modify one or more emissions units.

[ ] Air construction permit to make federally enforceable an assumed restriction on the potential emissions of one or more existing, permitted emissions units.

[ ] Air construction permit for one or more existing, but unpermitted, emissions units.

Owner/Authorized Representative or Responsible Official

1. Name and Title of Owner/Authorized Representative or Responsible Official:
Mr. Lindsey Sampson

2. Owner/Authorized Representative or Responsible Official Mailing Address:
Organization/Firm: Lee County Solid Waste Division
Street Address: 10500 Buckingham Road
City: Fort Myers State: FL Zip Code: 33905

3. Owner/Authorized Representative or Responsible Official Telephone Numbers:
Telephone: (239) 338 - 3302 Fax: (239) 461 - 5871

4. Owner/Authorized Representative or Responsible Official Statement:

I, the undersigned, am the owner or authorized representative(check here [ ], if so) or the responsible official (check here [ ], if so) of the Title V source addressed in this application, whichever is applicable. 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. 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 any permitted emissions unit.*

Signature Date

* Attach letter of authorization if not currently on file.

Professional Engineer Certification

1. Professional Engineer Name: Amit Chattopadhay, P.E.
Registration Number: 52823

2. Professional Engineer Mailing Address:
Organization/Firm: Malcolm Pirnie, Inc.
Street Address: 17-17 Route 208 North
City: Fair Lawn State: NJ Zip Code: 07410

3. Professional Engineer Telephone Numbers:
Telephone: (201) 797 - 7400 Fax: (201) 797 - 4558

4. 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.

If the purpose of this application is to obtain a Title V source 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 schedule is submitted with this application.

If the purpose of this application is to obtain an air construction permit 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.

If the purpose of this application is to obtain an initial air operation permit or operation permit revision 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

Date

(seal)

* Attach any exception to certification statement.

Scope of Application

Emissions Unit ID	Description of Emissions Unit	Permit Type	Processing Fee
	Municipal Waste Combustion Unit No. 3	AC1A	
	Lime Silo II	AC1F	

Application Processing Fee

Check one: [ ] Attached - Amount: $__________________ [X] Not Applicable

Construction/Modification Information

1. Description of Proposed Project or Alterations:

The Lee County Solid Waste Division operates the Lee County Energy Recovery Facility (LCERF) at 10500 Buckingham Road east of Fort Myers, Florida. The current facility consists of two Martin GmbH mass-burn traveling grate combustors each rated at a capacity of 660 tons/day (tpd) per unit for a total of 1,320 tons per day of solid waste fuel with a nominal HHV of 5,000 Btu/lb. Due to a growth in population since the facility came online in 1994, Lee County has decided to expand their current facility through the addition of a third 660-tpd combustion unit (Unit 3) that is a separate source. This facility expansion is not a modification of the existing two municipal waste combustors (Units 1 and 2).

2. Projected or Actual Date of Commencement of Construction: January 1, 2003

3. Projected Date of Completion of Construction: To Be Provided Later.

Application Comment

Application fees for this Prevention of Significant Deterioration application are covered by the LCERF's Power Plant Siting Act (PPSA) fees. The LCERF currently operates under the PPSA Conditions of Certification Case Number PA90-30.

II. FACILITY INFORMATION

A. GENERAL FACILITY INFORMATION

Facility Location and Type

1. Facility UTM Coordinates: Zone: 17	East (km): 424.21		North (km): 2945.70
2. Facility Latitude/Longitude: Latitude (DD/MM/SS): 26/37/54		Longitude (DD/MM/SS): -81/45/41	
3. Governmental Facility Code: 3	4. Facility Status Code: A	5. Facility Major Group SIC Code: 49	6. Facility SIC(s): 4953

7. Facility Comment (limit to 500 characters):

LCERF Operator is:
Covanta Lee, Inc. (Formerly Ogden-Martin Systems of Lee, Inc.)
10500 Buckingham Road, Suite 400
Fort Myers, FL 33905
Tel: (941) 337-2200/Fax: (941) 337-2510

The Facility's two existing MWC units currently operate under the following air permits:
PPSA Conditions of Certification PA90-30
FDEP Permit 0710119-001-AV
PSD-FL-151
PSD-FL-151A
PSD-FL-151B

Facility Contact

1. Name and Title of Facility Contact: Tom Eriksen, Facility Manager

2. Facility Contact Mailing Address:
Organization/Firm: Covanta Lee, Inc.
Street Address: 10500 Buckingham Road, Suite 400
City: Fort Myers State: FL Zip Code: 33905

3. Facility Contact Telephone Numbers:
Telephone: (941) 337 - 2200 Fax: (941) 337 - 2510

Facility Regulatory Classifications

Check all that apply:

1. [ ] Small Business Stationary Source?	[ ] Unknown
2. [X] Major Source of Pollutants Other than Hazardous Air Pollutants (HAPs)?	
3. [ ] Synthetic Minor Source of Pollutants Other than HAPs?	
4. [X] Major Source of Hazardous Air Pollutants (HAPs)?	
5. [ ] Synthetic Minor Source of HAPs?	
6. [X] One or More Emissions Units Subject to NSPS?	
7. [ ] One or More Emission Units Subject to NESHAP?	
8. [X] Title V Source by EPA Designation?	
9. Facility Regulatory Classifications Comment (limit to 200 characters):	

List of Applicable Regulations

40 CFR Part 50	40 CFR Part 52.21
40 CFR Part 60, Subpart Eb	40 CFR Part 60, Appendix A
40 CFR Part 60, Appendix B	
40 CFR Part 64	
Rule 62-204, F.A.C.	
Rule 62-210, F.A.C.	
Rule 62-212, F.A.C.	
Rule 62-296.416, F.A.C.	
Rule 62-297, F.A.C.	

B. FACILITY POLLUTANTS

List of Pollutants Emitted

1. Pollutant Emitted	2. Pollutant Classif.	3. Requested Emissions Cap		4. Basis for Emissions Cap	5. Pollutant Comment
		lb/hour	tons/year		
PM	B	5.081~~5.08~~	22.28~~22.26~~	Rule	USEPA NSPS
PM10	B	5.081~~5.08~~	22.28~~22.26~~	Rule	USEPA NSPS
CO	A	28.73	125.8	Rule	USEPA NSPS
SO2	A	65.72	287.8	Rule	USEPA NSPS
NOX	A	70.79	310.1	Rule	USEPA NSPS
PB	B	4.94 E-2	0.216	Rule	USEPA NSPS
VOC	B	4.936	21.62	ESCPSD	
H027	B	4.94 E-3	0.0216	Rule	USEPA NSPS (Cadmium)
DIOX	B	3.21 E-6	1.406 E-5	Rule	USEPA NSPS
H107	B	0.718	3.145	Rule	40 CFR 52.21 (HF)
H106	A	46.76	204.8	Rule	USEPA NSPS (HCl)
H114	B	4.26 E-2	0.187	Rule	USEPA NSPS (Mercury)
SAM	B	9.85~~16.78~~	39.30~~73.51~~	Rule	40 CFR 52.21
H021	B	3.95 E-5	1.73 E-4	ESCPSD	(Beryllium)
H015	B	2.65 E-3	0.0116	Other	Units 1 and 2 operation (Arsenic)
Ammonia	B	8.72	38.190	Other	Based on operation of Units 1 and 2.
HAPS	A	47.58	208.4	Rule	40 CFR 52.21

C. FACILITY SUPPLEMENTAL INFORMATION

Supplemental Requirements

1. Area Map Showing Facility Location: [X] Attached, Document ID: Fig. 1-1 [] Not Applicable [ ] Waiver Requested
2. Facility Plot Plan: [X] Attached, Document ID: Fig. 6-2 [ ] Not Applicable [ ] Waiver Requested
3. Process Flow Diagram(s): [X] Attached, Document ID: Below [ ] Not Applicable [ ] Waiver Requested
4. Precautions to Prevent Emissions of Unconfined Particulate Matter: [X] Attached, Document ID: Below [ ] Not Applicable [ ] Waiver Requested
5. Fugitive Emissions Identification: [X] Attached, Document ID: Below [ ] Not Applicable [ ] Waiver Requested
6. Supplemental Information for Construction Permit Application: [X] Attached, Document ID: See PSD Application Write-up [ ] Not Applicable
7. Supplemental Requirements Comment: The map showing facility location is Figure 1-1 of the PSD application. The facility plot plan is Figure 6-2 of the PSD application. The process flow diagram is provided in the PSD application write-up. Precautions to Prevent Emissions of Unconfined Particulate Matter are provided in the PSD application write-up in Section 6. Fugitive Emissions Identification is provided in the PSD application write-up in Section 6.4 (Source Data). Proposed Insignificant Activities are listed in the PSD application write-up in Section 6.4 (Source Data). The identification of additional applicable requirements is provided in the PSD application write-up.

Additional Supplemental Requirements for Title V Air Operation Permit Applications

8. List of Proposed Insignificant Activities:
[X] Attached, Document ID: See field 7 above [ ] Not Applicable

9. List of Equipment/Activities Regulated under Title VI:
[ ] Attached, Document ID:________
[ ] Equipment/Activities On site but Not Required to be Individually Listed
[X] Not Applicable

10. Alternative Methods of Operation:
[ ] Attached, Document ID:________ [X] Not Applicable

11. Alternative Modes of Operation (Emissions Trading):
[ ] Attached, Document ID:________ [X] Not Applicable

12. Identification of Additional Applicable Requirements:
[X] Attached, Document ID: See field 7 above [ ] Not Applicable

13. Risk Management Plan Verification:
[X] Plan previously submitted to Chemical Emergency Preparedness and Prevention Office (CEPPO). Verification of submittal attached (Document ID: Attachment G) or previously submitted to DEP (Date and DEP Office:________________________)
[ ] Plan to be submitted to CEPPO (Date required:____________________________)
[ ] Not Applicable

14. Compliance Report and Plan:
[ ] Attached, Document ID:________ [X] Not Applicable

15. Compliance Certification (Hard-copy Required):
[ ] Attached, Document ID:________ [X] Not Applicable

III. EMISSIONS UNIT INFORMATION

A separate Emissions Unit Information Section (including subsections A through J as required) must be completed for each emissions unit addressed in this Application for Air Permit. If submitting the application form in hard copy, indicate, in the space provided at the top of each page, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application.

A. GENERAL EMISSIONS UNIT INFORMATION
(All Emissions Units)

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).

[X] 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. Regulated or Unregulated Emissions Unit? (Check one)

[X] 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.

3. Description of Emissions Unit Addressed in This Section (limit to 60 characters):

Municipal waste combustor unit rated at 660 tons of municipal solid waste per day.

4. Emissions Unit Identification Number: [X] No ID
ID: [ ] ID Unknown

5. Emissions Unit Status Code: C	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code: 49	8. Acid Rain Unit? [ ]

9. Emissions Unit Comment: (Limit to 500 Characters)

Emissions Unit Control Equipment

1. Control Equipment/Method Description (Limit to 200 characters per device or method):

Air Pollution Control (APC) equipment for the third unit will be similar to APC equipment for the two existing units; namely, a spray dry absorber, fabric filter baghouse, activated carbon injection system, and selective non-catalytic reduction system.

2. Control Device or Method Code(s): 016, 025, 048, 067, 107

Emissions Unit Details

1. Package Unit:
Manufacturer: To Be Determined Model Number: To Be Determined

2. Generator Nameplate Rating: +- 20 MW (Nominal)

3. Incinerator Information: To Be Determined
Dwell Temperature: °F
Dwell Time: seconds
Incinerator Afterburner Temperature: °F

B. EMISSIONS UNIT CAPACITY INFORMATION
(Regulated Emissions Units Only)

Emissions Unit Operating Capacity and Schedule

1. Maximum Heat Input Rate:	275			mmBtu/hr
2. Maximum Incineration Rate:	55,000	lb/hr	660	tons/day
3. Maximum Process or Throughput Rate:	660 tons per day (annual basis)			
4. Maximum Production Rate:				
5. Requested Maximum Operating Schedule:				
	24	hours/day	7	days/week
	52	weeks/year	8,760	hours/year

6. Operating Capacity/Schedule Comment (limit to 200 characters):

Municipal Waste Combustor unit 3 is rated at 660 tons per day at a reference higher heating value (HHV)of 5,000 Btu per pound of waste on an annual basis. The Lee County Energy Recovery Facility is permitted to burn waste under their Power Plant Siting Act Conditions of Certification for Case Number PA90-30.

C. EMISSIONS UNIT REGULATIONS
(Regulated Emissions Units Only)

List of Applicable Regulations

40 CFR Part 50	National Primary and Secondary Ambient Air Quality Standards
40 CFR Part 52.21	Prevention of Significant Deterioration of Air Quality
40 CFR Part 60, Subpart Eb	New Source Performance Standards for Large Municipal Waste Combustors
40 CFR Part 60, Appendix A	Test Methods
40 CFR Part 60, Appendix B	Performance Specifications
40 CFR Part 64	Compliance Assurance Monitoring
Rule 62-204 F.A.C.	Air Pollution Control - General Provisions
Rule 62-210 F.A.C.	Stationary Sources - General Requirements
Rule 62-212 F.A.C.	Stationary Sources - Preconstruction Review
Rule 62-296.416 F.A.C.	Stationary Sources – Emission Standards for Waste-to-Energy Facilities
Rule 62-297 F.A.C.	Stationary Sources - Emissions Monitoring

D. EMISSION POINT (STACK/VENT) INFORMATION
(Regulated Emissions Units Only)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram? See Field 14 Below.	2. Emission Point Type Code: 1

3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking (limit to 100 characters per point):

4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common:

5. Discharge Type Code: V	6. Stack Height: 276 feet	7. Exit Diameter: 6.17 feet
8. Exit Temperature: 270 °F	9. Actual Volumetric Flow Rate: 80,000-155,800 acfm	10. Water Vapor: 14.73 %

11. Maximum Dry Standard Flow Rate: 35800-65,900	12. Nonstack Emission Point Height: feet

13. Emission Point UTM Coordinates:

Zone: 17 East (km): 424.20 North (km): 2945.70

14. Emission Point Comment (limit to 200 characters):

From Field 1 Above: Emission Point is located in the upper right area of Figure 6-2 of the PSD Application. The emission point is located at an elevation of 276 feet above grade (271 feet for structural stack plus 5 feet for flue).

The stack contains space three separate flues, one for each combustor unit. Flues for Units 1 and 2 currently are in the facility stack. The flue for Unit 3 will be installed during this project.

The maximum dry standard flow rate in field 11 above is corrected to 7% oxygen. Flow ranges above correspond to operation of unit over the operating window. See Section 6 of the PSD application documentation for further information on this operating window, specifically Figure 6-1.

E. SEGMENT (PROCESS/FUEL) INFORMATION
(All Emissions Units)

Segment Description and Rate: Segment 1 of 1 .

1. Segment Description (Process/Fuel Type) (limit to 500 characters): Municipal solid waste (MSW) generated in the Lee County area is combusted by the facility to generate thermal energy and heat water producing steam. This steam is used to power an electrical generator and produce electricity that is sold to the power grid. The MSW is rated at 5,000 Btu/pound under the PPSA Conditions of Certification Case Number PA90-30.		
2. Source Classification Code (SCC): 50100105	3. SCC Units: Tons Burned	
4. Maximum Hourly Rate: 27.5	5. Maximum Annual Rate: 240,900	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit: 10
10. Segment Comment (limit to 200 characters): Lee County proposes that the language under Condition A.10.1 (Allowable Fuels) of their current Title V operating permit be used for Unit 3 to establish the fuel slate for compliant operation of the proposed MWC Unit 3.		

Segment Description and Rate: Segment ___ of ___.

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
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 (limit to 200 characters):		

Emissions Unit Information Section __1__ of __2__.

F. EMISSIONS UNIT POLLUTANTS
(All Emissions Units)

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
PM	016		EL
PM10	016		EL
CO	025		EL
SO2	067	016	EL
NOX	107		EL
PB	016		EL
VOC	025		EL
H027	016		EL
DIOX	025	067	EL
H107	067	016	EL
H106	067	016	EL
H114	048	016	EL
SAM	067	016	EL
H021	016		EL
H015	016		EL
Ammonia			EL
HAPS	016	025	EL

Emissions Unit Information Section __1__ of __2__.

Pollutant Detail Information Page __1__ of __17__.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: PM	2. Total Percent Efficiency of Control:
3. Potential Emissions: 5.081~~5.08~~ lb/hour 22.25~~22.26~~	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 0.009 grains/dscf @ 7% O_2 Reference: Past operation of units 1 and 2 at facility	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{0.009\ \text{grains @ } 7\%\ O_2}{\text{dscf}} \times \frac{\text{lb}}{7{,}000\ \text{grains}} \times \frac{65{,}868\ \text{dscf @ } 7\%\ O_2}{\text{minute}} \times \frac{60\ \text{minute}}{\text{hour}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions __1__ of __1__.

1. Basis for Allowable Emissions Code: OTHER	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 0.009 grains/dscf @ 7% O_2	4. Equivalent Allowable Emissions: 5.08 lb/hour 22.26 tons/year

5. Method of Compliance (limit to 60 characters):

USEPA Method 5 [as per 40 CFR 60.58b(c)]

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emission factor is based on an analysis of past operation of units 1 and 2 at the facility in addition to other available data for municipal waste combustion facilities.

Emissions Unit Information Section 1 of 2.

Pollutant Detail Information Page 2 of 17.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: PM10	2. Total Percent Efficiency of Control:
3. Potential Emissions: 5.081~~5.08~~ lb/hour 22.25~~22.26~~ tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 0.009 grains/dscf @ 7% O_2 Reference: Past operation of units 1 and 2 at facility	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{0.009\text{ grains @ }7\%\,O_2}{\text{dscf}} \times \frac{\text{lb}}{7{,}000\text{ grains}} \times \frac{65{,}868\text{ dscf @ }7\%\,O_2}{\text{minute}} \times \frac{60\text{ minute}}{\text{hour}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: OTHER	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 0.009 grains/dscf @ 7% O_2	4. Equivalent Allowable Emissions: 5.08 lb/hour 22.26 tons/year

5. Method of Compliance (limit to 60 characters):

USEPA Method 5 [as per 40 CFR 60.58b(c)]

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emission factor is based on an analysis of past operation of units 1 and 2 at the facility in addition to other available data for municipal waste combustion facilities.

Emissions Unit Information Section _1_ of _2_.

Pollutant Detail Information Page _3_ of _17_.

(*Regulated Emissions Units* -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: CO	2. Total Percent Efficiency of Control:
3. Potential Emissions: 28.73 lb/hour 125.8 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 100 ppmdv @7% O_2 Reference: 40 CFR 60, Subpart Eb	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{100\ \text{ppmdv} @ 7\%\ O_2}{1 \times 10^6} \times \frac{28.01\ \text{lb}}{\text{lb mole}} \times \frac{65{,}868\ \text{dscf} @ 7\%\ O_2}{\text{minute}} \times \frac{60\ \text{minute}}{\text{hour}} \times \frac{\text{mole}}{385.3\ \text{dscf}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions _1_ of _1_

1. Basis for Allowable Emissions Code: RULE	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 100 ppmdv @ 7% O_2	4. Equivalent Allowable Emissions: 28.73 lb/hour 125.8 tons/year

5. Method of Compliance (limit to 60 characters):
CEM [as per 40 CFR 60.58b(i)]

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emission source is applicable to 40 CFR 60, Subpart Eb.

Emissions Unit Information Section __1__ of __2__.

Pollutant Detail Information Page __4__ of __17__.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: SO2	2. Total Percent Efficiency of Control: 80%
3. Potential Emissions: 65.72 lb/hour 287.8 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 100 ppmdv @ 7% O_2 Reference: 40 CFR 60, Subpart Eb	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{100\text{ ppmdv @ }7\%\ O_2}{1 \times 10^6} \times \frac{64.07\text{ lb}}{\text{lb mole}} \times \frac{65{,}868\text{ dscf @ }7\%\ O_2}{\text{minute}} \times \frac{60\text{ minute}}{\text{hour}} \times \frac{\text{mole}}{385.3\text{ dscf}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

40 CFR 60.52b(b) limits SO_2 emissions to 30 ppmdv (at 7% O_2) or 20% (by weight or volume) of potential SO2 emissions concentration, whichever is less stringent (20% of uncontrolled SO_2 emissions is conservatively estimated to be 100 ppmdv at 7% O_2).

Allowable Emissions Allowable Emissions __1__ of __1__

1. Basis for Allowable Emissions Code: RULE	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 100 ppmdv @ 7% O_2	4. Equivalent Allowable Emissions: 65.72 lb/hour 287.8 tons/year

5. Method of Compliance (limit to 60 characters):

CEM [as per 40 CFR 60.58b(e)]

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

40 CFR 60.52b(b) limits SO_2 emissions to 30 ppmdv (at 7% O_2) or 20% (by weight or volume) of potential SO2 emissions concentration, whichever is less stringent (20% of uncontrolled SO_2 emissions is conservatively estimated to be 100 ppmdv at 7% O_2).

Emissions Unit Information Section __1__ of __2__.

Pollutant Detail Information Page __5__ of __17__.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: NOX	2. Total Percent Efficiency of Control: Approx. 40%
3. Potential Emissions: 70.79 lb/hour 310.1 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 150 ppmdv @ 7% O_2 Reference: 40 CFR 60, Subpart Eb	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{150\text{ ppmdv @ }7\%\,O_2}{1\times10^6} \times \frac{46.01\text{ lb}}{\text{lb mole}} \times \frac{65{,}868\text{ dscf @ }7\%\,O_2}{\text{minute}} \times \frac{60\text{ minute}}{\text{hour}} \times \frac{\text{mole}}{385.3\text{ dscf}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

180 ppmdv at 7% O_2 for the first year of operation, thereafter 150 ppmdv at 7% O_2.

Allowable Emissions Allowable Emissions __1___ of __1__

1. Basis for Allowable Emissions Code: RULE	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 150 ppmdv @ 7% O_2	4. Equivalent Allowable Emissions: 70.79 lb/hour 310.1 tons/year

5. Method of Compliance (limit to 60 characters):

CEM [as per 40 CFR 60.58b(h)]

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

40 CFR 60, Subpart Eb establishes a NOx limit of 180 ppmdv at 7% O_2 for the first year of operation, thereafter the limit is 150 ppmdv at 7% O_2.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: Pb	2. Total Percent Efficiency of Control:
3. Potential Emissions: 4.94 E-2 lb/hour 0.216 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 0.200 mg/dscm @ 7% O_2 Reference: 40 CFR 60, Subpart Eb	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{0.2\text{ mg @ }7\%\ O_2}{\text{dscm}} x \frac{\text{gram}}{1000\text{ mg}} x \frac{\text{dscm}}{35.31\text{ dscf}} x \frac{65{,}868\text{ dscf @ }7\%\ O_2}{\text{minute}} x \frac{60\text{ minute}}{\text{hour}} x \frac{\text{lb}}{453.59\text{ gram}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions _1_ of _1_

1. Basis for Allowable Emissions Code: RULE	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 0.200 mg/dscm @ 7% O_2	4. Equivalent Allowable Emissions: 4.94 E-2 lb/hour 0.216 tons/year

5. Method of Compliance (limit to 60 characters):

USEPA Method 29 [as per 40 CFR 60.58b(d)]

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emission source is applicable to 40 CFR 60.58b(a)(4).

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: VOC	2. Total Percent Efficiency of Control:
3. Potential Emissions: 4.936 lb/hour 21.62 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 30 ppmdv @7% O_2 Reference: Past operation of units 1 and 2 at facility	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{30\ \text{ppmdv} @ 7\%\ O_2}{1 \times 10^6} x \frac{16.04\ \text{lb}}{\text{lb mole}} x \frac{65{,}868\ \text{dscf} @ 7\%\ O_2}{\text{minute}} x \frac{60\ \text{minute}}{\text{hour}} x \frac{\text{mole}}{385.3\ \text{dscf}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: OTHER	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 30 ppmdv @ 7% O_2	4. Equivalent Allowable Emissions: 4.936 lb/hour 21.62 tons/year

5. Method of Compliance (limit to 60 characters):

Proposed as initial stack test only using USEPA Method 18 or 25A.

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emission factor is based on an analysis of past operation of units 1 and 2 at the facility in addition to other available data for municipal waste combustion facilities.

Emissions Unit Information Section __1__ of __2__.

Pollutant Detail Information Page ___8___ of ___17___.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: H027 (Cadmium)	2. Total Percent Efficiency of Control:
3. Potential Emissions: 4.94 E-3 lb/hour 0.0216 tons/year	4. Synthetically Limited? [ ]

5. Range of Estimated Fugitive Emissions:
[ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year

6. Emission Factor: 0.020 mg/dscm @ 7% O_2 Reference: 40 CFR 60, Subpart Eb	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{0.02\text{ mg @ }7\%\,O_2}{\text{dscm}} \times \frac{\text{gram}}{1000\text{ mg}} \times \frac{\text{dscm}}{35.31\text{ dscf}} \times \frac{65{,}868\text{ dscf @ }7\%\,O_2}{\text{minute}} \times \frac{60\text{ minute}}{\text{hour}} \times \frac{\text{lb}}{453.59\text{ gram}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions ___1___ of ___1___

1. Basis for Allowable Emissions Code: RULE	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 0.020 mg/dscm @ 7% O_2	4. Equivalent Allowable Emissions: 4.94 E-3 lb/hour 0.0216 tons/year

5. Method of Compliance (limit to 60 characters):

USEPA Method 29 [as per 40 CFR 60.58b(d)]

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emission source is applicable to 40 CFR 60.52b(a)(3).

Pollutant Detail Information Page 9 of 17.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: DIOX	2. Total Percent Efficiency of Control:
3. Potential Emissions: 3.21 E-6 lb/hour 1.406 E-5 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 13 ng/dscm @ 7% O_2 Reference: 40 CFR 60, Subpart Eb	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{13\text{ ng @ }7\%\text{ }O_2}{\text{dscm}} \times \frac{\text{gram}}{1\text{ E9 ng}} \times \frac{\text{dscm}}{35.31\text{ dscf}} \times \frac{65{,}868\text{ dscf @ }7\%\text{ }O_2}{\text{minute}} \times \frac{60\text{ minute}}{\text{hour}} \times \frac{\text{lb}}{453.59\text{ gram}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: RULE	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 13 ng/dscm @ 7% O_2	4. Equivalent Allowable Emissions: 3.21 E-6 lb/hour 1.406 E-5 tons/year

5. Method of Compliance (limit to 60 characters):

USEPA Method 23 [as per 40 CFR 60.58b(g)]

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emission source is applicable to 40 CFR 60.52b(c).

Emissions Unit Information Section _1_ of _2_.

Pollutant Detail Information Page _10_ of _17_.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: H107 (Fluorides)	2. Total Percent Efficiency of Control:
3. Potential Emissions: 0.718 lb/hour 3.145 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 3.5 ppmdv @ 7% O_2 Reference: Past operation of units 1 and 2 at facility	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{3.5\text{ ppmdv @ }7\%\ O_2}{1\times10^{6}}\,x\,\frac{20.01\text{ lb}}{\text{lb mole}}\,x\,\frac{65{,}868\text{ dscf @ }7\%\ O_2}{\text{minute}}\,x\,\frac{60\text{ minute}}{\text{hour}}\,x\,\frac{\text{mole}}{385.3\text{ dscf}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions ___1___ of ___1___

1. Basis for Allowable Emissions Code: OTHER	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 3.5 ppmdv @ 7% O_2	4. Equivalent Allowable Emissions: 0.718 lb/hour 3.145 tons/year

5. Method of Compliance (limit to 60 characters):

Proposed as initial stack test only using USEPA Method 13A or 13B.

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emission factor is based on an analysis of past operation of units 1 and 2 at the facility in addition to other available data for municipal waste combustion facilities.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: H106 (HCl)	2. Total Percent Efficiency of Control: 95%

3. Potential Emissions: 46.76 lb/hour 204.8 tons/year	4. Synthetically Limited? [ ]

5. Range of Estimated Fugitive Emissions:
[ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year

6. Emission Factor: 125 ppmdv @ 7% O_2 Reference: 40 CFR 60, Subpart Eb	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{125\text{ ppmdv @ }7\%\ O_2}{1\times10^6}\ x\ \frac{36.47\text{ lb}}{\text{lb mole}}\ x\ \frac{65{,}868\text{ dscf @ }7\%\ O_2}{\text{minute}}\ x\ \frac{60\text{ minute}}{\text{hour}}\ x\ \frac{\text{mole}}{385.3\text{ dscf}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

40 CFR 60.52b(b) limits HCl emissions to 25 ppmdv (at 7% O_2) or 5% (by weight or volume) of potential HCl emissions concentration, whichever is less stringent (5% of uncontrolled HCl emissions is conservatively estimated to be 125 ppmdv at 7% O_2).

Allowable Emissions Allowable Emissions ___1___ of ___1___

1. Basis for Allowable Emissions Code: RULE	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 125 ppmdv @ 7% O_2	4. Equivalent Allowable Emissions: 46.76 lb/hour 204.8 tons/year

5. Method of Compliance (limit to 60 characters):

USEPA Method 26 or 26A [as per 40 CFR 60.58b(f)]

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

40 CFR 60.52b(b) limits HCl emissions to 25 ppmdv (at 7% O_2) or 5% (by weight or volume) of potential HCl emissions concentration, whichever is less stringent (5% of uncontrolled HCl emissions is conservatively estimated to be 125 ppmdv at 7% O_2).

Emissions Unit Information Section 1 of 2.

Pollutant Detail Information Page 12 of 17.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: H114 (Mercury)	2. Total Percent Efficiency of Control: 85%
3. Potential Emissions: 4.26 E-2 lb/hour 0.187 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 0.1725 mg/dscm @ 7% O_2 Reference: 40 CFR 60, Subpart Eb	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{0.1725\text{ mg @ }7\%\ O_2}{\text{dscm}} x \frac{\text{gram}}{1000\text{ mg}} x \frac{\text{dscm}}{35.31\text{ dscf}} x \frac{65{,}868\text{ dscf @ }7\%\ O_2}{\text{minute}} x \frac{60\text{ minute}}{\text{hour}} x \frac{\text{lb}}{453.59\text{ gram}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):
Rule 62-296.416, F.A.C. and 40 CFR 60.52b(a) limit mercury emissions to 0.070 milligrams per dry standard cubic meter (mg/dscm) (at 7% O_2) or removed 85% (by weight or volume) of uncontrolled mercury emissions, whichever is less stringent (15% of uncontrolled mercury emissions is conservatively estimated to be 0.1725 mg/dscm at 7% O_2).

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: RULE	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 0.1725 mg/dscm @ 7% O_2	4. Equivalent Allowable Emissions: 4.26 E-2 lb/hour 0.187 tons/year

5. Method of Compliance (limit to 60 characters):

USEPA Method 29 [as per 40 CFR 60.58b(d)]

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):
Rule 62-296.416, F.A.C. and 40 CFR 60.52b(a) limit mercury emissions to 0.070 milligrams per dry standard cubic meter (mg/dscm) (at 7% O_2) or removed 85% (by weight or volume) of uncontrolled mercury emissions, whichever is less stringent (15% of uncontrolled mercury emissions is conservatively estimated to be 0.1725 mg/dscm at 7% O_2).

Emissions Unit Information Section 1 of 2.

Pollutant Detail Information Page 13 of 17.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: SAM (Sulfuric Acid Mist)	2. Total Percent Efficiency of Control:
3. Potential Emissions: 9.85~~16.78~~ lb/hour 39.30~~73.51~~	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 9.85 lb/hour~~16.68 ppmdv at 7% O_2~~ Reference: Past operation of units 1 and 2 at facility	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{16.68\text{ ppmdv @ }7\%\text{ O}_2}{1\times10^6}\times\frac{98.09\text{ lb}}{\text{lb mole}}\times\frac{65{,}868\text{ dscf @ }7\%\text{ O}_2}{\text{minute}}\times\frac{60\text{ minute}}{\text{hour}}\times\frac{\text{mole}}{385.3\text{ dscf}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: OTHER	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 9.85 lb/hour~~16.68 ppmdv at 7% O_2~~	4. Equivalent Allowable Emissions: 9.85~~16.78~~ lb/hour 39.3~~73.51~~

5. Method of Compliance (limit to 60 characters):

Proposed as initial stack test only using USEPA Method 8.

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emission factor is based on an analysis of past operation of units 1 and 2 at the facility in addition to other available data for municipal waste combustion facilities.

Emissions Unit Information Section 1 of 2.

Pollutant Detail Information Page 14 of 17.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: H021 (Beryllium)	2. Total Percent Efficiency of Control:
3. Potential Emissions: 3.95 E-5 lb/hour 1.730 E-4	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 0.16 ug/dscm @ 7% O_2 Reference: Past operation of units 1 and 2 at facility	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{0.16\,\text{ug} @ 7\%\,O_2}{\text{dscm}} x \frac{\text{gram}}{1E6\,\text{ug}} x \frac{\text{dscm}}{35.31\,\text{dscf}} x \frac{65{,}868\,\text{dscf} @ 7\%\,O_2}{\text{minute}} x \frac{60\,\text{minute}}{\text{hour}} x \frac{\text{lb}}{453.59\,\text{gram}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: OTHER	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 0.16 ug/dscm @ 7% O_2	4. Equivalent Allowable Emissions: 3.95 E-5 lb/hour 1.730 E-4 tons/year

5. Method of Compliance (limit to 60 characters):

Proposed as initial stack test only using USEPA Method 29.

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emission factor is based on an analysis of past operation of units 1 and 2 at the facility in addition to other available data for municipal waste combustion facilities.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: H015 (Arsenic)	2. Total Percent Efficiency of Control:
3. Potential Emissions: 2.65 E-3 lb/hour 0.0116 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 10.74 ug/dscm @ 7% O_2 Reference: Past operation of units 1 and 2 at facility	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{10.74\,\text{ug @ }7\%\,O_2}{\text{dscm}} \times \frac{\text{gram}}{\text{1E6 ug}} \times \frac{\text{dscm}}{35.31\,\text{dscf}} \times \frac{65{,}868\,\text{dscf @ }7\%\,O_2}{\text{minute}} \times \frac{60\,\text{minute}}{\text{hour}} \times \frac{\text{lb}}{453.59\,\text{gram}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions ___1___ of ___1___

1. Basis for Allowable Emissions Code: OTHER	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 10.74 ug/dscm @ 7% O_2	4. Equivalent Allowable Emissions: 2.65 E-3 lb/hour 0.0116 tons/year

5. Method of Compliance (limit to 60 characters):

Proposed as initial stack test only using USEPA Method 29.

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emission factor is based on an analysis of past operation of units 1 and 2 at the facility in addition to other available data for municipal waste combustion facilities.

Emissions Unit Information Section 1 of 2.

Pollutant Detail Information Page 16 of 17.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: Ammonia	2. Total Percent Efficiency of Control:
3. Potential Emissions: 8.72 lb/hour 38.19 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 50 ppmdv @ 7% O_2 Reference: Past operation of units 1 and 2 at facility	7. Emissions Method Code: 0

8. Calculation of Emissions (limit to 600 characters):

$$\frac{50\ \text{ppmdv} @ 7\%\ O_2}{1 \times 10^6} x \frac{17.0\ \text{lb}}{\text{lb mole}} x \frac{65{,}868\ \text{dscf} @ 7\%\ O_2}{\text{minute}} x \frac{60\ \text{minute}}{\text{hour}} x \frac{\text{mole}}{385.3\ \text{dscf}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: OTHER	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 50 ppmdv @ 7% O_2	4. Equivalent Allowable Emissions: 8.72 lb/hour 38.19 tons/year

5. Method of Compliance (limit to 60 characters):

Proposed as initial stack test only using USEPA Method CTM-027 (Conditional Test Method).

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emission factor is based on an analysis of past operation of units 1 and 2 at the facility in addition to other available data for municipal waste combustion facilities.

Emissions Unit Information Section __1__ of __2__.

Pollutant Detail Information Page __17__ of __17__.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: HAPS (Total HAPs)	2. Total Percent Efficiency of Control:
3. Potential Emissions: 47.58 lb/hour 208.4 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 47.58 lb/hour Reference: Summation of Individual HAPs	7. Emissions Method Code: 0
8. Calculation of Emissions (limit to 600 characters): Summation of Individual HAPs: arsenic, beryllium, cadmium, dioxins, fluorides (HF), hydrochloric acid (HCl), lead, and mercury.	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):	

Allowable Emissions Allowable Emissions ___1___ of ___1___

1. Basis for Allowable Emissions Code: OTHER	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 47.58 lb/hour	4. Equivalent Allowable Emissions: 47.58 lb/hour 208.4 tons/year
5. Method of Compliance (limit to 60 characters): Not Applicable	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): Requested emission limit is summation of arsenic, beryllium, cadmium, dioxins, fluorides (HF), hydrochloric acid (HCl), lead, and mercury.	

H. VISIBLE EMISSIONS INFORMATION
(Only Regulated Emissions Units Subject to a VE Limitation)

Visible Emissions Limitation: Visible Emissions Limitation __1__ of __1__

1. Visible Emissions Subtype: VE10	2. Basis for Allowable Opacity: [X] Rule [ ] Other

3. Requested Allowable Opacity:
Normal Conditions: 10 % Exceptional Conditions: 10 %
Maximum Period of Excess Opacity Allowed: 6 min/hour

4. Method of Compliance:
USEPA Method 9 and continuous opacity monitoring system [as per 40 CFR 60.58b(c)]

5. Visible Emissions Comment (limit to 200 characters):

Visible Emission is regulated under 40 CFR 60, Subpart Eb. Opacity is defined as a 6-minute average. Unit 3 will utilize a continuous opacity monitoring system (COMS).

I. *CONTINUOUS MONITOR INFORMATION*
(Only Regulated Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor __1__ of __7__

1. Parameter Code: O2	2. Pollutant(s):
3. CMS Requirement:	[X] Rule [ ] Other

4. Monitor Information: To Be Provided Later.
Manufacturer:
Model Number: Serial Number:

5. Installation Date: To Be Provided Later.	6. Performance Specification Test Date: To Be Provided Later.

7. Continuous Monitor Comment (limit to 200 characters):

40 CFR 60.58b(b) requires installation and operation of Continuous Emissions Monitoring System (CEMs) at each location where CO, SO_2, and NO_x emissions are monitored (i.e., before SDA and after FF).

I. CONTINUOUS MONITOR INFORMATION
(Only Regulated Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor __2___ of __7___

1. Parameter Code: EM	2. Pollutant(s): CO
3. CMS Requirement:	[X] Rule [ ] Other
4. Monitor Information: To Be Provided Later. Manufacturer: Model Number:	Serial Number:
5. Installation Date: To Be Provided Later.	6. Performance Specification Test Date: To Be Provided Later.
7. Continuous Monitor Comment (limit to 200 characters): 40 CFR 60.58b(i) requires installation and operation of CO CEM.	

I. CONTINUOUS MONITOR INFORMATION
(Only Regulated Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor __3___ of __7___

1. Parameter Code: VE	2. Pollutant(s):
3. CMS Requirement:	[X] Rule [ ] Other
4. Monitor Information: To Be Provided Later. Manufacturer: Model Number:	Serial Number:
5. Installation Date: To Be Provided Later.	6. Performance Specification Test Date: To Be Provided Later.
7. Continuous Monitor Comment (limit to 200 characters): 40 CFR 60.58b(c) requires installation and operation of a continuous opacity monitoring system.	

I. CONTINUOUS MONITOR INFORMATION
(Only Regulated Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor __4___ of __7___

1. Parameter Code: EM	2. Pollutant(s): SO2
3. CMS Requirement:	[X] Rule [ ] Other
4. Monitor Information: To Be Provided Later. Manufacturer: Model Number: Serial Number:	
5. Installation Date: To Be Provided Later.	6. Performance Specification Test Date: To Be Provided Later.
7. Continuous Monitor Comment (limit to 200 characters): 40 CFR 60.58b(e) requires installation and operation of inlet and outlet CEM systems (i.e., before the SDA and after the FF).	

I. CONTINUOUS MONITOR INFORMATION
(Only Regulated Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor __5___ of __7___

1. Parameter Code: TEMP	2. Pollutant(s):
3. CMS Requirement:	[X] Rule [ ] Other
4. Monitor Information: To Be Provided Later. Manufacturer: Model Number: Serial Number:	
5. Installation Date: To Be Provided Later.	6. Performance Specification Test Date: To Be Provided Later.
7. Continuous Monitor Comment (limit to 200 characters): A continuous monitoring system is required under 40 CFR 60.58b(i) to monitor the temperature of the flue gas stream at the inlet of the fabric filter control device.	

I. CONTINUOUS MONITOR INFORMATION
(Only Regulated Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor __6___ of __7___

1. Parameter Code: FLOW (Steam)	2. Pollutant(s):
3. CMS Requirement:	[X] Rule [ ] Other
4. Monitor Information: To Be Provided Later. Manufacturer: Model Number:	Serial Number:
5. Installation Date: To Be Provided Later.	6. Performance Specification Test Date: To Be Provided Later.
7. Continuous Monitor Comment (limit to 200 characters): A continuous monitoring system is required under 40 CFR 60.58b(i) to monitor steam flow.	

I. CONTINUOUS MONITOR INFORMATION
(Only Regulated Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor __7___ of __7___

1. Parameter Code: EM	2. Pollutant(s): NOx
3. CMS Requirement:	[X] Rule [ ] Other
4. Monitor Information: To Be Provided Later. Manufacturer: Model Number:	Serial Number:
5. Installation Date: To Be Provided Later.	6. Performance Specification Test Date: To Be Provided Later.
7. Continuous Monitor Comment (limit to 200 characters): 40 CFR 60.58b(h) requires the installation and operation of a NOx CEM system.	

Emissions Unit Information Section 1 of 2.

J. EMISSIONS UNIT SUPPLEMENTAL INFORMATION
(Regulated Emissions Units Only)

Supplemental Requirements

1. Process Flow Diagram
[X] Attached, Document ID: Below [ ] Not Applicable [ ] Waiver Requested

2. Fuel Analysis or Specification
[X] Attached, Document ID: Below [ ] Not Applicable [ ] Waiver Requested

3. Detailed Description of Control Equipment
[X] Attached, Document ID: Below [ ] Not Applicable [ ] Waiver Requested

4. Description of Stack Sampling Facilities
[X] Attached, Document ID: Below [ ] Not Applicable [ ] Waiver Requested

5. Compliance Test Report

[ ] Attached, Document ID:________

[ ] Previously submitted, Date:_______________

[X] Not Applicable

6. Procedures for Startup and Shutdown
[X] Attached, Document ID: Below [ ] Not Applicable [ ] Waiver Requested

7. Operation and Maintenance Plan
[X] Attached, Document ID: Below [ ] Not Applicable [ ] Waiver Requested

8. Supplemental Information for Construction Permit Application
[X] Attached, Document ID: Below [ ] Not Applicable

9. Other Information Required by Rule or Statute
[X] Attached, Document ID: Below [ ] Not Applicable

10. Supplemental Requirements Comment:
The following items are provided in the PSD application write-up: Process flow diagram; fuel analysis or specification; detailed description of control equipment (Section 4); supplemental information for construction permit application; other information required by rule or statute; and identification of additional applicable requirements.
A description of stack sampling facilities; procedures for startup and shutdown; and operation and maintenance plan will be provided later.

Emissions Unit Information Section __1__ of __2__.

Additional Supplemental Requirements for Title V Air Operation Permit Applications

11. Alternative Methods of Operation
[ ] Attached, Document ID:_______ [X] Not Applicable

12. Alternative Modes of Operation (Emissions Trading)
[ ] Attached, Document ID:_______ [X] Not Applicable

13. Identification of Additional Applicable Requirements
[X] Attached, Document ID: See field 10 above [ ] Not Applicable

14. Compliance Assurance Monitoring Plan
[ ] Attached, Document ID:_______ [X] Not Applicable

15. Acid Rain Part Application (Hard-copy Required)

[ ] Acid Rain Part - Phase II (Form No. 62-210.900(1)(a))
Attached, Document ID:_______

[ ] Repowering Extension Plan (Form No. 62-210.900(1)(a)1.)
Attached, Document ID:_______

[ ] New Unit Exemption (Form No. 62-210.900(1)(a)2.)
Attached, Document ID:_______

[ ] Retired Unit Exemption (Form No. 62-210.900(1)(a)3.)
Attached, Document ID:_______

[ ] Phase II NOx Compliance Plan (Form No. 62-210.900(1)(a)4.)
Attached, Document ID:_______

[ ] Phase NOx Averaging Plan (Form No. 62-210.900(1)(a)5.)
Attached, Document ID:_______

[X] Not Applicable

III. EMISSIONS UNIT INFORMATION

A separate Emissions Unit Information Section (including subsections A through J as required) must be completed for each emissions unit addressed in this Application for Air Permit. If submitting the application form in hard copy, indicate, in the space provided at the top of each page, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application.

A. GENERAL EMISSIONS UNIT INFORMATION
(All Emissions Units)

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in This Section: (Check one)

[X] 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. Regulated or Unregulated Emissions Unit? (Check one)

[X] 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.

3. Description of Emissions Unit Addressed in This Section (limit to 60 characters):
Operation of a limo storage silo for the air pollution control equipment associated with Municipal Waste Combustor Unit 3 at the facility. Particulate emissions will be controlled with a baghouse.

4. Emissions Unit Identification Number: [X] No ID
ID: [ ] ID Unknown

5. Emissions Unit Status Code: C	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code: 49	8. Acid Rain Unit? [ ]

9. Emissions Unit Comment: (Limit to 500 Characters)

Emissions Unit Control Equipment

1. Control Equipment/Method Description (Limit to 200 characters per device or method):

Particulate emissions from filling operations of the lime storage silo will be controlled using a fabric filter baghouse. Emissions occur during filling operations only.

2. Control Device or Method Code(s): 018

Emissions Unit Details

1. Package Unit: Manufacturer: To Be Provided	Model Number: To Be Provided
2. Generator Nameplate Rating:	MW

3. Incinerator Information:

Dwell Temperature: °F
Dwell Time: seconds
Incinerator Afterburner Temperature: °F

Emissions Unit Information Section __2__ of __2__

B. EMISSIONS UNIT CAPACITY INFORMATION
(Regulated Emissions Units Only)

Emissions Unit Operating Capacity and Schedule

1. Maximum Heat Input Rate:			mmBtu/hr
2. Maximum Incineration Rate:	lb/hr		tons/day
3. Maximum Process or Throughput Rate:			
4. Maximum Production Rate:			
5. Requested Maximum Operating Schedule:			
	24 hours/day		7 days/week
	52 weeks/year		8760 hours/year
6. Operating Capacity/Schedule Comment (limit to 200 characters):			

C. EMISSIONS UNIT REGULATIONS
(Regulated Emissions Units Only)

List of Applicable Regulations

Rule 62-297.620(4), F.A.C.	Exceptions and Approval of Alternate Procedures and Requirements

D. EMISSION POINT (STACK/VENT) INFORMATION
(Regulated Emissions Units Only)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram?	2. Emission Point Type Code: 1
3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking (limit to 100 characters per point):	
4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common:	

5. Discharge Type Code: D	6. Stack Height: 85 feet	7. Exit Diameter: 0.67 feet
8. Exit Temperature: Ambient °F	9. Actual Volumetric Flow Rate: 1200 acfm	10. Water Vapor: %

11. Maximum Dry Standard Flow Rate: 1200 dscfm	12. Nonstack Emission Point Height: feet

13. Emission Point UTM Coordinates:

Zone: 17 East (km): 424.249 North (km): 2945.717

14. Emission Point Comment (limit to 200 characters):

E. SEGMENT (PROCESS/FUEL) INFORMATION
(All Emissions Units)

Segment Description and Rate: Segment __1__ of __1__

1. Segment Description (Process/Fuel Type) (limit to 500 characters): Lime Silo Loading Operations		
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 (limit to 200 characters):		

Segment Description and Rate: Segment _____ of _____

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
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 (limit to 200 characters):		

F. EMISSIONS UNIT POLLUTANTS
(All Emissions Units)

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
PM	018		NS
PM10	018		NS

Emissions Unit Information Section 2 of 2

Pollutant Detail Information Page 1 of 2

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: PM	2. Total Percent Efficiency of Control: 99%
3. Potential Emissions: 0.154 lb/hour 0.0281 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 0.015 gr/dscf Reference: Engineering Estimate	7. Emissions Method Code:

8. Calculation of Emissions (limit to 600 characters):

$$\frac{0.015\text{ grains}}{\text{dscf}} \times \frac{1{,}200\text{ dscf}}{\text{minute}} \times \frac{60\text{ minutes}}{\text{fill}} \times \frac{\text{lb}}{7{,}000\text{ grains}} = \frac{0.154\text{ lb}}{\text{fill}}$$

$$\frac{0.154\text{ lb}}{\text{fill}} \times \frac{1\text{ fill}}{\text{day}} \times \frac{365\text{ days}}{\text{year}} \times \frac{\text{ton}}{2000\text{ lb}} = \frac{0.0281\text{ tons}}{\text{year}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Potential emissions in field 3 above assume one silo fill per day.

Allowable Emissions Allowable Emissions ______ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year

5. Method of Compliance (limit to 60 characters):

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emissions Unit Information Section 2 of 2

Pollutant Detail Information Page 2 of 2

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: PM10	2. Total Percent Efficiency of Control: 99%
3. Potential Emissions: 0.154 lb/hour 0.0281 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 0.015 grains/dscf Reference: Engineering Estimate	7. Emissions Method Code:

8. Calculation of Emissions (limit to 600 characters):

$$\frac{0.015\text{ grains}}{\text{dscf}} \times \frac{1{,}200\text{ dscf}}{\text{minute}} \times \frac{60\text{ minutes}}{\text{fill}} \times \frac{\text{lb}}{7{,}000\text{ grains}} = \frac{0.154\text{ lb}}{\text{fill}}$$

$$\frac{0.154\text{ lb}}{\text{fill}} \times \frac{1\text{ fill}}{\text{day}} \times \frac{365\text{ days}}{\text{year}} \times \frac{\text{ton}}{2000\text{ lb}} = \frac{0.0281\text{ tons}}{\text{year}}$$

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Potential emissions in field 3 above assume one silo fill per day.

Allowable Emissions Allowable Emissions ______ of ______

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	

H. VISIBLE EMISSIONS INFORMATION
(Only Regulated Emissions Units Subject to a VE Limitation)

Visible Emissions Limitation: Visible Emissions Limitation __1__ of __1__

1. Visible Emissions Subtype: 05	2. Basis for Allowable Opacity: [X] Rule [ ] Other

3. Requested Allowable Opacity:
Normal Conditions: 5 % Exceptional Conditions: 5 %
Maximum Period of Excess Opacity Allowed: min/hour

4. Method of Compliance:
USEPA Method 9

5. Visible Emissions Comment (limit to 200 characters):
Lee County proposes to demonstrate compliance under Rule 62-297.620(4), F.A.C. (Exceptions and Approval of Alternate Procedures and Requirements), which allows the Secretary of the Florida Department of Environmental Protection to waive particulate compliance test requirements when potential particulate emissions are less than 100 tons per year and the emission unit is equipped with a baghouse. An alternative compliance standard of 5% opacity can be included in the permit under this rule.

I. CONTINUOUS MONITOR INFORMATION
(Only Regulated Emissions Units Subject to Continuous Monitoring)

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 (limit to 200 characters):

J. EMISSIONS UNIT SUPPLEMENTAL INFORMATION
(Regulated Emissions Units Only)

Supplemental Requirements

1. Process Flow Diagram
[X] Attached, Document ID: Below [ ] Not Applicable [ ] Waiver Requested

2. Fuel Analysis or Specification
[ ] Attached, Document ID:________ [X] Not Applicable [ ] Waiver Requested

3. Detailed Description of Control Equipment
[X] Attached, Document ID: Below [ ] Not Applicable [ ] Waiver Requested

4. Description of Stack Sampling Facilities
[X] Attached, Document ID: Below [ ] Not Applicable [ ] Waiver Requested

5. Compliance Test Report
[ ] Attached, Document ID:________
[ ] Previously submitted, Date:_______________
[X] Not Applicable

6. Procedures for Startup and Shutdown
[X] Attached, Document ID: Below [ ] Not Applicable [ ] Waiver Requested

7. Operation and Maintenance Plan
[X] Attached, Document ID: Below [ ] Not Applicable [ ] Waiver Requested

8. Supplemental Information for Construction Permit Application
[X] Attached, Document ID: See PSD Application Write-up [ ] Not Applicable

9. Other Information Required by Rule or Statute
[X] Attached, Document ID: See PSD Application Write-up [ ] Not Applicable

10. Supplemental Requirements Comment:
The following items are provided in the PSD application write-up: Process flow diagram; detailed description of control equipment (Section 4); supplemental information for construction permit application; other information required by rule or statute; and identification of additional applicable requirements.
A description of stack sampling facilities; procedures for startup and shutdown; and operation and maintenance plan will be provided later.

Additional Supplemental Requirements for Title V Air Operation Permit Applications

11. Alternative Methods of Operation
[ ] Attached, Document ID:________ [X] Not Applicable

12. Alternative Modes of Operation (Emissions Trading)
[ ] Attached, Document ID:________ [X] Not Applicable

13. Identification of Additional Applicable Requirements
[X] Attached, Document ID: See PSD Application Write-up [ ] Not Applicable

14. Compliance Assurance Monitoring Plan
[ ] Attached, Document ID:________ [X] Not Applicable

15. Acid Rain Part Application (Hard-copy Required)

[ ] Acid Rain Part - Phase II (Form No. 62-210.900(1)(a))
Attached, Document ID:________

[ ] Repowering Extension Plan (Form No. 62-210.900(1)(a)1.)
Attached, Document ID:________

[ ] New Unit Exemption (Form No. 62-210.900(1)(a)2.)
Attached, Document ID:________

[ ] Retired Unit Exemption (Form No. 62-210.900(1)(a)3.)
Attached, Document ID:________

[ ] Phase II NOx Compliance Plan (Form No. 62-210.900(1)(a)4.)
Attached, Document ID:________

[ ] Phase NOx Averaging Plan (Form No. 62-210.900(1)(a)5.)
Attached, Document ID:________

[X] Not Applicable

ATTACHMENT 6

LEE COUNTY ENERGY RECOVERY FACILITY
LEE COUNTY SOLID WASTE DIVISION
LEE COUNTY, FLORIDA

PREVENTION OF SIGNIFICANT DETERIORATION AIR PERMIT APPLICATION

MAJOR MODIFICATION TO ADD A THIRD MUNICIPAL WASTE COMBUSTOR UNIT TO THE EXISTING LEE COUNTY ENERGY RECOVERY FACILITY

Prepared For:
Lee County Solid Waste Division
10500 Buckingham Road
Fort Myers, Florida 33905

Prepared By:
RTP Environmental Associates, Inc. ®
239 U.S. Highway 22 East
Green Brook, New Jersey 08812
(732) 968-9600

Revised February 17, 2003

LEE COUNTY ENERGY RECOVERY FACILITY
PREVENTION OF SIGNIFICANT DETERIORATION (PSD)
APPLICATION FOR MUNICIPAL WASTE COMBUSTOR UNIT 3

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LEE COUNTY ENERGY RECOVERY FACILITY
PSD APPLICATION FOR MUNICIPAL WASTE COMBUSTOR UNIT 3

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

AAQS	Ambient Air Quality Standard
acf	Actual Cubic Feet
acfm	Actual Cubic Feet Per Minute
ACI	Activated Carbon Injection
APC	Air Pollution Control (Equipment)
AQCR	Air Quality Control Region
AQRV	Air Quality Related Values
ARC	Ambient Reference Concentration
As	Arsenic
ASME	American Society of Mechanical Engineers
avg	Average
BACT	Best Available Control Technology
Be	Beryllium
BPIP	USEPA Building Profile Input Program
BTU	British Thermal Unit
C	Degrees Celsius (Temperature Scale)
C&D	Construction and Demolition Waste
CAA	Clean Air Act
CARB	California Air Resources Board
CEM	Continuous Emissions Monitoring
cfm	Cubic Feet Per Minute
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
Covanta	Covanta Lee, Inc.
dscf	Dry Standard Cubic Feet
dscfm	Dry Standard Cubic Feet Per Minute
dscm	Dry Standard Cubic Meter
ESP	Electrostatic Precipitator
°F	Degrees Fahrenheit (Temperature Scale)
FAA	Federal Aviation Administration
FAAQS	Florida Ambient Air Quality Standards
F.A.C.	Florida Administrative Code (Regulations)
FDEP	Florida Department of Environmental Protection
FF	Fabric Filter (Baghouse)
FGD	Flue Gas Desulfurization
FR	Federal Register
GCP	Good Combustion Practices
GEP	Good Engineering Practice (Stack Height)
gr/cf	Grams Per Cubic Foot
gr/dscf	Grams Per Dry Standard Cubic Foot
g/s	Grams Per Second
ha	Hectare

ACRONYMS AND ABBREVIATIONS
(CONTINUED)

HAPs	Hazardous Air Pollutants
HDPE	High Density Polyethylene
HF	Hydrogen Fluoride
Hg	Mercury
HHV	Higher Heating Value
HHW	Household Hazardous Waste
hrs/yr	Hours Per Year
ISC	Industrial Source Complex Model
ISCST	Industrial Source Complex Short-Term Model
km	Kilometer
LAER	Lowest Achievable Emission Rate
lb/hr	Pounds Per Hour
LCERF	Lee County Energy Recovery Facility
m^3	Cubic Meters
mg	Milligram
MACT	Maximum Achievable Control Technology
MMBTU	Million British Thermal Units
MSW	Municipal Solid Waste
MW	Megawatts
MWC	Municipal Waste Combustor
NAAQS	National Ambient Air Quality Standards
NCDC	National Climatic Data Center
NEMA	National Electrical Manufacturers Association
NESHAPs	National Emission Standards for Hazardous Air Pollutants
ng	Nanogram
ng/Nm^3	Nanograms Per Normal Cubic Meter
NMHC	Non-Methane Hydrocarbons
NO	Nitrogen Oxide
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxides
NPS	(U.S.) National Park Service
NSPS	New Source Performance Standards
NSR	Non-Attainment New Source Review
NWS	National Weather Service
O_2	Oxygen
O_3	Ozone
OAQPS	(USEPA) Office of Air Quality Planning and Standards
Pb	Lead
PCDD	Polychlorinated dibenzo-p-dioxin
PCDF	Polychlorinated dibenzofurans
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter with an Aerodynamic Diameter Less Than 2.5 Microns

ACRONYMS AND ABBREVIATIONS
(CONCLUDED)

PM_{10}	Particulate Matter with an Aerodynamic Diameter Less Than 10 Microns
ppb	Parts Per Billion
ppm	Parts Per Million
ppmdv	Parts Per Million By Volume (Dry Basis)
ppmv	Parts Per Million By Volume
PPSA	(Florida Electrical) Power Plant Siting Act
PSD	Prevention of Significant Deterioration
PVC	Polyvinyl Chloride
REMAP	Reference Methods, Accuracy And Precision
SAM	Sulfuric Acid Mist
SCR	Selective Catalytic Reduction
SDA	Spray Dry Absorption (a.k.a. Semi-Dry Scrubber)
SIL	Significant Impact Level
SIP	State Implementation Plan
SNCR	Selective Non-Catalytic Reduction
SO_2	Sulfur Dioxide
S/S/M	Start-Up, Shutdown, and Malfunction
TCDD	Tetrachlorodibenzo-p-dioxin
TCDF	Tetrachlorodibenzofurans
TLV	Threshold Limiting Value
tpd	Tons Per Day
tpy	Tons Per Year
TSP	Total Suspended Particulates
ug	Microgram
um	Micrometer (micron)
Unit 1	Existing MWC Unit Number 1 at the LCERF (not modified)
Unit 2	Existing MWC Unit Number 2 at the LCERF (not modified)
Unit 3	Proposed New MWC Unit Number 3 at the LCERF
UPL	Upper Predicted Limits
U.S.	United States of America
USEPA	U.S. Environmental Protection Agency
UTM	Universal Transverse Mercator (Coordinate System)
VOC	Volatile Organic Compounds

LEE COUNTY ENERGY RECOVERY FACILITY PREVENTION OF SIGNIFICANT DETERIORATION APPLICATION FOR MUNICIPAL WASTE COMBUSTOR UNIT 3

SECTION 1

EXECUTIVE SUMMARY

Revised February 17, 2003

SECTION 1
EXECUTIVE SUMMARY

1.1 INTRODUCTION

Lee County and Hendry County have entered into an interlocal agreement that requires them to jointly provide an integrated solid waste management system to satisfy the needs of their residents. The system includes three major components: (1) an aggressive materials separation program; (2) a waste-to-energy facility that is located in Lee County and known as the Lee County Energy Recovery Facility (LCERF); and (3) a landfill located in Hendry County. Lee County now wishes to expand the LCERF so that the two counties can continue to satisfy the public demand for efficient, environmentally sound, and cost-effective solid waste disposal services.

This document contains Lee County's Prevention of Significant Deterioration (PSD) application for approval of the expansion project. Specifically as required by Rule 62-212.400, Florida Administrative Code (F.A.C.) and 40 CFR 52.21, this is Lee County's application for a PSD permit for a major modification of an existing major source, the LCERF.

1.2 THE EXISTING FACILITY

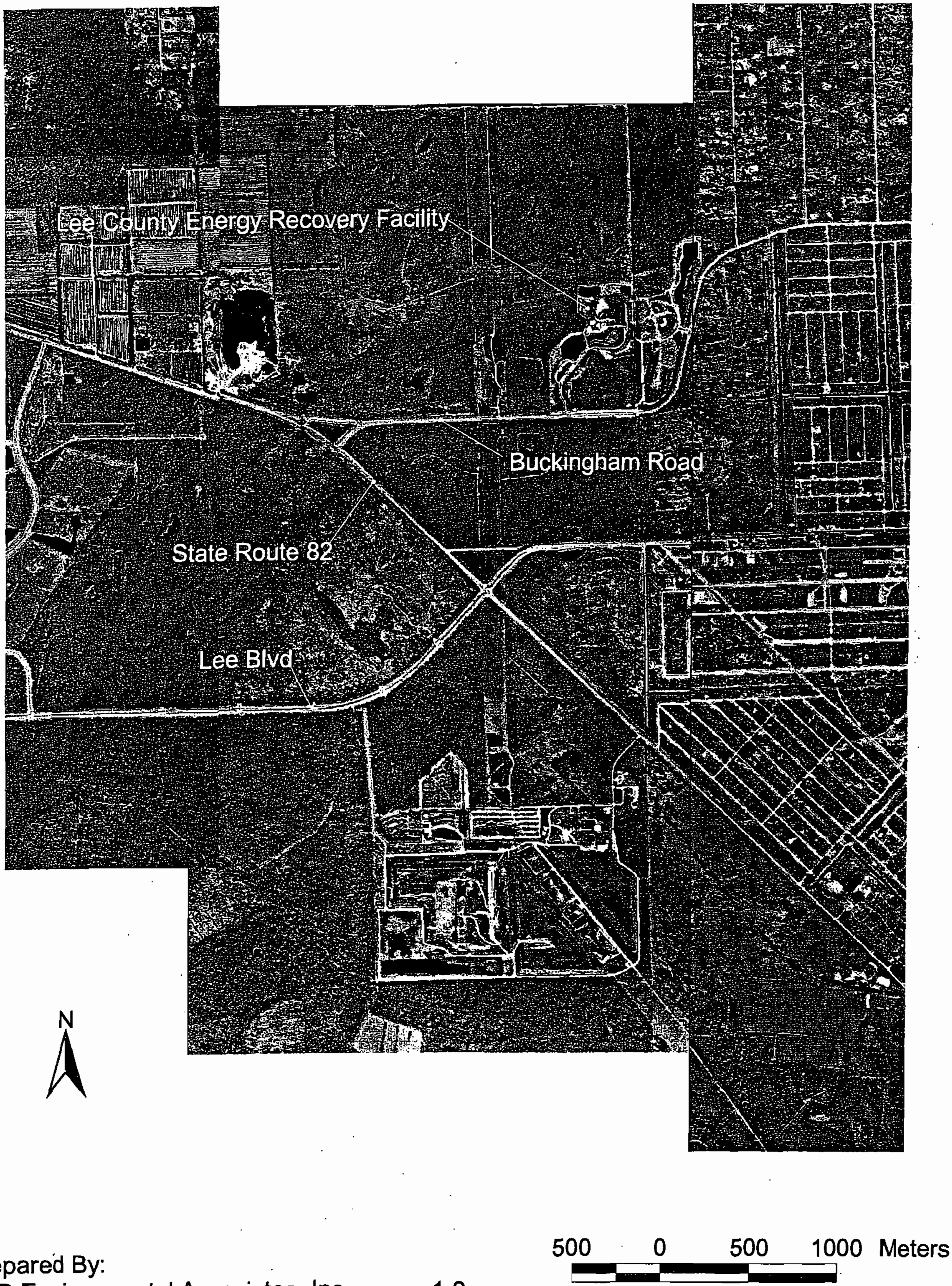
The LCERF is located at 10500 Buckingham Road, southeast of the City of Fort Myers, on a 155-acre site in an unincorporated portion of Lee County. The general location of the LCERF is shown in Figure 1-1. The specific coordinates for the LCERF are: Universal Transverse Mercator (UTM) Coordinates Zone 17, 424.21 km East and 2945.70 km North; Latitude 26° 37' 54" North, Longitude: 81° 45' 41" West.

The LCERF has been designed, built and operated by Covanta Lee, Inc. (Covanta; formerly Ogden Martin Systems of Lee, Inc.), pursuant to a long-term contract with Lee County. Covanta began commercial operations of the LCERF on December 1, 1994.

Lee County has obtained PSD and Title V permits authorizing the construction and operation of two municipal waste combustor (MWC) units at the LCERF. [See PSD-FL-151, PSD-FL-151A; PSD-FL-151B; and 0710119-001-AV]. In addition, the County obtained approval for the construction and operation of the LCERF pursuant to the Florida Electrical Power Plant Siting Act (PPSA), Sections 403.501 - .518, Florida Statutes. [See PPSA Case Number PA 90-30]. The PPSA approval expressly authorized an "ultimate site capacity" for the LCERF that is based on the use of three MWC units.

The LCERF currently is equipped with two MWC units (hereafter Units 1 and 2), which utilize the Martin reverse-reciprocating stoker grate technology. Each MWC unit is capable of processing 660 tons per day (tpd) of municipal solid waste (MSW) with a higher heating valve (HHV) of 5,000 British thermal units (BTU) per pound on an annual basis. The maximum heat input of each MWC unit is 275 million BTU (MMBTU) per hour on an annual basis. The LCERF converts solid waste into saleable energy through

FIGURE 1-1
GENERAL LOCATION OF THE LEE COUNTY ENERGY RECOVERY FACILITY



Prepared By:
RTP Environmental Associates, Inc.

the use of two water wall boilers and a steam turbine generator, which produces up to 40 megawatts (MW) of electricity. The LCERF operates on a small portion of the power it generates and the remaining electricity is sold.

Truck transport is used to deliver municipal solid waste to the LCERF and to remove ash residue from the LCERF. The MSW is brought inside the LCERF before it is dumped from the packer trucks into the refuse pit. All MSW is stored inside the fully enclosed LCERF prior to combustion and is not visible from the outside. Air is drawn from the tipping floor and refuse pit and then used in the combustion process. As a result, the tipping floor and refuse pit are kept under negative air pressure, which helps ensure that dust and odors do not escape into the ambient environment. Overhead cranes mix the MSW and then place it in charging hoppers that feed into the two MWC units. Large, bulky items and other non-processible wastes are removed and set aside for proper disposal elsewhere.

The airborne emissions from the LCERF's stack are controlled through a combination of good combustion practices (GCP), a scrubber (a.k.a. spray dry absorber or SDA), a fabric filter (FF) baghouse, an activated carbon injection (ACI) system, and a selective non-catalytic reduction (SNCR) system. Fabric filters also are used to control the emissions from the LCERF's lime silos and ash handling building. The lime silos store pebble lime, which is used to make lime slurry for the SDA. Particulate matter emissions may occur when the lime silos are loaded from delivery trucks.

Bottom ash from the MWC units, and fly ash from the fabric filters, are combined and wetted in an ash discharger and then transported inside fully enclosed conveyors to an ash management building, where ferrous and non-ferrous metals are removed. The combined ash residue is stored inside the ash management building until it is taken to the Hendry County landfill for disposal.

1.3 THE PROPOSED FACILITY MODIFICATION

Despite the comprehensive materials separation program implemented in Lee and Hendry Counties, the amount of solid waste delivered to the LCERF has increased every year since the LCERF began operating. This increase in solid waste generation is primarily due to population growth in the area. In 1999, the amount of solid waste received by the LCERF reached the facility's guaranteed annual capacity of 372,300 tons. In 2000, the LCERF processed over 392,000 tons of solid waste, but the County had to dispose of nearly 44,000 additional tons of processible solid waste in landfills because there was not sufficient capacity in the LCERF. Current population projections for Lee and Hendry Counties suggest that the amount of MSW will continue to increase, reaching nearly 550,000 tons by 2010. Since the County's aggressive materials separation program has not eliminated the need for more MSW disposal capacity, Lee County concluded that it should expand the LCERF, rather than increase its use of landfills.

Lee County will expand the LCERF by installing a third 660-tpd MWC unit (Unit 3) and associated equipment, which will increase the LCERF's capacity to 1,980-tpd. The expansion also will include the installation of a new boiler, air pollution control system, and steam turbine generator for Unit 3.

Since the original PPSA application for the LCERF anticipated the installation of a third MWC unit, the design of the LCERF was planned to facilitate the addition of Unit 3. There is space available for an additional flue in the LCERF's stack, and the tipping floor and refuse pit have been sized to accommodate the operation of three MWC units at 1,980 tpd. Nonetheless, there is a need for an expansion to the switchyard, the ash management building and the turbine generator building. There also will need to be certain modifications and/or additions to some of the LCERF's common equipment and systems so that Unit 3 can be integrated into the existing facility. There are no PSD significant changes planned for Units 1 and 2 at this time; therefore, Units 1 and 2 are not subject to New Source Review.

1.4 STRUCTURE OF PSD APPLICATION

Section 2 (Regulatory Review) of this document contains a review of applicable air rules and regulations for the existing LCERF and proposed Unit 3 addition. Section 3 (Air Pollutant Emissions) details air pollutant emissions from municipal waste combustion and possible control options. Section 4 (Best Available Control Technology Evaluation) evaluates emissions control technologies and determines the Best Available Control Technology options based on environmental, economic and social impacts and feasibility. Section 5 (Existing Ambient Air Quality) describes the existing ambient air quality for the area surrounding the LCERF. The air quality impacts are discussed in Section 6 (Air Quality Impact Analyses) along with the approach used in the air quality dispersion modeling and results obtained from the modeling. Section 7 (Additional Impact Analyses) presents additional analyses required under PSD regulations and for the risk assessments in the PPSA permit application. Section 8 (References) contains references used in this document and attachments to this document are found in Section 9 (Attachments).

1.5 SUMMARY OF IMPACTS AND CONCLUSIONS

Lee County proposes Best Available Control Technology to be Good Combustion Practices for the control of volatile organic compounds (VOC) and carbon monoxide (CO); a SDA and FF baghouse for control of sulfur dioxide (SO_2), MWC Acid Gases (as SO_2 and hydrogen chloride [HCl]), and particulate matter less than 10 microns in diameter (PM_{10}); activated carbon injection for control of mercury (Hg); and selective non-catalytic reduction for control of nitrogen oxides (NOx).

Lee County proposes to accept emission limits lower than the New Source Performance Standards (NSPS) under 40 CFR 60, Subpart Eb, and lower than existing permit limits for Units 1 and 2 at the LCERF, for particulate matter; sulfur dioxide; volatile organic compounds; and fluorides. Emission limits for other pollutants will be proposed at NSPS levels (e.g., carbon monoxide, cadmium, hydrogen chloride, lead, mercury, MWC organics, and nitrogen oxides. Actual emissions from Unit 3 are expected to be lower than the limits proposed by Lee County.

Maximum increases in facility impacts due to the third MWC unit were shown to be less than the federal and state ambient air quality standards (AAQS), Class I and Class II PSD increments, de minimis monitoring levels, and Florida ambient reference concentrations (ARCs). In fact, maximum increases in facility impacts due to the third MWC unit, as well as maximum future facility impacts for all three MWC units, were shown to be less than the significant impact levels (SILs) for PSD criteria pollutants for both Class I and Class II areas. Hence, for pollutants regulated under the PSD regulations, impacts from the third MWC unit as well as the entire future facility are considered to be indistinguishable from background concentrations and are therefore considered to be negligible.

1.6 SPECIFIC PERMIT ISSUES

Lee County proposes to test for the following pollutants during the initial compliance emissions test on Unit 3 and then, upon successful demonstration that the emission levels are equal to or below their proposed emissions level, Lee County proposes to have the emissions limits deleted from the PSD air permit for Unit 3.

- Sulfuric Acid Mist
- Fluorides
- Arsenic
- Beryllium
- Volatile Organic Compounds
- Ammonia

This deletion request is based on a history of non-detectable or very low concentrations measured during prior performance tests for Units 1 and 2 at the LCERF. Unit 3 will be very similar to Units 1 and 2. Testing of a pollutant that is not measurable is expensive, without providing any benefit to human health and the environment. Lee County proposes alternative compliance measures to ensure control of emissions from the above pollutants, such as temperature of the fabric filter baghouse and control of sulfur dioxide.

As noted in condition A.41 of the current Title V permit, special conditions already are in place in the existing permit for Units 1 and 2 for start-up/shutdown/malfunction (S/S/M) operations. Similar S/S/M conditions are proposed for Unit 3. Lee County also requests relief from the carbon monoxide emission standard under the Subpart Eb NSPS during periods of malfunction for up to 15 hours per occurrence as provided in the November 16, 2001 Federal Register (see Section 3.6.1 [Additional Carbon Monoxide Malfunction Regulations]).

LEE COUNTY ENERGY RECOVERY FACILITY
PREVENTION OF SIGNIFICANT DETERIORATION
APPLICATION FOR MUNICIPAL WASTE COMBUSTOR UNIT 3

SECTION 2
REGULATORY REVIEW

Revised February 17, 2003

SECTION 2
REGULATORY REVIEW

This section discusses the air quality regulations promulgated by the U.S. Environmental Protection Agency (USEPA) and the Florida Department of Environmental Protection (FDEP) applicable to Lee County's proposed project.

2.1 APPLICABLE REGULATIONS

Air quality regulations promulgated by the USEPA and the FDEP establish ambient air quality standards and regulate the sources of air contaminants in order to achieve and maintain the ambient standards. The proposed expansion to the Lee County Energy Recovery Facility (LCERF) has been evaluated to ensure compliance with the following rules and regulations.

- Prevention of Significant Deterioration (PSD)
- Non-Attainment New Source Review (NSR)
- Ambient Air Quality Standards (AAQS)
- New Source Performance Standards (NSPS)
- National Emission Standards for Hazardous Air Pollutants (NESHAP)
- Federal Aviation Administration (FAA) regulations governing stack height
- FDEP Rules (Chapter 62, Florida Administrative Code [F.A.C.]) governing air pollution
- Florida Electrical Power Plant Siting Act (PPSA)

In many cases, the FDEP air pollution regulations reflect the standards established by the USEPA; however, with respect to those cases where the Florida rules represent a more restrictive requirement, the Florida regulation has been applied.

This section focuses on the PSD regulations and discusses the applicability of the PSD program to Lee County's proposed project with respect to the source (Unit 3) and individual pollutants emitted by Unit 3. The remaining regulations referenced above are discussed further in the PPSA application.

2.2 FLORIDA STATE PROGRAM AUTHORITY

The State of Florida has been delegated full authority by the USEPA to administer the State Implementation Plan (SIP). Additionally, the FDEP has an approved program for issuing permits for new and modified sources, thereby satisfying the requirements of USEPA's PSD regulations (40 CFR Part 52.21). The USEPA also has delegated responsibility to the FDEP for administration of the PSD program for sources subject to the PPSA.

2.3 PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

The Clean Air Act (CAA) was amended in 1977 to incorporate the PSD program. To carry out the policies of the 1977 CAA amendments, USEPA adopted revised PSD regulations on June 19, 1978. These revised regulations contained the PSD increments mandated by Congress and identified the types of emission sources subject to the PSD regulations, as directed by the amended CAA (40 CFR 52.21). PSD regulations apply to attainment areas. PSD attainment areas are those areas that have been designated as in attainment or unclassifiable with respect to meeting federal or state ambient air quality standards for regulated (criteria) pollutants. The LCERF site is located in Lee County, which is part of the Southwest Florida Intrastate Air Quality Control Region (40 CFR 81.97). The project site is currently designated as attainment for the criteria pollutants (i.e., particulate matter with mean aerodynamic diameter less than 10 micron [um] [PM_{10}]; sulfur dioxide [SO_2]; nitrogen dioxide [NO_2]; carbon monoxide [CO]; lead [Pb] and ozone [O_3]).

For PSD purposes, the primary definition of major stationary source includes any source belonging to a list of 28 specified source categories which has the potential to emit 100 tons per year (tpy) or more of any pollutant regulated under the CAA. The LCERF is classified as a major source for PSD purposes because it is one of the 28 specified sources (i.e., a municipal incinerator capable of charging more than 50 tons per day (tpd) of refuse as defined in 40 CFR 52.21 and Section 169(1) of the Clean Air Act, also known as a municipal waste combustor [MWC]) and it has the potential to emit more than 100 tpy of at least one regulated pollutant (Rule 62-210.200(159)(b)8, F.A.C., Definition of Major Source of Air Pollution).

A modification to an existing major source is subject to PSD regulation if it is located in a PSD attainment area and it is a major modification. A major modification is generally a physical change or a change in method of operation of an existing major source which would result in a contemporaneous significant increase in emissions of any regulated pollutant. A significant emissions increase is an increase greater than or equal to the emission levels listed in Table 212.400-2 (Regulated Air Pollutants - Significant Emission Rates), which is contained in Rule 62-212.400, F.A.C.

In general, a PSD application in Florida (Rule 62-212.400(5), F.A.C.) must contain the following information:

- A description of the nature, location, design capacity and typical operating schedule of the facility or modification, including specifications and drawings showing its design and plant layout.
- An estimate of the emissions associated with the project or modification.
- A Best Available Control Technology (BACT) determination.
- Information relating to the air quality impacts of the facility or modification, including meteorological and topographical data.

- Information relating to the air quality impacts of general commercial, residential, industrial and other growth which has occurred since August 7, 1977, in the area the facility or modification would affect.
- A Good Engineering Practice stack height analysis.
- An assessment of the source's impact on air quality-related values including soils, vegetation, visibility and general commercial, residential and industrial growth.

The PSD regulations establish Class I, or pristine, areas in the United States. The regulations require that any major facility proposing to locate near a Class I area have an assessment performed of the source's effect on visibility at the Class I area, on Class I increment consumption, and other air quality related values (AQRVs). The Everglades National Park, a designated Class I area, is about 90 kilometers from the LCERF site. Section 7 (Additional Impact Analyses) contains the Class I impacts analyses.

2.3.1 SOURCE APPLICABILITY

Lee County's proposed project is a major modification to an existing major stationary source because the existing LCERF is a municipal waste combustion facility that is capable of burning more than 50-tpd of waste, and Unit 3 will cause at least one of the PSD regulated pollutants to be emitted at a rate that exceeds the PSD significance levels established in Rule 62-212.400, F.A.C. PSD requirements apply to new major sources or major modifications located in areas which have been designated as in attainment or unclassifiable for the ambient air quality standards for a particular pollutant. As stated further in Section 5.4 (Attainment Status), the Unit 3 project is in an area that is classified as attainment or is unclassifiable for all criteria pollutants. This project entails the addition of MWC Unit 3; Units 1 and 2 will not be modified.

2.3.2 POLLUTANT APPLICABILITY

Under the PSD program, if the potential annual emission rate exceeds the PSD emission rates designated in Rule 62-212.400, F.A.C., then a BACT analysis and air quality modeling must be conducted for each PSD pollutant emitted at greater than the significance levels. Table 2-1 compares estimated Unit 3 annual emission rates, presented in Section 3 (Air Pollutant Emissions), with the corresponding PSD significant emission rates, and identifies those pollutants for which air quality impact and BACT analyses must be performed. The detailed approaches and considerations for performing BACT analyses are presented in Section 4 (Best Available Control Technology Evaluation). As shown in Table 2-1, formal PSD analyses (including a BACT Analysis) are required for CO, NO_X, SO_2, sulfuric acid mist (SAM), PM_{10}, mercury, MWC acid gases, MWC metals and MWC organics.

The maximum annual emission rates presented in Table 2-1 were calculated assuming that Unit 3 operates 365 days per year at 110 percent load. This assumption is conservative, because Unit 3 is expected to have an annual availability factor less than 100% due to scheduled and unscheduled downtime.

TABLE 2-1
PSD POLLUTANT APPLICABILITY FOR THE ADDITION OF MWC UNIT 3 TO THE LCERF

Name of PSD Pollutant	PSD Significant Emission Rates[a] (tpy)	Proposed Unit 3 Emission Rate (tpy)	PSD Applicable
Carbon Monoxide	100	125.8	Yes
Nitrogen Oxides	40	310.1	Yes
Sulfur Dioxide	40	287.8	Yes
Sulfuric Acid Mist	7	39.30~~73.51~~	Yes
Particulate Matter (Total)	25	22.28~~22.26~~	No
Particulate Matter (PM_{10})	15	22.28~~22.26~~	Yes
Ozone (VOCs)	40	21.62	No
Lead	0.6	0.216	No
Beryllium	4E-4	1.73E-4	No
Mercury	0.1	0.187	Yes
Fluorides	3	3.145~~2.986~~[b]	Yes~~No~~
MWC Acid Gases (as SO_2 & HCl)	40	492.7	Yes
MWC Metals (as PM)	15	22.25~~22.26~~	Yes
Total Reduced Sulfur (Including H_2S)	10	Negligible	No
Reduced Sulfur Compounds (Including H_2S)	10	Negligible	No
Hydrogen Sulfide	10	Negligible	No
Vinyl Chloride	1	Negligible	No
MWC Organics (Total Dioxins and Furans)[b]	3.5E-6	1.41E-5	Yes

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[a] Source: Rule 61-212.400, F.A.C. Table 212.400-2 (Regulated Air Pollutants – Significant Emission Rates) and 40 CFR 52.21 (Prevention of Significant Deterioration of Air Quality).

[b] Measured as total tetra- through octa- chlorinated dibenzo-p-dioxins and dibenzo furans.

LEE COUNTY ENERGY RECOVERY FACILITY
PREVENTION OF SIGNIFICANT DETERIORATION
APPLICATION FOR MUNICIPAL WASTE COMBUSTOR UNIT 3

SECTION 3
AIR POLLUTANT EMISSIONS

Revised February 17, 2003

SECTION 3
AIR POLLUTANT EMISSIONS

3.1 INTRODUCTION

The combustion of municipal solid waste (MSW) in energy recovery facilities results in the emission of some air pollutants as a consequence of several mechanisms and processes. Emissions generated in the combustion of MSW depend upon the composition of the waste stream or reflect the character of the combustion process. The quantity of each compound released also depends on whether or not it is controlled through the use of air pollution control techniques or technology.

The discussion of emission factors and rates presented in this section focuses primarily on those pollutants of public health and regulatory concern. Emissions estimates in this section are based on available operational data from Units 1 and 2 over the past seven years in addition to other available data from the U.S. Environmental Protection Agency (USEPA) and other municipal waste combustion facilities.

3.2 BASIS FOR EMISSION LIMITS

Lee County has reviewed the current plant operational data as well as test data from other facilities. The purpose of this effort is to determine appropriate permit limits for the proposed Unit 3 at the Lee County Energy Recovery Facility (LCERF). The starting point for the permit limits begins with the 1995 New Source Performance Standards (NSPS). USEPA based the performance limits in the NSPS on the most recent available data. This included 12 units with spray dry absorbers (SDA), fabric filters (FF) and selective non-catalytic reduction (SNCR) systems operating in 1994, as well as earlier data. Overall, USEPA used performance test data from over 60 municipal waste combustor plants (60 FR 65391, 19 December 1995 and 60 FR 65396, 19 December 1995). As required by Congress, the NSPS "MACT Floor" is set at the level achieved by the best performing plant. Although USEPA did not include European test data, it did indicate that the European data would not have changed the limits (59 FR 48254, 20 September 1994, Section VII - *Comparison of the Proposal and European Emission Limits*).

Due to the United States Supreme Court "Carbone" ruling on May 16, 1994 (1994 WL 183594), little development of new municipal waste combustors (MWC) has occurred in the United States after 1994. Hence, the conclusions reached by USEPA at that time should still be valid. There has been some additional experience gained in the operation of facilities equipped with modern pollution control trains, including SDA, FF, SNCR and activated carbon injection (ACI) systems. Enhanced combustion controls have also improved overall MWC performance, and USEPA's good combustion practices (GCP) have proven to be effective. The only potential modifications to the design of a new facility could be the use of a selective catalytic reduction (SCR) system for NOx control. These systems began being applied to MWCs in Europe and Asia in the late 1980s and were reviewed by USEPA in setting the NSPS. They will be reviewed further, based on current costs, in the BACT review for this project.

Therefore, based on the Best Available Control Technology (BACT) considerations, Unit 3 will be designed and operated in accordance with the NSPS standards. Regardless of the permit limits, there will be no change in the basic design or operation of the proposed facility, unless SCR is added for NO_x control. The operation of the MWC, as well as the pollution control system, is continuously monitored and strictly regulated. The steam load is tied to the most recent dioxin stack tests demonstrating compliance with the applicable limit. The MWC load cannot exceed more than 110% of the rate achieved during the last approved stack test. Additionally, the inlet temperature to the bag house is monitored to ensure that condensed metals are collected and dioxins are not formed on the particulate in the bag house. The maximum temperature cannot be more than 17C (30.6°F) above the temperature measured during the last approved dioxin stack tests. The three GCP parameters (MWC load, baghouse inlet temperature and CO emissions) effectively establish operating conditions between stack testing events which will maintain compliance with the applicable standard.

In addition, there are continuous emission monitors (CEMs) for sulfur dioxide (SO_2), at the inlet of the SDA and at the stack. SO_2 is one of the more difficult acid gas species to remove. Control of SO_2 to the NSPS limits indicates sufficient control of MWC acid gases. The combustion related conditions are monitored continuously through carbon monoxide (CO) and nitrogen oxides (NOx) continuous emission monitors. These monitors along with the automatic combustion control system ensure proper combustion control. There is also an opacity monitor that ensures proper performance of the bag house. These instruments are monitored by control room personnel to ensure the proper operation of the MWC. There is a monitoring requirement for the carbon feed rate to ensure adequate control for mercury. The accuracy of the continuous emissions monitors (CEMs) are verified by quarterly performance specification tests. Those regulated pollutants not monitored by CEMs are typically subject to periodic stack tests. The overall effect of the design, control, and monitoring systems is to ensure that the operation of the MWC is subject to continuous oversight and hence fully protective of the public and the environment.

As noted above, regardless of the emission limit set in the permits, there will be no difference in the design or operation of the facility, unless SCR is required. Permit limits more stringent than NSPS merely increase the risk of spurious "exceedances" of an overly-restrictive standard.

It should be noted that the metals emissions are not guaranteed by the vendor and are the responsibility of Lee County. The County has maintained an aggressive materials separation program as outlined in the Materials Separation Plan for this project. There is a limited ability to predict what the variability of the waste stream will be over the life of Unit 3 and life of the permit and there is no reliable means to quantify the effect of the Materials Separation Plan on stack emissions. The permit limits must be set to accommodate the full range of variability that may occur in the waste stream over this time and should be independent of the municipal solid waste and the Materials Separation Plan. In order to provide reasonable assurance that a lower limit could be met for the NSPS metals (cadmium, lead, mercury), additional control equipment would be required. Costs for such additional control would be prohibitive, on a cost per ton removed basis.

Due to the limited amount of test data available for the stack test pollutants (21 data points per unit), there is some difficulty in determining what, if any, reductions in the federally enforceable emission limits can be achieved in practice. Since the permit limits are deterministic, pass/fail limits that can never be exceeded, it is appropriate that they accommodate the full range of normal operation.

Although Lee County believes that the NSPS limits are stringent and protective standards, additional analyses have been performed in response to Florida Department of Environmental Protection's (FDEP) requests. These analyses included both stack test data and continuous emissions monitoring data. These data were analyzed to determine appropriate permit limits for the proposed new unit. USEPA's research for the NSPS was also considered.

After compiling and analyzing the data, the Lee County Solid Waste Division worked to define permit limits that were acceptable to the vendor (operator) as well as the County. Lead and cadmium pose particular problems because emissions of these pollutants are determined by the waste stream, which is variable by nature. Further, the NSPS limits for these pollutants already are set very low. There already is a 50% reduction in the emission limit for cadmium and a greater than 50% reduction in the lead limit from the existing units, which are regulated under the Emission Guidelines, and the NSPS for the new unit. Therefore, the County and vendor are unable to accept any reduction in the NSPS limits for these two pollutants, given the potential variability in the waste stream and the already low level required by the NSPS.

Based on the County's extensive analysis of available data from Units 1 and 2 and other factors, Lee County is willing to accept permit limits for the third MWC unit that are lower than the NSPS values (or the existing permit level where no NSPS is specified) for four parameters: VOCs; fluorides; SO_2; and particulate matter. The attached table identifies the County's proposed emission factors for all pollutants. There are no NSPS limits for fluorides or VOCs because these are indirectly considered through control mechanisms for MWC acid gases and MWC organics. However, there are current permit limits for fluoride and VOCs in the Title V permit for the existing MWC units. The County is proposing an approximate 30% reduction in the limit for fluorides; an approximate 20% reduction in the VOC level; a 10% reduction in the PM level; and a 3% reduction in the SO_2 limit for the proposed new unit.

Considerable effort and expense was expended by the County, its consultants and the vendor in developing these proposed emission limits. This included a review of the Reference Methods, Accuracy And Precision (REMAP) studies performed by American Society of Mechanical Engineers (ASME) concerning USEPA Methods 5, 23, 26 and 29, as well as a review of data from other Florida MSW combustion facilities. The County believes that the proposed levels represent stringent yet achievable standards based on the performance of the existing units, and the extensive database compiled by USEPA in developing the NSPS. The database of facility and emission control technologies that were utilized by USEPA to develop the NSPS is still current. There has been no advancement in BACT that would allow the vendor and County to propose lower limits.

While the County's effort was rigorous and extensive, this by itself is not adequate to determine an achievable emission limit. As noted above, professional judgment accrued through experience is necessary to determine whether an emission limit is achievable and is therefore appropriate for being enforceable. Achievable in the federal context of emission standards requires that the limit must be continuously achievable for known or expected variations in a process.

It should also be noted that the limit selected will have little effect on the design or operation of the facility. The facility will be designed to meet BACT requirements and the Maximum Achievable Control Technology requirements. Further, CEM data and test reports document that long term emissions are considerably less than the short term emissions factors that are monitored and regulated by continuous emission systems or short term stack tests.

Table 3-1 summarizes proposed emissions levels for LCERF's Unit 3.

The rest of Section 3 discusses the proposed permit limits by pollutant. As part of this application for a PSD permit for Unit 3, Lee County has proposed enforceable permit limits ("Primary Emission Limits") for 13 of the pollutants that will be emitted from the LCERF. Four of the proposed Primary Emission Limits are lower than the NSPS and/or the limits for LCERF's Units 1 and 2.

Lee County also is proposing "Secondary Emission Limits" for lead and cadmium. The Secondary Emission Limit for lead would be 113.5 ug/dscm, which is far less than the NSPS limit for lead (200 ug/dscm). The Secondary Emission Limit for cadmium would be 1.24E-02 mg/dscm, which also is significantly less than the applicable NSPS limit (2.00E-02 mg/dscm).

These Secondary Emission Limits would be adopted and used by the FDEP as a means of compelling the County to minimize the LCERF's emissions of these two pollutants. If there were an exceedance of a Secondary Emission Limit, the County would be required to undertake the activities described in the County's Action Plan, as described below. However, an exceedance of a Secondary Emission Limit would not be used by the FDEP or a third party as the basis for a traditional enforcement action pursuant to the Clean Air Act (CAA) or the FDEP's air quality standards.

TABLE 3-1
PROPOSED EMISSION FACTORS FOR LCERF'S MWC UNIT 3

Pollutant Name	Emission Factor[a]
Ammonia	50 ppmdv
Arsenic (Ar)	10.74 ug/dscm
Beryllium (Be)	0.16 ug/dscm
Carbon Monoxide (CO)	100 ppmdv
Cadmium (Cd)	20 ug/dscm
Hydrogen Chloride (HCl)	25 ppmdv or 95% Control[b]
Fluoride	3.5 ppmdv
Lead (Pb)	200 ug/dscm
Mercury (Hg)	70 ug/dscm or 85% Control[b]
Municipal Waste Combustor Organics (Total PCDD/PCDF)	13 ng/dscm
Nitrogen Oxides (NO_x)	180 ppmdv 1st year; 150 ppmdv thereafter
Particulate Matter (PM)	0.009 grains/dscf
Sulfur Dioxide (SO_2)	29 ppmdv or 80% Control[b]
Sulfuric Acid Mist (SAM)	16.68 ppmdv
Volatile Organic Compounds (VOC)	30 ppmdv

Note: ppmdv = parts per million by volume (dry basis)
ug = micrograms
ng = nanograms
dscm = dry standard cubic meter
dscf = dry standard cubic foot

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[a] All emission factors are corrected to 7% oxygen.
[b] Whichever is less restrictive.

Action Plan

Lee County shall conduct periodic stack tests for lead and cadmium in accordance with the schedule and methods required in this permit. The average of three test runs, conducted under representative conditions (i.e., not adversely affected by equipment malfunction or other unusual conditions) shall be compared to the Secondary Emission Limits. If the test data indicate that a Secondary Emission Limit was exceeded during the stack test, the County shall take the following steps:

I. Within 60 days of receiving the final results of the original stack test, the County shall re-test for the pollutant that exceeded the Secondary Emission Limit.

  a) If the re-test results are at or below the Secondary Emission Limit, the results of the re-test shall be provided to the FDEP. The County shall not be required to take any further action.
  b) If the re-test results are above the Secondary Emission Limit, the County shall conduct a formal review of both stack tests and shall attempt to identify the cause of the exceedances. The County's review process may include:

    1. A review of the quality control data for the stack tests.
    2. A review of the operational conditions at the facility during the tests.
    3. A review of events and conditions that may have adversely affected the test results.
    4. A review of the scale records prior to and during the tests.
    5. Interviews with facility personnel (e.g., crane operators and tipping floor spotters) regarding relevant activities occurring prior to and during the tests.
    6. A review of the County's records concerning franchise haulers and customers to identify potential sources of problematic wastes and investigate disposal practices of those identified.
    7. A review of the records from the FDEP and local agencies (e.g., notices of violation) for potential sources of problematic wastes.

  c) The County shall prepare and submit a report (the "Report") to the FDEP within 90 days of the second stack test. The Report shall describe the County's efforts to identify the cause of the exceedances, the County's findings, and the measures that should be undertaken to reduce the potential for future exceedances of the Secondary Emission Limit.

II. The County shall implement the recommendations contained in the Report. The recommended action may include one or more of the following:

  a) Implementation of an education campaign targeted at the waste generators that are identified in the Report as potential sources of problematic wastes.

b) Modification of the spotters' procedures and activities on the tipping floor.
c) Modification of the crane operators' procedures and practices.
d) Modification of the other operational procedures followed at the facility.

III. If the County implements the recommendations in the Report, but nonetheless continues to experience exceedances of the Secondary Emission Limits for the same pollutant in subsequent stack tests, then the County may request the FDEP to adjust the Secondary Emission Limit for that pollutant. In such circumstances, the County's request shall contain the following information:

a) The new proposed Secondary Emission Limit, including the methodology utilized to select the proposed limit.
b) A summary of the actions taken to date by the County and the facility operator to reduce the emissions of the specific pollutant that is exceeding the current Secondary Emission Limit.
c) An explanation of why the Department should accept the proposed new Secondary Emission Limit.

3.3 COMPOSITION OF MUNICIPAL SOLID WASTE

MSW is a heterogeneous mixture of materials, and the physics and chemistry of its combustion are very complex. Some emissions are products of combustion, such as NOx and CO, while other compounds present in the flue gas reflect the amount of the compound present in the waste itself.

In Lee County, certain wastes are separated from the MSW at various points prior to combustion at the LCERF, thus limiting certain compounds in the fuel (waste) and limiting certain pollutant emissions. Lee County has residential and commercial materials separation programs to separate ferrous metals, aluminum, plastic and other materials prior to combustion. Horticulture (yard) wastes are removed from the waste stream at the point of generation and converted into mulch for County residents. Household hazardous wastes (HHW) collection centers are used to separate HHW materials from the MSW. Most importantly, Lee County attempts to remove certain items from the waste stream before they enter the LCERF, including residential biomedical waste, white goods, used motor oil, fluorescent bulbs, thermostats and thermometers.

While Lee County supports materials separation, there is no known relationship between materials separation programs and quantifiable changes in stack emissions. Therefore, while materials separation is considered in the BACT analysis, materials separation should not be considered as BACT.

A more detailed description of Lee County's Solid Waste Management programs is provided in the PPSA application.

3.4 PARTICULATE MATTER AND PM_{10}

When solid waste is burned, particulate matter (PM) may originate from three sources: inorganic substances; organometallic substances; and unburned waste. Inorganic materials are not combusted, and consequently, the majority of these materials exit the system as bottom ash. A small portion of the inorganic material may become entrained in the flue gas, carried to the air pollution control (APC) equipment, and then collected and removed. Organometallic compounds appear as inorganic oxides or metal salts in the flue gas, resulting from high temperature combustion. Unburned solid waste entrained in the flue gas is a result of non-combustible materials and agglomeration of small particles. Trace metals present in the solid waste also become entrained in the flue gas. Some trace metals also may be adsorbed onto entrained solids.

The size and quantity of particulate matter emitted during the MSW combustion process depends on such factors as residence time within the combustion chamber, combustion temperature, oxidizing/reducing conditions during the combustion process, and the chemistry of the particulate matter and solid waste. A longer residence time of MSW on the grate allows more complete combustion of organic particles and a commensurate decrease in particle size. Longer flue gas residence times also increase the likelihood that larger particles will drop out of the flue gas in the combustion chamber and boiler passages. High temperatures and oxidizing conditions also promote more complete combustion.

Particulate matter will be controlled by a SDA, which will reduce the temperature of the flue gas stream and promote condensation of vapor phase flue gas components and allow the FF system to effectively remove the resulting solid phase particulates. The County's proposed control technology also includes a FF system, which will remove fly ash (including trace metals) and other types of particulate matter from the flue gas.

The maximum PM concentration at the baghouse outlet is proposed to be limited to 0.009 grains per dry standard cubic foot (gr/dscf) at 7% O_2. This emission level is equivalent to a maximum emission rate of 5.08 pounds per hour (lb/hour) and 22.26 tons per year (tpy).

In this document, as a conservative assumption, the assessment of the potential ambient impacts from the LCERF's emissions of particulate matter assumes that the particulate matter emissions from the proposed project will consist entirely of PM_{10} (Covanta Projects, Inc., 2002). These ambient impacts will be discussed later in Section 6 (Air Quality Impact Analyses).

3.5 MWC ACID GASES

3.5.1 SULFUR DIOXIDE

Sulfur dioxide is formed in the furnace from the oxidation of sulfur in the solid waste during the combustion process. The sulfur content of the waste and the chemical form (organic or inorganic) of the sulfur determine the rate and quantity of sulfur dioxide formation. Organic sulfur will oxidize during combustion to produce gaseous sulfur dioxide and sulfur trioxide. A fraction of the inorganic sulfur (e.g., sulfates, sulfides, and sulfites) will oxidize into a gaseous form at the design temperatures in the LCERF's Unit 3 and the remainder of the inorganic sulfur will remain in the bottom ash.

A SDA followed by a FF will be used to reduce sulfur dioxide emissions. The flue gas containing sulfur dioxide will enter the SDA where it will come into contact with a finely atomized alkaline slurry. The resultant reactions are:

$$Ca(OH)_2 + SO_2 + H_2O \rightarrow CaSO_3 \cdot 1/2\ H_2O + 3/2H_2O$$
$$CaSO_3 \cdot 1/2H_2 + 1/2O_2 + 3/2\ H_2O \rightarrow CaSO_4 \cdot 2H_2O$$

Unit 3 will be designed to achieve lower outlet emissions for sulfur dioxide than is required by the NSPS. The NSPS standard is 30 ppmdv at 7% O_2 or 80% removal (by weight) of uncontrolled emissions, whichever is least stringent. Unit 3 will achieve 29 ppmdv at 7% O_2 or 80% removal. Maximum uncontrolled emissions of sulfur dioxide for Unit 3 are expected to be 500 ppmdv, corrected to 7% O_2. Eighty percent removal of this concentration will result in stack emissions of 100 ppmdv, corrected to 7% O_2 for Unit 3. Thus, the maximum allowable concentration of sulfur dioxide from Unit 3 will be 100 ppmdv corrected to 7% O_2. This level is equivalent to 65.72 lb/hour or 287.8 tpy based on worst-case operating conditions. Actual emissions from Unit 3 will typically be considerably less than this value.

3.5.2 SULFURIC ACID MIST

When released into the ambient environment, sulfur dioxide may react with water vapor to form sulfuric acid. Sulfuric acid may further react to form sulfate salts, a particulate aerosol. The SDA/FF system will control Sulfuric Acid Mist (SAM) emissions from Unit 3 to maximum levels of ~~16.68 ppmdv, corrected to 7% O_2. This level equates to 16.78~~ 9.5 lb/hour and 39.30~~73.51~~ tpy.

If the County successfully demonstrates that the SAM levels are 16.68 ppmdv or below during the initial compliance emissions test, the County proposes to have the SAM permit limit removed from the Prevention of Significant Deterioration (PSD) permit.

This deletion request is based on a history of low concentration measurements during prior performance tests. Testing for SAM at such low levels is an unnecessary expense and does not provide any benefit to human health and the environment. Because SAM is a function of sulfur dioxide concentration, flue gas temperature and flue gas moisture content, continuous control of sulfur dioxide is a viable surrogate for control of SAM.

3.5.3 HYDROGEN CHLORIDE

Hydrogen chloride is formed during the combustion of MSW. The amount of hydrogen chloride formed during the combustion process is related to the amount of chlorine containing products present during the combustion process. Examples of such compounds are salts (sodium chloride and calcium chloride) and polyvinyl chloride (PVC).

A SDA followed by a FF will be used to reduce hydrogen chloride emissions from Unit 3. The flue gas containing hydrogen chloride will enter the SDA where it will come in contact with a finely atomized alkaline slurry. The resultant reaction is:

$$2HCl + Ca(OH)_2 \rightarrow CaCl_2 + 2H_2O$$

The USEPA NSPS at 40 CFR 60, Subpart Eb, establish a limit for hydrogen chloride of 25 ppmdv, corrected to 7% O_2, or 95% removal (by weight) of uncontrolled hydrogen chloride emissions, whichever is least stringent. Maximum uncontrolled hydrogen chloride emissions for Unit 3 are expected to be 2500 ppmdv, corrected to 7% O_2. Unit 3 will remove a minimum of 95% of this level and thus will emit a maximum of 125 ppmdv, corrected to 7% O_2 which is equivalent to 46.76 lbs/hour or 204.8 tpy. Actual hydrogen chloride emissions from Unit 3 are expected to be less than these values.

3.5.4 FLUORIDES

Fluorides can be formed during the combustion of MSW. The source for fluoride is thermally driven chemical reactions between the combustion air and the fluorine in the solid waste. A majority of the fluorine found in municipal solid waste is chemically bound to other compounds. A portion of these substances is released during combustion and becomes entrained in the flue gas. Consequently, the type of fluorine compounds formed in the MWC units will be strongly dependent on the presence of gaseous compounds, combustion temperatures, and oxidizing/reducing conditions in the combustor. Similarly, the uncontrolled emission rate for fluorides is related to fuel concentrations of fluoride and the combustion technology.

Fluorides will be controlled by the SDA/FF system and the maximum allowable concentration of fluorides from Unit 3 is 3.5 ppmdv, corrected to 7% O_2. This level is lower than the existing fluoride permit limit of 5 ppmdv (corrected to 7% O_2) for Units 1 and 2. Unit 3 will emit a maximum of 0.718 lb/hour or 3.145 tpy of fluorides measured as hydrogen fluorides (or 2.986 tpy of fluorides). Actual fluorides emissions from Unit 3 are expected to be less than this value.

Upon successful demonstration that the fluoride levels are less than 3.5 ppmdv level during the initial compliance emissions test, the County proposes to have the fluoride permit limit removed from the PSD permit.

This deletion request is based on a history of low concentration measurements during prior performance tests. Testing for fluoride at such low levels is an unnecessary expense and does not provide any benefit to human health and the environment. Because fluoride is highly soluble in water and is controlled by the semi-dry scrubber system, continuous control of SO_2 is a viable surrogate for control of fluorides.

3.6 CARBON MONOXIDE

Carbon monoxide (CO) is formed by the incomplete oxidation of carbon compounds in fuel. Some carbon monoxide is formed in all combustion processes in which carbon-containing fuel is burned. However, the amount of carbon monoxide formed is dependent upon the combustion efficiency of the fuel-burning process. Incomplete oxidation can be caused by a number of factors, including:

- Fuel-rich conditions (not enough oxygen).
- Poor fuel-air mixing (oxygen does not intimately contact fuel).
- Low combustion temperature.
- Short combustion zone residence time.

Accordingly, carbon monoxide formation is minimized by designing the combustor to provide an adequate supply of combustion air and maximizing combustion efficiency. The USEPA utilizes carbon monoxide as part of the strategy to ensure that good combustion is occurring. Good combustion practices (GCP) were developed by the EPA to minimize both formation and emission of dioxins/furans and other trace organics. There are three components to GCP: a CO emission limit, a load limit, and a temperature limit at the inlet of the PM control device (USEPA, 1995d).

Elevated emissions of carbon monoxide from a MWC may result from the failure of the combustion system to complete the burnout of the combustible gases emitted from the burning refuse on the grate. The proper utilization of underfire and overfire air provides adequate oxygen levels and gas turbulence to minimize emissions of carbon monoxide.

Section 3.6.1 below discusses in detail the carbon monoxide emissions during start-up, shutdown and malfunction of Unit 3 and the NSPS requirements for carbon monoxide during these periods as they were amended by the November 16, 2001 NSPS amendments.

Unit 3 will utilize an automatic combustion control system to minimize carbon monoxide emissions. This will enable Unit 3 to maintain a proposed maximum emission limit of 100 ppmdv corrected to 7% O_2 (based on a 4-hour block average), which is also the NSPS limit. This emission rate is equivalent to 28.73 lb/hour and 125.8 tpy.

3.6.1 ADDITIONAL CARBON MONOXIDE MALFUNCTION REGULATIONS

On November 16, 2001, the USEPA proposed and promulgated through a direct final rule, amendments to the Subpart Eb NSPS concerning compliance with the CO emissions standards during periods of start-ups, shutdowns and malfunctions (S/S/M) (66 Fed. Reg. 57824-57828, November 16, 2001). Prior to the USEPA's action, the CO emissions standards in the NSPS were not enforced during periods of S/S/M, but only for a maximum duration of three hours. The November 2001 amendment extends this malfunction time period for CO emissions, if the malfunction is caused by a loss of boiler water level control or combustion air control.

During periods of boiler S/S/M, it is difficult to maintain the proper balance between the waste feed and combustion air flow to provide for sufficient control of complete combustion. Incomplete combustion will increase the amount of CO formation, and supplemental combustion with auxiliary fuel burners is typically used to provide additional oxidation of CO to carbon dioxide (CO_2).

Loss of boiler water level control, from a rupture of a boiler tube for example, exposes the metal tubes to increases in temperatures. Boiler tube metal must be kept at or below about 800°F (427C) to prevent damage or burn-out. Proper boiler water level assists in regulating tube metal temperatures, and failure of the water level control will allow temperatures to rise above this 800°F (427C) mark and increase damage to the remaining boiler tubes. Temperatures above this level and failure to maintain correct temperature profiles can lead to boiler damage from heat stress. Increases in CO formation normally are overcome by using auxiliary fuel burners to provide additional combustion. However, the use of the fuel burners during the failure of boiler water level will increase the temperature of the boiler water tubes and increase the potential for MWC unit failure. Indeed, the use of auxiliary fuel burners during periods of boiler tube malfunction are prohibited by the National Fire Protection Association.

A second type of malfunction covered under the amended NSPS is loss of combustion air control due to such events as loss of control or malfunction of combustion air fan, loss of control or malfunction of induced draft fan, or a failure or malfunction of the grate system. Loss of combustion air control prevents control of the MWC unit to provide for complete combustion and results in increased CO formation as well as significantly increases the risk for explosion. The increased CO formation can be remedied by using auxiliary fuel burners to provide for additional oxidation of CO into CO_2. However, the use of auxiliary fuel burners can worsen the problem by decreasing the amount of air available for combustion.

The amended NSPS requires MWCs to develop and implement operation and maintenance programs and allows CO emissions to increase during these periods of S/S/M and limits the event to 15 hours per occurrence. The LCERF has an operation and maintenance program in place to ensure that the MWC unit is operated properly and is compliant under the amended NSPS.

3.7 NITROGEN OXIDES

Nitrogen oxides are produced in all combustion processes. There are two mechanisms by which nitrogen oxides are formed during combustion.

- Thermal nitrogen oxides are formed by high temperature oxidation of nitrogen in the combustion air.
- Fuel nitrogen oxides are formed by the oxidation of nitrogen in the fuel.

The primary components of nitrogen oxides (NOx) are nitric oxide (NO) and nitrogen dioxide (NO_2). The combination of these compounds is referred to as nitrogen oxides. Conversion of nitrogen in the waste occurs at lower temperatures (less than 1,090C [2,000°F]), while oxidation of atmospheric nitrogen occurs at higher temperatures. Because of the temperatures at which MWC furnaces operate, 70 to 80 percent of nitrogen oxides formed in MWCs is associated with nitrogen in the waste (USEPA, 1996). Accordingly, technologies that affect the formation of nitrogen oxides from fuel nitrogen would have a relatively significant effect on the overall nitrogen oxides emissions level. Factors that affect fuel nitrogen oxides formation include the amount and distribution of excess combustion air, the nitrogen content of the refuse fuel, and to some extent, changes in combustion temperature.

Research has shown that the formation of thermal nitrogen oxides is affected strongly by combustion temperature (MacKinnon, 1974). Since thermal nitrogen oxides formation is dependant on high temperatures, nitrogen oxides formation may occur in "hot spots" in the combustion zone where local temperatures reach levels much higher than the average combustion temperature. Thermal nitrogen oxides formation is also affected by the availability of oxygen in high temperature regions of the combustion zone. Consequently, thermal nitrogen oxides formation can be minimized by limiting the amount of excess air provided to the high temperature zones of the combustion chamber and by the location and manner in which air is later introduced to complete combustion.

Unit 3 will utilize an automatic combustion control system and SNCR to reduce nitrogen oxides levels and maintain a maximum emission limit of 150 ppmdv, corrected to 7% O_2 (180 ppmdv at 7% O_2 for the first year of operation), in conformance with the federal NSPS for the municipal waste combustion industry. This 150 ppmdv level equates to 70.79 lb/hour and 310.1 tpy.

3.8 MWC METALS

Combustion of solid waste may result in the emission of trace concentrations of certain metals. These metals are present in both the combustible and non-combustible parts of the waste. During combustion, the non-volatile metals are distributed in two general areas: bottom ash and fly ash. Volatile metal emissions also occur as vapor phase emissions. The distribution of trace metals is determined by their physical properties and the operating temperatures of the various components of the combustion unit and the air pollution control system. Trace metals will be removed at the LCERF by the SDA and FF system. The SDA will reduce the flue gas temperature to approximately 300°F (149C). At that temperature, most volatilized metals will condense on available particulate matter and be collected by the FF.

The USEPA NSPS specifies separate emission levels for mercury, lead, and cadmium. The Florida Mercury Rule (Rule 62-296.416, F.A.C.) provides specific limits for mercury emissions. Other metals are regulated by the particulate control standard established by the NSPS. The emission rates for mercury, lead, cadmium, arsenic and beryllium are discussed below.

The flue gas stream may contain trace amounts of nickel, antimony, copper, chromium, selenium, tin, zinc, and other metals. These trace metals will be controlled with the particulate matter.

3.8.1 MERCURY

Mercury is a trace metal found in many different waste materials. Within the temperature range of the combustion process for solid waste, mercury is found as a metallic vapor. The melting point and boiling point of mercury are -38.87C (-37.97°F) and 356.9C (674.42°F), respectively (Perry, et al., 1984).

Significant research efforts have been undertaken in order to determine the origin and nature of mercury emissions from MWCs. The origin of mercury in solid waste was investigated by Franklin Associates, "Characterization of Products Containing Mercury in Municipal Solid Waste in the United States, 1970 to 2000" (1991). According to the report, numerous field test programs established the variability of mercury emissions. The field test programs indicated that up to 89% of the mercury in solid waste at that time (1991) was from batteries and, therefore, new mercury-free or low mercury content batteries should significantly reduce the uncontrolled mercury emissions from MWCs. This conclusion was correct, as shown by the subsequent reduction of mercury levels in uncontrolled stack gases as mercury was removed from consumer batteries. Notwithstanding the reductions that have occurred, additional amounts of mercury are still introduced into the waste stream with mercury containing devices and some pesticide treatments.

With activated carbon injection, mercury is adsorbed onto the carbon particle, which is then captured in the PM control device. Test programs using activated carbon injection on MWCs in the United States have shown mercury removal efficiencies can vary from 50 to over 95 percent, depending on several factors, including the carbon feed rate (USEPA, 1996).

The activated carbon injection (ACI) system proposed by the County will provide a stable and reliable control of mercury emissions. The ACI system will reduce the concentration of mercury from Unit 3 to 70 ug/dscm as required under the Florida Mercury Rule or provide 85% removal of uncontrolled mercury emissions as required under the USEPA NSPS, whichever is less stringent. Maximum uncontrolled mercury emissions are expected to be 1,150 ug/dscm, corrected to 7% O_2. The powdered activated carbon injection system will provide 85% removal of uncontrolled mercury emissions or a level of 172.5 ug/dscm, corrected to 7% O_2. The maximum emission rate will be 0.043 lb/hour or 0.187 tpy.

3.8.2 LEAD

Lead is a trace metal found in solid waste. Lead emissions are directly proportional to the lead content of the solid waste, as long as the waste component is combustible. The melting point and boiling point of lead are 327.5C (621.5°F) and 1,620C (2,948°F), respectively (Perry, et al., 1984). Some of the lead will volatilize and condense to become a component in the fly ash. Lead will either become part of the bottom ash or adhere to the fly ash which will be collected in the FF.

Unit 3 will maintain the USEPA NSPS limit of 200 ug/dscm at 7% O_2. This is equivalent to an emission factor of 0.0494 lb/hour or 0.216 tpy.

3.8.3 CADMIUM

Cadmium is present in both combustible and non-combustible components of municipal solid waste and is collected in the FF. The melting point and boiling point of cadmium are 320.9C (609.6°F) and 767C (1,412.6°F), respectively (Perry, et al., 1984). As with the other metals, cadmium emissions will be efficiently controlled by proper operation of the SDA/FF system. The County's proposed project will comply with the USEPA NSPS emissions level of 20 ug/dscm at 7% O_2. This is equivalent to a maximum emission factor of 0.00494 lb/hour or 0.0216 tpy.

3.8.4 ARSENIC

Arsenic is a metallic compound found in trace quantities in solid waste. Emissions of arsenic are a function of the arsenic content of the MSW.

The arsenic content of municipal solid waste is generally in the combustible fraction and, as such, is considered to be fully released and volatilized by the combustion process. Arsenic, therefore, primarily exits the furnace with the flue gas stream with a small fraction found in bottom ash. Studies involving combustion of both coal and refuse have shown that arsenic is enriched in fine particulate matter, as compared to coarser particulate matter or bottom ash. It is theorized that arsenic, and other metals as well, are volatilized in the high temperature combustion zone of the MWC. Upon cooling, these compounds are then adsorbed or condensed onto fine particulate matter. The amount of enrichment varies with particle size, amount of particulate, and flue gas temperature (California Air Resources Board [CARB], 1984). Therefore, high removal efficiencies for arsenic and other metals can be achieved by effectively controlling fine particulate matter emissions.

By operating the particulate matter control equipment at temperatures below 500°F (260C) and efficiently collecting particulate matter, the County will achieve high removal efficiencies for arsenic in flue gas (CARB, 1984). The LCERF will utilize a SDA followed by a FF to control arsenic. As stated above, the SDA/FF will condition the flue gas and cool it to approximately 300°F (149C).

Operation of the SDA/FF will reduce arsenic emissions to a maximum level of 10.74 ug/dscm, corrected to 7% O_2. This arsenic emission level equates to 0.00265 lb/hour or 0.0116 tpy.

Once Unit 3 demonstrates compliance with this arsenic emission level during its initial emissions test, Lee County proposes to have this arsenic level removed from its permit.

This deletion request is based on a history of low concentration measurements during prior performance tests. Testing for arsenic at such low levels is an unnecessary expense and does not provide any benefit to human health and the environment. Because arsenic is a function of the quantity of arsenic in the waste fuel and will be controlled using the particulate control equipment (SDA and FF), continuous monitoring of opacity, combined with annual particulate tests are viable surrogates for verifying control of arsenic.

3.8.5 BERYLLIUM

Beryllium is a metallic compound found in trace quantities in MSW. As a product of combustion, beryllium emissions are a function of the beryllium content of the MSW. Beryllium is a light metal and has a high melting point, which allows it to be used in nuclear work, ceramic applications and other uses with high temperature requirements. Beryllium is not used in appreciable quantities for consumer products which are generally found in municipal solid waste. Beryllium occurs naturally in soils in small quantities (about 2-6 ppm) (Merck and Company, Inc., 1996). The primary beryllium contribution to solid waste comes largely from newsprint, paper-board, and other paper byproducts. Yard wastes, food wastes, polyurethane foam, and polyethylene containers may also contribute to combustible constituents of beryllium. As stated above in Section 3.3 (Composition of Municipal Solid Waste), the LCERF Materials Separation Plan assists in the removal of recyclable paper products and yard wastes to the extent possible, thereby reducing the amount of beryllium introduced to the LCERF.

The maximum allowable concentration of beryllium from Unit 3 is 0.16 ug/dscm, corrected to 7% O_2. This level equates to 3.95 E-5 lb/hour or 1.730 E-4 tpy. Upon demonstration that Unit 3 is below this level during the initial emissions test, the applicant proposes to have this beryllium limit removed from the permit. Beryllium emission estimates are included primarily to demonstrate non-applicability to PSD review for Unit 3.

This deletion request is based on non-detect measurements of prior performance tests. The USEPA has determined that the beryllium National Emission Standards for Hazardous Air Pollutants (NESHAP) does not apply to MWCs. Testing of a pollutant that is not measurable is expensive without providing any benefit to human health and the environment. Continuous monitoring of opacity and annual particulate tests are viable surrogates for monitoring control of beryllium because beryllium is a function of the quantity of beryllium in the waste fuel and will be controlled using the particulate control equipment.

3.9 MWC ORGANICS

MWC Organics are defined by the USEPA in 40 CFR 60.51b as organic compounds emitted in the exhaust gases from municipal waste combustor units and includes tetra- through octa- chlorinated dibenzo-p-dioxins and dibenzofurans. Various organic compounds have been measured in emissions from solid waste combustion facilities. The principal compounds of concern are dioxins/furans.

Dioxin and tetrachlorodibenzo-p-dioxin (TCDD) are popular synonyms for the chemical 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). This chemical is one of 22 TCDD isomers, each of which is distinguished by the location of the four chlorine atoms contained within its structure. Each species of TCDD has its own chemical and physical properties.

The term polychlorinated dibenzo-p-dioxin (PCDD) refers to 75 isomers that differ in the number and position of chlorine atoms attached to the dibenzo-p-dioxin molecule and the number system for distinguishing possible chlorine site.

In a similar manner, 2,3,7,8-tetrachlorodibenzofurans (2,3,7,8-TCDF) is one of 22 tetrachlorodibenzofurans. The term polychlorinated dibenzofurans (PCDF) refers to 135 chemically, physically, and toxicologically distinct isomers (Fred C. Hart Associates, Inc., 1984).

Lee County's proposed project will employ good combustion practices in combination with a SDA and FF to minimize PCDD and PCDF formation and emissions. GCP according to the USEPA includes monitoring of steam load, carbon monoxide concentration and flue gas temperature into the fabric filter.

Further, the use of the ACI and FF systems will promote removal of dioxins/furans in flue gas. The maximum PCDD and PCDF emissions (tetra- through octa- chlorinated dibenzo-p-dioxins and dibenzofurans) from Unit 3 will be at or below 13 ng/dscm at 7% O_2 (total). This is equivalent to an emission factor of 3.21 E-6 lbs/hour or 1.41 E-5 tpy (total).

3.10 VOLATILE ORGANIC COMPOUNDS

Volatile organic compounds (VOCs) and other non-methane hydrocarbons (NMHC) are formed during the combustion of MSW and are present in the flue gas. The principal mechanism to control these organic compounds is GCP. GCP include proper design and operation of the MWC unit to maximize the thermal destruction of VOCs and NMHC.

The maximum allowable VOC concentration from Unit 3 is 30 ppmdv, corrected to 7% O_2. This emission level equates to 4.936 lb/hour (as methane) or 21.62 tpy. The permit limit for the existing MWC Units 1 and 2 is 37 ppmdv corrected to 7% O_2. Upon successful demonstration that the VOC levels from Unit 3 are below 30 ppmdv level during the initial compliance emissions test, the County proposes to have the VOC permit limit removed from the air permit.

This deletion request is based on a history of non-detectable or low concentrations measured during prior performance tests. Testing of a pollutant at these low concentrations is an unnecessary expense and does not provide any significant benefit to human health and the environment. Because VOC emissions are a function of the combustion process, continuous monitoring of carbon monoxide is a viable surrogate for monitoring control of VOCs.

3.11 VINYL CHLORIDE

Vinyl chloride emissions from Unit 3 are expected to be non-existent or negligible because of the oxidizing atmosphere in the furnace.

3.12 TOTAL REDUCED SULFUR

Total Reduced Sulfur emissions from Unit 3 are expected to be non-existent or negligible because of the oxidizing atmosphere in the furnace.

3.13 REDUCED SULFUR COMPOUNDS

Emissions of Reduced Sulfur Compounds from Unit 3 are expected to be non-existent or negligible because of the oxidizing atmosphere in the furnace.

3.14 HYDROGEN SULFIDE

Emissions of hydrogen sulfide from Unit 3 are expected to be non-existent or negligible because of the oxidizing atmosphere in the furnace.

3.15 AMMONIA

The County will utilize a SNCR system to control nitrogen oxides emissions. As discussed later in Section 4 (Best Available Control Technology Evaluation), SNCR utilizes ammonia as a reagent to promote the reduction of nitrogen dioxide into nitrogen molecules in the post combustion flue gas stream. The SNCR system will be designed and operated in a manner to minimize ammonia slip, which will not exceed 50 ppmdv, corrected to 7% O_2.

This maximum ammonia emission level of 50 ppmdv equates to a level of 8.72 lb/hour or 38.19 tpy. Upon successful demonstration that the ammonia levels from Unit 3 are below this 50 ppmdv level during the initial compliance emissions test, the County proposes to have the ammonia permit limit removed from the air permit.

3.16 TOTAL HAZARDOUS AIR POLLUTANTS

Emissions of total hazardous air pollutants (HAPs), as defined by Rule 62-210.200(130), F.A.C., will consist of arsenic, beryllium, cadmium, dioxins, hydrogen chloride, hydrogen fluoride, lead and mercury. Total HAPs from Unit 3 will 47.58 lb/hour or 208.4 tpy.

LEE COUNTY ENERGY RECOVERY FACILITY
PREVENTION OF SIGNIFICANT DETERIORATION
APPLICATION FOR MUNICIPAL WASTE COMBUSTOR UNIT 3

SECTION 4
BEST AVAILABLE CONTROL TECHNOLOGY EVALUATION

Revised February 17, 2003

SECTION 4
BEST AVAILABLE CONTROL TECHNOLOGY EVALUATION

4.1 DESCRIPTION OF CONTROL TECHNOLOGY REVIEW

The proposed modification to the Lee County Energy Recovery Facility (LCERF) is a major modification to an existing major stationary source in an attainment area and is subject to Prevention of Significant Deterioration (PSD) review because this modification will result in an increase in pollutant emissions in excess of PSD significant emission rates. Specific pollutants with proposed emissions greater than PSD significant emission rates (see Table 2-1) are particulate matter [particulates with a mean aerodynamic diameter less than ten microns (PM_{10})], sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NOx), mercury (Hg), sulfuric acid mist (SAM), municipal waste combustor (MWC) metals (as PM), MWC acid gases (as SO_2, ~~and~~ hydrogen chloride [HCl], and hydrogen fluoride [HF]), and MWC Organics (as total dioxins and furans). A Best Available Control Technology (BACT) evaluation must be conducted for the pollutants which are subject to PSD review.

On December 20, 1989, the U.S. Environmental Protection Agency (USEPA) proposed standards and guidelines for MWCs in 40 CFR Part 60 Subparts Ea and Ca, respectively. Subparts Ea and Ca were promulgated on February 11, 1991 and were developed under the authority of paragraph (b) of Section 111 of the Clean Air Act (CAA) of 1977. These promulgated standards and guidelines were developed from a series of background information documents issued from 1987 through 1989 (60 FR 65388). On November 15, 1990, amendments to the CAA were enacted and Section 129 (Solid Waste Combustion) was added to the CAA. Section 129 specified that revised standards and guidelines must be developed for MWCs. The USEPA subsequently reviewed the Subpart Ea standards and Subpart Ca guidelines and concluded that they were not fully consistent with new requirements established in Section 129 of the CAA. Therefore, USEPA proposed to revise the standards and guidelines in a September 20, 1994 proposal that was promulgated December 19, 1995 as the final rule (Section Eb and Cb).

In preparing the final rule, USEPA did collect additional data. They reaffirmed conclusions drawn from background information documents issued from 1987 to 1989. USEPA did solicit public comments on the 1994 proposed rulemaking that was compiled into a background information document "Municipal Waste Combustion: Background Information Document for Promulgated Standards and Guidelines – Public Comments and Responses" (USEPA, 1995d). No new U.S. MWC has been permitted since the promulgation of the final standards and guidelines for MWCs. Thus, the information presented in this BACT for Lee County reflect information and conclusions contained in documents issued by USEPA in the late 1980s that were reaffirmed when USEPA established final standards and guidelines for MWCS in 1995. USEPA's conclusions have not changed because there has been a lack of any new activity in the municipal waste combustion industry.

In accordance with current USEPA policy, a BACT analysis involves, on a pollutant specific basis, the identification of all applicable emission control alternatives for the pollutants subject to PSD review and any others requested by the governing regulatory agency. The control alternatives are then evaluated using a "top down" approach where they are ranked in descending order of effectiveness. A "top down" analysis first examines the most stringent or "top" control method to determine if technical considerations or potential energy, environmental, or economic impacts justify a conclusion that the control method is not BACT. If the most stringent or "top" control alternative is determined not to be BACT using this methodology, then the next most stringent alternative is considered until BACT is determined. Equipment with equivalent control capabilities does not require an evaluation. For those pollutants which have applicable air pollutant emission standards, such as New Source Performance Standards (NSPS), BACT needs to be at least as stringent as the applicable standard.

The criteria used to evaluate BACT alternatives are as follows:

- Technical Feasibility
- Energy Impacts
- Environmental Impacts
- Economic Impacts

The technical feasibility of a control alternative relates to whether the technology can reasonably be expected to remove a specific pollutant from the source exhaust gas stream given the physical and chemical characteristics of the source and its exhaust. Energy impact evaluation relates to the determination of whether the energy needed to apply a control technology is excessive relative to other available technologies. Environmental impact evaluation relates to the identification of both beneficial and non-beneficial environmental impacts resulting from application of a given control technology. Economic impact evaluation relates to the determination of the cost-effectiveness of applying a given control technology. For purposes of the BACT analysis, cost effectiveness estimates are developed as a "cost per ton of pollutant removed" for evaluating the reasonableness of various emission control technology costs. This is done by dividing the total annual cost of each control alternative by the amount of emissions (in tons) reasonably expected to be controlled by each control alternative. Economic impacts can also be determined as an "incremental cost-effectiveness" when evaluating the added benefit of marginally different control options.

4.2 PROPOSED CONTROL TECHNOLOGIES

The applicant, Lee County, proposes to control air pollutant emissions through a combination of good combustion practices (GCP) and add-on exhaust gas controls. PM_{10} as well as MWC Metals (as PM_{10}) will be controlled with a high efficiency fabric filter (FF) baghouse. Acid gases such as SO_2, MWC acid gases (SO_2, ~~and~~ HCl, and HF), and SAM will be controlled with a spray dry absorber (SDA) in combination with the FF. NOx will be controlled with Selective Non-Catalytic Reduction (SNCR). GCP will be utilized to maximize burnout of products of incomplete combustion such as CO, volatile organic compounds (VOCs), and trace organics. The applicant also proposes to install an activated carbon injection system in combination with flue gas cooling in the spray dry absorber (SDA) and particulate control in the FF for control of Hg. These types of control have been proven to be effective in controlling the range of pollutants expected to be emitted from a municipal waste combustor. Thus, these proposed control options will be considered the "base" control options for the pollutant specific BACT analyses.

4.3 MATERIALS SEPARATION

Lee County has in place an aggressive county-wide materials separation plan to minimize waste generation. Residents of Lee County are required to pay for curbside collections of separated glass bottles, plastic containers (numbers 1 through 7), steel cans, aluminum cans and foil, corrugated cardboard, kraft paper bags, telephone books, magazines, newspapers and dry-cell batteries for recycling. Residents also separate household waste such as electronic equipment, motor oils, pesticides, waste fuels (gasoline/fuel oil), paints, solvents, drain cleaners, pool chemicals, anti-freeze and auto batteries. Lee County has a voluntary commercial materials separation program that provides for the collection of source separated recyclable materials from businesses and institutions. The County requires its franchise collection haulers to provide, at a minimum, recycling collection services for all businesses and institutions, and prohibits the imposition of any collection and transfer fees for recyclables. The Lee County Materials Separation Plan is more fully described in Volume II.

Source separation of combustible and non-combustible materials can result in lower emissions of various pollutants such as mercury and lead from household and industrial/commercial batteries. The Lee County Materials Separation Plan includes ferrous and non-ferrous metal collection from residential collection, private recycling facilities, "buy-back" programs for scrap steel, copper, and aluminum and post-combustion ferrous and non-ferrous metals separation and recovery at the LCERF. Segregated loads of commercial construction and demolition (C&D) waste debris are generally not accepted at the LCERF. Segregated C&D waste is directed to separate private landfills and recycling facilities. White goods (large appliances such as stoves and refrigerators) are collected separately by franchise haulers and delivered to private recycling facilities.

Lee County maintains waste tire storage and processing areas at the LCERF. Waste tires are shredded by a private tire processor and used as fuel for the LCERF combustors and for drainage media at the County's landfill.

Lee County also sponsors several additional waste programs to be utilized on a voluntary basis. Residents and business can dispose used motor oils at designated county "oil-change" business locations. The County also provides a residential used-sharps program for convenient disposal of used syringes. Biomedical waste disposal containers for used syringes can be obtained free at participating pharmacies and fire stations. Drop-off locations for the biomedical waste are available at fire stations throughout Lee County. Other commercially generated waste, such as fluorescent bulbs, thermostats and thermometers are to be disposed properly by the generator according to prevailing local, state and federal rules and regulations.

While certain materials separation efforts are considered in this document because of their potential to reduce air emissions, the amount of emissions reductions cannot be quantified. For this reason, materials separation activities are discussed in this BACT analysis; however, materials separation should not be imposed as BACT.

4.4 BACT REVIEW FOR PARTICULATE MATTER (PM_{10}) and MWC METALS

For the purposes of this BACT review, particulate matter refers to PM_{10} and MWC Metals. In the proposed facility system, there are several operations that generate particulate emissions that are controlled by air pollution control (APC) equipment. The primary source of particulate matter at the proposed Unit 3 is the combustion unit. Minor particulate matter sources are the tipping floor area, various conveyors that will be part of the facility modification, ash handling areas and the storage and handling of lime used in the SDA.

The combustion air intake for Unit 3 will collect particulate matter and odors from the tipping floor area as is done with the existing two units. Since tipping area particulate emissions are controlled in the combustion unit and collected by the SDA/FF, these are evaluated as part of the combustion unit particulate emissions. Fugitive particulate created by the delivery and use of lime will be controlled by a separate control device mounted on the storage silo. This is further discussed in Section 6.4 (Source Data) of this document.

It is anticipated that the ash handling system will not be a significant source of fugitive particulate from the proposed Unit 3. The existing ash handling systems for Units 1 and 2 are designed to be wet systems for ash quenching and dust suppression. The bottom ash from the combustor and fly ash from the APC system are mixed together in an ash discharger where the resultant wet ash is approximately 10 to 20 weight percent water which minimizes nuisance dust generation. The ash is stored in a separate building prior to disposal. Ash handling and disposal is further discussed in Section 6.4 (Source Data) of this document. This BACT section will focus entirely on particulate emissions resulting from the combustion unit.

4.4.1 PARTICULATE FORMATION MECHANISMS

The particulates generated in the pit area or tipping hall will be entrained in the air used by the combustion unit. The primary dust generating mechanisms are the movement of trucks and other equipment in the tipping area, the discharge of refuse into the pit area, the mixing and movement of refuse by the overhead cranes, the loading of refuse into hoppers, and other minor activities. The air intakes for the combustion unit are located in the tipping hall area to provide control of odors and particulate matter. Within the tipping floor area, the negative pressure created by the induced draft fans directs movement of air to the screened vents, therefore preventing odors and dust from escaping to the environment.

The movement of refuse through the combustors, in addition to the refuse combustion, causes the suspension of substantial amounts of particulates. The high combustion temperatures also cause the vaporization of a portion of the MWC metals contained in the waste, which condense onto entrained particles as flue gas temperatures decrease along the exhaust gas flow pathway. Some of the larger particulates fall out in the boiler section, but the majority move downstream to the SDA unit. Particulates collected in the bottom ash from the boiler section are mixed in the ash discharger with fly ash particulate matter collected by the SDA system. All collected flyash is conveyed by enclosed screw conveyors.

Once the combustion exhaust gases enter the SDA, the flue gas cleaning system introduces a lime-slurry spray into the exhaust gas stream and thereby increases the particulate loading in the flue gas. As the lime-slurry dries and the water evaporates, the exhaust gases cool and the dry lime particles disperse from the resultant intense turbulence within the reaction chamber. This intense turbulence causes intimate contact between the fine lime particulate and acid gases and other constituents in the exhaust stream. Condensation onto particles and agglomeration of finer particles occurs. Some large particles in the exhaust gases are collected in the hopper of the SDA vessel. The remaining particles are carried to the FF control system where the combination of reacted and unreacted lime helps form a filter "cake" on the baghouse fabric that assists in particulate removal and ultimately, highly efficient exhaust gas cleaning.

4.4.2 SOURCE SEPARATION IMPACT ON PARTICULATE EMISSIONS

While certain materials separation efforts are considered in this document because of their potential to reduce air emissions, the amount of emissions reductions cannot be quantified. For this reason, materials separation activities are discussed in this BACT analysis; however, materials separation should not be imposed as BACT. There is no evidence to demonstrate that source separation of certain components by itself provides for consistent and measurable reductions of particulate emissions. Because it is not possible to quantify the effect of source separation, source separation does not qualify as a technology or clean fuel process.

4.4.3 AVAILABLE CONTROL TECHNOLOGIES

Particulate matter control devices have been employed in numerous industries and include FFs, electrostatic precipitators (ESP), cyclones, wet scrubbers, and others. From a top-down perspective the most effective types of particulate matter control equipment being successfully applied to municipal waste combustors are FF and ESP systems. USEPA, in its review of control technologies in support of the NSPS for municipal waste combustors, considers FF and ESP systems to be equivalent in providing control of particulate matter (USEPA, 1989e; and USEPA, 1995d). This equipment has been successfully applied to numerous municipal waste combustor installations in the U.S. It is a generally accepted conclusion that either an ESP or a FF system can effectively reduce the particulate loading in an exhaust gas stream from a municipal waste combustor and either technology represents the most restrictive emission control technology available for particulate emissions. Unit 3 will incorporate a FF system designed to limit particulate emissions to 0.009 grains per dry standard cubic foot (gr/dscf) of exhaust gas, corrected to 7% oxygen.

Developments in FF technology have produced a variety of filter materials including coated or non-coated fiberglass, felts, and synthetic membranes to deal with differences in ash characteristics and resistivity, inlet flue gas temperature, filter cake cohesiveness, and other problems encountered with specific FF design parameters. Lee County will utilize a bag material that will meet the proposed PM_{10} emission limit of 0.009 grains per dry standard cubic foot (gr/dscf) at 7% O_2.

4.4.4 SELECTION OF BACT

Lee County is proposing to install a FF system to control particulate matter emissions which represents the "top" technology available. No further evaluation of control options is considered necessary. Therefore, a FF designed to achieve a particulate matter emission rate of 0.009 gr/dscf at 7% O_2 is selected as BACT for Unit 3.

In addition, a second lime silo will be added to the facility for additional lime storage needed for the Unit 3 SDA system. The lime silo will be equipped with a FF unit to control particulate emissions during filling operations of the silo. The FF for the lime silo will be designed to achieve an outlet grain loading of 0.03 gr/dscf, which is considered BACT for small, low flow FF units.

4.5 BACT REVIEW FOR SULFUR DIOXIDE, MWC ACID GASES, FLUORIDES, AND SULFURIC ACID MIST

For purposes of this BACT review, acid gases include SO_2, MWC acid gases, such as HCl and hydrogen fluorides (HF), and SAM. SO_2 and acid gases are generated in the combustion unit. The sources of these pollutants are the thermally driven chemical reactions between the sulfur, chlorine, fluorine, and other elements and compounds in the municipal solid waste (MSW) and combustion air. Gas scrubbing systems are the most effective methods currently available for application to resource recovery systems to control SO_2 and acid gases. Wet, semi-dry, and dry scrubbing systems are available and have been applied to MSW combustion facilities. The following discussion addresses the formation of SO_2, as an equivalent acid gas, in the combustor and the specific energy, economic, and environmental impacts of available control technologies.

4.5.1 FORMATION MECHANISMS

The majority of the sulfur, chlorine, and fluorine ~~and chlorine~~ found in refuse is chemically bound to other compounds. A portion of these substances are released during combustion and escape the furnace in various forms. Consequently, the type of sulfur, chlorine and fluorine compounds released from the combustion units will be strongly dependent on the presence of gaseous compounds, combustion temperatures, and oxidizing/reducing conditions in the combustor. Similarly, uncontrolled emission rates of these compounds will be related to fuel concentrations of sulfur, chlorine, and fluorine, and to the combustion technology.

Various sulfur compounds are produced from direct combustion processes. SO_2 is the predominant form of sulfur compound released from the municipal solid waste combustion process. Some of the SO_2, when released into the ambient environment, reacts with atmospheric water vapor to form sulfuric acid. Similarly, emitted chlorine and fluorine react with water vapor to form hydrochloric acid (HCl) and hydrogen fluoride (HF). The presence of these acid gases in the atmosphere results in reduced visibility, material corrosion, sensitive organ irritation in humans and animals, and can add to acid rain/fog problems. Sulfuric acid and emitted sulfuric acid mist may further react in the atmosphere to form sulfate salts, a particulate aerosol.

4.5.2 SOURCE SEPARATION IMPACT ON MWC ACID GAS EMISSIONS

Source Separation Impact on SO_2 and Sulfur Compound Emissions

Municipal waste combustion facility emissions of SO_2 and sulfur compounds appear to be related to both the sulfur content of the MSW and to the combustion environment. The major contributors of sulfur to the municipal solid waste stream (and their approximate sulfur content by weight) were estimated in the California Air Resources Board (CARB) document (1984) to be plastics (0.3%), textiles (0.2%), food wastes (0.25%), and yard wastes (0.35%). As can be seen by these approximate figures, the sulfur content of municipal solid waste is quite small, typically averaging less than 0.25% of the total weight (CARB, 1984). Other sources of sulfur in MSW and their approximate sulfur contents (by weight) are corrugated cardboard (0.05%), mixed paper (0.04%), newsprint (0.03%), and rubber (0.2%) (CARB, 1984). A search for more recent data regarding the chemical constituency of different components of the general municipal solid waste stream did not identify useful information. This was confirmed in discussions with Mr. Winston Porter, formerly of the USEPA (Marks, M., 2002).

With the exception of food wastes and textiles, the Lee County Materials Separation Plan provides curbside collection for a significant portion of these materials. Lee County provides weekly collection of yard and horticultural wastes from all single family residential dwellings. Commercially generated yard and horticultural wastes are generally transported to county and private facilities for recycling. Corrugated cardboard, mixed paper and newsprint are included in the residential and commercial materials separation programs. Used automotive tires are separately collected and shredded for the County by a private tire processor. Shredded tires are burned at the LCERF to recover energy and steel. Shredded tires are also used as drainage media at the County's landfill.

While certain materials separation efforts are considered in this document because of their potential to reduce air emissions, the amount of emissions reductions cannot be quantified. For this reason, materials separation activities are discussed in this BACT analysis; however, materials separation should not be imposed as BACT. There is no evidence to demonstrate that source separation of certain components by itself provides for consistent and measurable reductions of SO_2 and sulfur compounds. Because it is not possible to quantify the effect of source separation, source separation does not qualify as a technology or clean fuel process.

Source Separation Impact of HCl Emissions

HCl emissions, to a limited extent, can be related to the amount of MSW components containing chlorine. The CARB reports that plastics [mostly polyvinyl chloride (PVC) and polyurethane plastics] and miscellaneous organic wastes are the major sources of chlorine in MSW. Table salt is also regarded as a major chlorine source (CARB, 1984). Other chlorine contributors in the MSW stream are chlorine-bleached paper, yard waste, and high density polyethylene (HDPE) plastics. Based on Berkeley, California data reported by CARB, the approximate chlorine content, by weight, for these MSW components are: plastics, 6.5%; organic wastes, 1.8%; yard waste, 0.3%; rubber and textiles, 0.14%; mixed paper, 0.12%; and cardboard and newsprint, 0.05% (CARB, 1984). While separation of organic wastes, mostly food wastes, is not feasible due to their putrescible nature, recycling of other identified materials is technically and economically feasible. Recycling of plastics and paper and composting yard wastes would appear to be effective options for limiting chlorine from those contributors to the proposed Unit 3. However, tests of separated wastes have shown that removal of these wastes via materials separation programs exerts little change in facility HCl emissions. Apparently, significant chlorine exists even in source separated waste to produce significant emissions of HCl.

The Lee County Materials Separation Plan provides curbside collection of source-separated materials including plastic containers, yardwaste, mixed paper, cardboard and newsprint, as part of the residential materials separation program. These materials are also recycled at commercial businesses and institutions. Unfortunately, the plastics which are readily recycled (i.e., polyethylene) tend to contain only trace amounts of chlorine. Typical chlorine contents for various plastic materials are polyethylene (trace), polystyrene (trace), polyurethane (2.4%), and PVC (45%) (CARB, 1984). It is likely that much of the PVC plastics are used mostly for various building materials and represent only a small fraction of plastics in the normal MSW stream. Construction/demolition waste debris is not generally accepted at the Lee County ERF and is typically disposed separately from MSW at privately owned facilities identified in the Materials Separation Plan.

While certain materials separation efforts are considered in this document because of their potential to reduce air emissions, the amount of emissions reductions cannot be quantified. For this reason, materials separation activities are discussed in this BACT analysis; however, materials separation should not be imposed as BACT. There is no evidence to demonstrate that source separation of certain components by itself provides for consistent and measurable reductions of HCl. Because it is not possible to quantify the effect of source separation, source separation does not qualify as a technology or clean fuel process.

Source Separation Impact of HF Emissions

Like other acid gases, emissions of HF are related to the quantity of fluorine in the solid waste. Other than the use of soluble fluoride, added to drinking water to prevent tooth decay, the most widely known forms (and uses) of fluorine and hydrofluoric acid (used to etch glass light bulbs), uranium hexafluoride (for the production of fissionable uranium) and chlorofluorocarbons (CFCs) (used as a refrigerant). Fluorine is also contained in teflon and other fluorinated plastics. Since CFC use as a propellant in aerosol spray cans has been severely restricted by federal law, there are no easily identifiable fluorine components in the solid waste stream. Thus, it is unlikely that any source separation strategy at this time would be effective at appreciably reducing the fluorine content of solid waste.

While certain materials separation efforts are considered in this document because of their potential to reduce air emissions, the amount of emissions reductions cannot be quantified. For this reason, materials separation activities are discussed in this BACT analysis; however, materials separation should not be imposed as BACT. There is no evidence to demonstrate that source separation of certain components by itself provides for consistent and measurable reductions of HF. Because it is not possible to quantify the effect of source separation, source separation does not qualify as a technology or clean fuel process.

4.5.3 AVAILABLE CONTROL TECHNOLOGIES

A number of control technologies specifically designed to reduce SO_2 and acid gas emissions have been tested and/or are operating on combustion sources in the U.S. and abroad. The most successful methods (i.e., those consistently achieving the highest control efficiencies) employ either a wet scrubbing system or an alkaline sorbent injection system of a dry or a semi-dry nature or a combination of these. Another control system that has been tested and/or employed in various forms utilizes a catalytic method of SO_2 control. These technologies are described in the following review of control alternatives for the proposed Unit 3.

Wet Scrubbing Systems

The promulgation of the CAA in 1970 and subsequent inclusion of NSPS for coal-fired utility boilers caused many new coal-fired utility boiler projects to include flue gas desulfurization (FGD) units, typically wet scrubbers, in the plant designs. The typical "first generation" wet scrubber was a wet lime or limestone spray tower which normally achieved SO_2 removal efficiencies in the 70 - 90% range. Scrubber designs included packed towers or medium high pressure drop venturi scrubbers, and many were designed for particulate removal in the same vessel. A number of design and operating problems have been associated with these "first generation" designs such as:

- Corrosion caused by improper materials selection and design;
- Equipment failure caused by improper equipment selection or design;
- Scaling and plugging caused by improper operation and control and by improper equipment design or control system design;
- Scrubber waste processing and disposal problems caused by improper equipment design, mostly related to the cementing properties and poor dewatering characteristics of calcium sulfite sludges.

As these "first generation" problems were identified, they were corrected by retrofit and improved new system designs.

The various operating problems were encountered because often the scrubber was designed for both particulate and acid gas removal. Wet scrubbing for acid gases differs markedly from wet scrubbing for particulate matter in several ways: (1) emphasis is on gas/liquid contact and not impingement of particles, (2) chemical additives to the scrubber liquid require careful attention to the system chemistry and accelerate the potential for corrosion and fouling of scrubber internals, and (3) the volume of waste is substantially increased. As a result, significantly more attention is paid to process conditions and effluent/exhaust chemical composition with wet scrubbing for gases (USEPA, 1987d).

Many types of wet scrubbers are used for removing acid gases including spray towers, centrifugal scrubbers and low pressure drop venturi scrubbers. Scrubbers with internals, such as packed-beds and trays, are typically not incorporated with waste combustion due to the potential for plugging and corrosion (USEPA, 1987d).

Currently, wet scrubbers are operating on numerous sources in the U.S., predominantly high sulfur fuel (coal and oil) fired power plants, municipal sludge combustors, and hazardous waste combustors. Wet, calcium-based FGD systems have been the preferred acid gas control option for large utility power plants. However, wet scrubbers have not gained popularity in the U.S. waste-to-energy industry. Municipal waste combustion plants in the U.S. have predominantly utilized dry or semi-dry FGD systems in combination with a FF baghouse to minimize water use and for enhanced fine particulate control. USEPA, in evaluating data and conducting analyses in support of the established MWC emission guidelines, NSPS and maximum achievable control technology (MACT) gave little consideration to wet scrubbers as a viable acid gas control option for MWCs (USEPA, 1989b).

The bulk of recent wet scrubber experience with municipal waste combustion systems and thus, municipal waste combustion flue gas cleaning systems, comes primarily from Europe. Modern flue gas cleaning systems reflect a better quality of design based upon the experience gained from the first scrubber installations. Some specific examples of earlier designs and the modifications made include:

- The use of packed bed designs in earlier systems (e.g., turbulent contact absorbers) in lieu of the preferred open spray tower.
- Earlier designs incorporated the use of venturi scrubbers for removal of particulate, HCl and SO_2 in the same unit. The preferred method is to remove particulate separately, thus avoiding the high pressure drop of the venturi and the problems associated with scaling and mud formation. This is accomplished by placing the scrubber downstream of a particulate collection device such as an ESP.
- Location of induced draft fans downstream of wet scrubbers where the flue gas is at saturation, and thus more corrosive, was also modified in later designs (Jordan, 1987).

The original TA LUFT Legislation promulgated in West Germany in 1974 prompted the installation of wet scrubbers on a number of refuse burning facilities in West Germany. The original wet scrubber systems installed at the Kiel and Krefeld facilities were tested and reviewed to gain performance data for these systems.

The Kiel plant was the first refuse burning facility in West Germany to have used ESPs in combination with a single stage wet scrubber. The facility is equipped with two VKW furnaces and can burn up to 240 metric tons per day (265 tpd) of sewage sludge and refuse. Flue gases exiting the furnaces are routed to ESPs for removal of particulate matter and then enter a single stage wet scrubber for control of HCl, hydrogen fluoride (HF) and SO_2. The wet scrubbers use calcium hydroxide, $Ca(OH)_2$, as the alkaline reagent. Air pollution tests conducted at the Kiel plant in 1976 showed HCl and HF removal efficiencies of greater than 95%. In addition, emissions of sulfur oxides (SO_2 and SO_3) were reduced by approximately 50% (CARB, 1984). The Kiel plant demonstrated high on-line reliability for continuous operation (Beaumont Environmental, Inc. (BEI), 1986).

The lower SO_2 removal efficiency relative to the higher HF and HCl removal efficiencies shown at the Kiel facility identified a problem with single-stage scrubbing utilizing a calcium based sorbent for acid gas control. The performance of wet scrubbers is dependent on many factors, and at the time, the data base was too limited on municipal waste combustion applications for detailed evaluations of the effects. Theoretically, the reaction of strong acid gases (HCl, HF) proceeds rapidly with alkaline solutions and even mildly acidic solutions. Hence, HCl and HF removal should be high (greater than 90%) in most cases, assuming proper operation. The reaction of SO_2 proceeds more slowly and over a limited pH range, the limiting factors are the rate of SO_2 absorption and, for calcium systems, the dissolution rate of solid caustic particles. Thus, SO_2 removal may vary greatly over a limited range of operation, depending on pH control, inlet SO_2 concentration, and many other factors (USEPA, 1987e). This determination of different reaction rates prompted European facilities to begin utilizing two stage wet scrubbers to separately remove first HCl and HF in the first stage and SO_2 in the second stage.

Two stage wet scrubbing also provided for better recycled products from generated wastes. Control of HCl in the combustor flue gas with a single-stage scrubber results in a significant portion of calcium chloride ($CaCl_2$) in waste scrubber solids as well as a buildup of chlorides in the scrubber liquor such that waste handling and liquor recycle are more difficult. Solids were also more difficult to settle and dewater with $CaCl_2$, making generation of a useful waste material such as gypsum ($CaSO_4$) impractical. Utilization of a two-stage scrubber allows removal of HF and HCl, typically with water, in the first stage with the second stage, or main absorber, utilizing reagent scrubbing for SO_2 control. This arrangement has demonstrated better control of all acid gases while providing the potential for more saleable by-product wastes (USEPA, 1987e).

The Krefeld plant, built soon after the Kiel plant, is designed to burn up to 1600 metric tpd of sewage sludge and refuse. Similar in design to the Kiel facility, the Krefeld plant at that time utilized ESPs and wet scrubbers for emissions control. However, the Krefeld plant incorporated two-stage wet scrubbers. Each stage uses a different alkaline reagent in the scrubber solution. The first stage uses calcium hydroxide to reduce emissions of gaseous HCl and HF. Emissions of sulfur oxides are reduced in the second stage through use of either a sodium or calcium based reagent (CARB, 1984). Results from tests conducted on the Krefeld facility showed an optimum 99+% HCl removal, 97+% HF removal and 96+% SO_2 reduction when firing refuse only (BEI, 1986).

Wet scrubbers have demonstrated potential for high efficiency SO_2 and acid gas control. However, it has been shown that wet scrubbers alone are only moderately effective in controlling heavy metals and organic emissions. In order to get effective metal and organic emissions control, additional reagent injection and subsequent particulate collection are employed. Generally, ESP's are used in conjunction with wet scrubbers for added particulate removal. Typically, some flue gas re-heating is necessary to reduce acid condensation within downstream equipment and to increase plume rise. FFs are not typically used with wet scrubbers due to the detrimental effect of saturated moisture on the filter bags (Davis, W.T., 2000).

Regarding the ability of wet scrubbers to remove additional pollutants, several test programs at municipal waste combustion facilities with wet scrubbers have focused on variations in dioxin/furan toxicity at different points in the process. The results indicated that although there may be a reduction in the mass rate of organics, the overall toxicity of the emission increases. This phenomenon is theorized as being attributable to stripping of chloride ions from high PCDD/PCDF isomers such as octa and hepta to the higher toxicity isomers, tetra and penta PCDD/PCDF (Franklin Associates, 1991).

Wet scrubbers are generally not effective in controlling submicron aerosol mists which would include SAM or volatilized mercury vapor. The fate of captured mercury is unknown regarding the continuous recycling of wet scrubber reagent and the disposal of sludge with captured mercury in the liquid phase. Most recent European facilities that employ wet scrubbers also include a reagent injection system for mercury control (Franklin Associates, 1991).

With introduction of very stringent emissions limitations in Germany, Austria and the Netherlands in the early 1990's, high efficiency multi-stage flue gas cleaning processes were designed and applied to new MWCs or retrofitted to existing MWCs. These typically comprised selective separation stages for each individual pollutant. The captured pollutants and their resultant waste streams were converted to recyclable products, for example, SO_2 to $CaSO_4$ or gypsum. In addition, it became desirable to control well below regulatory requirements to "near zero" emissions. This application of multiple control steps was often done without consideration for cost or the impact on energy production/plant efficiency. In some cases in the mid-1990's, plants were built with five to seven individual cleaning steps in the attempt to produce saleable products from the waste stream. Companies in the environmental control industry found that this approach was not transferable to many other countries due to differences in waste management practices and economics. Furthermore, it became evident that revenue generated from recycled products did not justify the added investment of separate control stages (Schüttenhelm, et al., 2000).

In Germany as well as other countries, a trend to simpler, integrated flue gas cleaning processes has been observed in the last three to four years. This trend has been prompted by more general acceptance of MWCs as well as a ban on landfilling MSW, coupled with a considerable change in the overall economic climate. Development of more thermally efficient MWC systems that include less expensive, and hence, more cost effective control technologies has been the result. Thus, new plants are featuring integrated flue gas cleaning processes producing mixed wastes for disposal, rather than individual separation processes producing recyclable wastes (Schüttenhelm, et al., 2000).

Semi-Dry Sorbent Systems (SDA)

SDA scrubber systems effectively control SO_2 and other acid gases and have been applied to the majority of resource recovery facilities in the U.S. in the last 10 years. In addition, SDA's have been the technology of choice for retrofit to existing municipal waste combustors to meet the emission guidelines acid gas removal requirements.

Spray drying is designed to control acid gases, but also provides control of organics and volatile metal emissions from municipal waste combustion facilities. In the spray drying process, lime slurry is injected into the spray dryer chamber typically through either a rotary atomizer or two-fluid nozzles. Rotary atomizers use centrifugal energy to atomize the slurry. The slurry is fed to the center of a rapidly rotating disk or wheel where it flows outward to the edge of the disk. The slurry is atomized as it leaves the surface of the rapidly rotating disk. Two-fluid nozzles use kinetic energy to atomize the slurry. High velocity air is injected into a stream of slurry, breaking the slurry into droplets, which are ejected at near sonic velocities into the spray drying chamber. Both of these atomization methods have been used in spray dryers on municipal waste combustion facilities. Spray dryers with two-fluid nozzles are typically larger in height than diameter while those with rotary atomizers have a larger diameter than height. Slurry droplets of comparable size can be obtained with both two-fluid nozzles and rotary atomizers, minimizing differences in performance due to atomizer type.

The atomized slurry droplets contact the hot flue gas in the SDA chamber. The water in the lime slurry evaporates to cool the flue gas, and the lime reacts with the acid gases in the flue gas to form calcium salts. The SDA chamber is designed to provide sufficient contact and residence time to produce a dry product leaving the SDA chamber. The residence time in the chamber is typically 10 to 15 seconds. The particulate exiting the SDA contains fly ash plus calcium salts, water, and unreacted lime. The simultaneous evaporation and reaction in the spray drying process increases the moisture and particulate content of the flue gas.

Key design and operating parameters that can significantly affect SDA performance are SDA outlet temperature, lime-to-acid stoichiometric ratio, and slurry droplet size. The SDA outlet temperature is controlled by the amount of water in the slurry. More effective acid gas removal occurs at lower temperatures, but the temperature must be kept high enough to ensure the slurry and reaction products are adequately dried prior to collection in the particulate control device and that the flue gas temperature stays above the acid dew point. Therefore, a minimum SDA outlet temperature of approximately 240°F (116C) or higher is typically required to control agglomeration of PM and sorbent by calcium chloride and to guarantee that wet material is not collected by the particulate control device (Davis, W.T., 2000).

The stoichiometric ratio is defined as the molar ratio of calcium in the lime slurry fed to the SDA to the theoretical amount of calcium required to completely react with the HCl and SO_2 in the flue gas at the inlet to the SDA. At a ratio of 1.0, the moles of calcium are equal to the moles of incoming HCl and SO_2. However, because of mass transfer limitations, incomplete mixing, differing rates of reaction (SO_2 reacts more slowly than HCl), and the presence of other acid gases that react with calcium (e.g., HF, sulfur trioxide), the amount of lime fed to the spray dryer is generally more than the theoretical amount. Although not usually measured during a compliance test, droplet size would be expected to affect SDA performance. Smaller droplet size increases the surface area for reaction between lime and acid gases and increases the rate of water evaporation.

The FF is generally preferred over the electrostatic precipitation (ESP) in combination with SDA because of its inherent high efficiency and especially because of its greater secondary reaction capability. This secondary reaction capability relates to the creation of a porous filter cake on the FF bags which contains both spent and unspent reagent. This filter cake is credited with controlling pressure drops, dampening surges or pollutant spikes, providing a site for increased reagent utilization, and increasing equipment reliability (BEI, 1986).

A performance summary of SDA/FF on several facilities (USEPA, 1989a and USEPA, 1995d) presented the following results which support the use of a SDA/FF as a means of controlling several pollutants in addition to MWC acid gases:

- Acid gases - Factors affecting acid gas removal by SDA/FF systems include stoichiometric ratio, SDA outlet temperature (FF inlet), and inlet SO_2

concentration to the SDA. A stoichiometric ratio in excess of three is generally necessary to obtain consistently high acid gas removal efficiencies of 90% SO_2 and 98% HCl. Suppliers have claimed that SDA/FF systems are capable of achieving 90+% SO_2 and 95+% HCl removal efficiencies. (Eight years of data from the existing Lee County facilities have demonstrated the ability to consistently achieve this performance level).

- Particulate Matter - Analysis of particulate matter emissions from the facilities averaged less than 0.01 gr/dscf at 12% CO_2.
- Metals - Based on measured removal efficiencies of metals by SDA/FF systems; arsenic, cadmium, chromium, and lead can be removed at 99% efficiency. Nickel removal is generally high (98%), but varies. The level of Mercury removal by SDA/FF systems is uncertain, given test data showing removal efficiencies ranging from zero to 95%.
- Dioxins and Furans - SDA/FF systems operating at FF inlet temperatures of 325°F (163C) or less can consistently achieve average outlet dioxin and furan concentrations of between 1 and 30 ng/dscm at 7% O_2.

In developing and promulgating the MWC NSPS, the USEPA concluded that SDA/FF systems are the best demonstrated control technology for reducing MWC facility emissions of acid gases, particulate matter and metals, and providing additional control of MWC facility organic emissions. This conclusion is based on operating data from a number of operating modern MWC facilities (USEPA, 1989b and USEPA, 1995d).

Dry Injection Systems

In dry SO_2 removal processes, the dry sorbent powder reacts with SO_2 and is removed in the particulate collector. Three general approaches are available or have been tested for bringing the dry sorbent into contact with the SO_2: 1) furnace sorbent injection, 2) economizer injection of calcium hydroxide sorbent, and 3) post furnace injection of dry sorbent into combustion products. These three approaches correspond to the three temperature windows that are available for SO_2 removal by a dry sorbent: furnace injection at temperatures around 1100-1250C (2012-2282°F) using a variety of calcium-based sorbents; economizer inlet injection between 450 and 550C (840-1020°F) using hydrates; and duct injection into the gas passage leading to the particulate collector, either at temperatures approaching within 5-15C (5-27°F) of adiabatic saturation for hydrates or at 130-180C (234-324°F) for sodium sorbents (Muzio, et al., 1987).

Furnace sorbent injection is a technique for controlling acid gas emissions which has been applied to conventional municipal waste combustion facilities. Lime (CaO), hydrated lime [$Ca(OH)_2$], or limestone ($CaCO_3$) is injected into the furnace section of the MWC. If limestone is used, sufficient temperature must be available for calcination of $CaCO_3$ to CaO and CO_2. Limestone is rapidly calcined to lime in the furnace at temperatures of 1400-2000°F (760-1093C). The lime, in turn, reacts with SO_2 and HCl to form calcium sulfate ($CaSO_4$) and calcium chloride ($CaCl_2$), which can be removed by the particulate control device. In conventional municipal waste combustion facilities, sorbent can be injected into the furnace using existing overfire air jets or through separate ports located above the fuel bed.

Furnace injection provides for effective SO_2 removal because lime and SO_2 readily react at typical furnace temperatures of 1600-2200°F (871-1204C). Furnace sorbent injection also provides extended contact time between lime and acid gases, as they are in contact in the flue gas starting in the combustor, through the heat recovery sections, and ending in the particulate control device. Control efficiencies have been estimated to range up to 50% or more for SO_2 and up to 90% for HCl (USEPA, 1989a). However, HCl and lime reportedly do not react at temperatures above 1400°F (760C). Potential disadvantages of furnace sorbent injection include fouling and erosion of convective heat transfer surfaces by the injected sorbent (USEPA 1989a).

A temperature window around 550C (1022°F) exists that yields sulfur capture rates similar to furnace injection with commercial hydrates and significantly better performance with specially prepared sorbents. This reactivity peak, found under the Electric Power Research Institute (EPRI) sorbent research program, is at a temperature frequently located near the economizer inlet. Injection at these moderate temperatures may not only result in higher sorbent utilizations but also facilitate injection due to the smaller cross-section (denser, higher velocity gas) and ability to insert lances or injection grids. The process, however, is effective only with hydrates. At these temperatures, SO_2 appears to react very rapidly and directly with calcium hydroxide, according to the following formula:

$$Ca(OH)_2 + SO_2 \rightarrow CaSO_3 + H_2O$$

The formation of sulfite, however, has to compete with the reaction between the abundant CO_2 and $Ca(OH)_2$ to form $CaCO_3$. Below 550C (1022°F), both sulfite and carbonate occur, but sulfite formation dominates. Above 550C (1022°F), dehydration of the $Ca(OH)_2$ accelerates, with carbonation and dehydration occurring at the expense of sulfite formation. Since sulfite formation is very fast and the window is approximately 100C (212°F) wide, the process is compatible with the high quench rates through economizers (Muzio, et al., 1987).

Economizer injection of sorbent appears useful for SO_2 removal, especially in retrofit situations. Study in this area is ongoing, and as yet, this control method has not been proposed or demonstrated on modern municipal waste combustion facilities in the U.S. Furthermore, interaction of the hydrates with trace contaminants in MSW combustion flue gas has not been fully evaluated. Due to a lack of available operational data, this experimental control option cannot be fully evaluated at this point. Therefore, this method is not considered further in this application.

Duct sorbent injection (DSI) is designed to control acid gas emissions by injecting powdered sorbent, usually hydrated lime [$Ca(OH)_2$], into the flue gas upstream of the particulate control device. The sorbent is generally injected through a venturi or into a reactor vessel just upstream of the particulate control device. The residence time prior to the particulate control device is generally one to two seconds. The sorbent reacts rapidly with the acid gases to form salts which, in addition to the fly ash and unreacted sorbent, are removed by the ESP or FF. Lower system operating temperatures increase sorbent reactivity and increase removal of acid gases as well as condensable metals and organics. At the injection point, the flue gas temperature can range from less than 300°F to roughly 600°F (149-316C). Flue gas can be conditioned (cooled) upstream of the injection point by heat exchange, such as by an economizer or air-to-air exchanger, humidification, or addition of lower temperature air (USEPA, 1989a).

Higher removal efficiencies have been observed when the flue gas is conditioned and humidified (Muzio, et al., 1987). Generally, spray drying of sorbent is more effective at removing SO_2 and acid gases than dry sorbent injection, with increasing acid gas control as the outlet gas temperature decreases toward the saturation temperature (USEPA, 1988b). Dry sorbent injection without flue gas conditioning does not appear to significantly add to the control of metals emissions more than the control supplied by the particulate control device.

Greater acid gas control can be achieved by combining the DSI system with an FF rather than an ESP. Collected particulate builds up on the FF bags forming a filter cake. The presence of unreacted sorbent in the filter cake provides additional acid gas removal. FFs may also provide additional control of metals through control of fine particulate (USEPA, 1989a).

An analysis of performance of DSI/FFs at several facilities, including Dutchess County, New York; Claremont, New Hampshire; Quebec City, Canada; and Wurzburg, West Germany, gave the following results (USEPA, 1989a):

- Acid Gases - analysis of acid gas data shows that the FF inlet temperature significantly affects SO_2 and HCl removal efficiency (i.e., removal efficiency across the DSI/FF systems increase as temperature decreases for the data sets involved). Up to 90% SO_2 and 95% HCl removal efficiency has been demonstrated with an FF inlet temperature of 250°F (121C) and increased stoichiometric ratio of lime to acid gas. The ability to achieve these removal levels consistently has not yet been documented.
- Particulate Matter - Outlet PM concentrations averaged 0.01 gr/dscf or lower at the tested DSI/FF systems.
- Metals - Removal efficiency for metals was available for only one facility. Removal efficiencies were estimated for other facilities based on measured outlet concentrations. Removal efficiencies for lead (Pb), cadmium (Cd), and arsenic were estimated to average 99% or better. Estimates of removal efficiencies for chromium (Cr) and nickel (Ni) ranged from 94-99%. Removal efficiencies for Hg ranged from zero control to 99% control and appeared tied to the FF inlet temperature (USEPA, 1989a).
- Dioxins and Furans - Removal of dioxins and furans also appeared dependent on the FF inlet temperature, showing decreased emissions with temperature

decrease. At less than 300°F (149C), emissions were below 7.7 ng/dscm at 7% O_2 (USEPA, 1989a).

Innovative Acid Gas Control Processes

The DeSONOx process is a flue gas purification process during which nitrogen oxides (NOx) and SO_2 are simultaneously extracted. The essential feature of this process is the combination of catalysts for the selective reduction of nitrogen oxide by ammonia (NH_3) with oxidizing catalysts for the conversion of SO_2 to sulfur trioxide (SO_3). The derived SO_3 is extracted as usable, concentrated sulfuric acid.

The DeSONOx process was pilot tested on the Münster heating and power plant in Germany. Preliminary results from initial testing of the system showed up to 85% SO_2 removal (Brand, et al., 1989). Corresponding HF and HCl removal efficiencies were not reported.

It appears that this technology is now marketed by Mg Engineering - Lurgi and is employed as a specialty technology for low SO_2 concentration flue gas streams. This technology does not appear to be offered for large scale facilities. No information could be found indicating application of this technology to a large-scale waste-to-energy project. Emerichem, LLC (formerly Goalline Environmental Technologies), markets the SCONOX® and SCOSOX® pollution control technologies. SCONOX® is a catalytic control method for nitrogen oxides and SCOSOX® is a catalytic control method for SO_2. SCOSOX® has not been applied to a large scale municipal waste combustion facility for SO_2 control and currently is not being marketed in this application. Furthermore, a representative of Emerichem, LLC stated that the company would decline from offering to provide a SCOSOX® system in this application due to the potential for catalyst fouling and deactivation from trace contaminants in the municipal waste combustion flue gas (Hober, M, 2002a).

Therefore, at present, it appears that these technologies must still be considered as experimental technologies and are yet undemonstrated for application to large-scale, municipal waste combustion facilities. In addition, test results have not shown acid gas control efficiencies as high as either the SDA or wet scrubber systems. Also, the systems do not appear to offer the secondary pollutant control of HCl, HF, trace metals, etc. that the SDA/FF offers. Hence, these innovative technologies will not be further considered for application to Unit 3.

4.5.4 RANKING OF ALTERNATIVE CONTROL TECHNOLOGIES

Several systems for controlling SO_2 and acid gas compounds in combustor flue gases have been reviewed. The overall ranking of systems would conclude that wet scrubbing and semi-dry (SDA) sorbent injection systems would rank the highest of the available systems with respect to SO_2 and acid gas removal efficiency. In general, it is expected that a modern wet scrubbing system would provide slightly better SO_2 and acid gas control than the SDA. Table 4-1 presents these approximate expected control efficiencies.

Based on the above analyses of control technologies available for controlling SO_2 and acid gases, two alternatives: wet scrubbers and semi-dry scrubbers will be further evaluated on the basis of energy, economics and environmental impacts. The applicant is proposing the use of an SDA system which will be considered the base case.

4.5.5 ENVIRONMENTAL IMPACT

Despite advancements in scrubber technology, some environmental impacts are unavoidable as a result of the use of wet scrubbers. Wet scrubbers consume more makeup water (by an approximate factor of three) than a SDA system. The wet scrubber also produces an acidic, high-chloride wastewater requiring treatment. Alternative treatments for the wastewater include:

- The use of cooling tower blowdown for prescrubber makeup
- Percolation of wastewater through a limestone bed
- Evaporation ponds
- Deep well injection
- Solids dewatering and disposal to a landfill

More sophisticated (and more costly) wastewater treatment alternatives would include reverse osmosis, electrodialysis, and flash evaporation/crystallization. If organics removal is required, carbon filters, UV-ozonation, or other organic treatment methods may be considered. Because the prescrubber (cooling tower) blowdown contains dilute hydrochloric acid, there may be uses for this by-product after filtration (e.g., demineralizer regeneration). Waste solids from the SDA/FF typically do not require additional treatment or processing because potential secondary uses are limited. This material is typically used for stabilization of material to be landfilled or it is directly landfilled.

Another indirect environmental impact associated with wet scrubbers is the additional pollutant burden produced by flue gas reheat above the saturation temperature if done with gas burners. Effective wet scrubbing of flue gases requires reducing flue gas temperatures to below the saturation temperature. Excessive water carryover in the flue gas can damage or destroy the particulate control device. This problem is avoided with the SDA/FF in that the flue gas temperature is maintained above saturation. Also, while slightly higher acid gas removal efficiencies are expected with the wet scrubber, significant data exists for the removal ability of SDA/FF systems. Eight years of data from the existing LCERF Units 1 and 2 show SDA/FF systems provide high efficiency acid gas removal and comparable, if not better, secondary removal of other pollutants such as trace metals and trace organics than would be expected from a wet scrubber.

TABLE 4-1
CONTROL EFFICIENCIES OF SULFUR DIOXIDE AND ACID GAS CONTROL TECHNOLOGIES[a]

Pollution Control System	Achievable Removal Efficiencies	
	SO_2	Acid Gas (HCl and HF)
Wet Scrubber	90-95 %	95-99 %
Spray Dry Absorber	85-95 %	95-99 %
Dry Injection Systems	50-90 %	90-95 %

Note: SO_2 = Sulfur Dioxide
HCl = Hydrogen Chloride
<u>HF = Hydrogen Fluoride</u>

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[a] Source: Air Pollution Engineering Manual (Davis, W.T., 2000)

Positive environmental impacts are observed relative to MSW produced for disposal. Wet scrubbing systems produce less scrubber solid waste than that produced by an SDA/FF by an approximate ratio of 2/3. If treated, some of the wet scrubber waste solids may be saleable as by-product (e.g., gypsum); however, this potential usage is speculative at best because of the presence of other trace contaminants from the municipal solid waste. Thus, in this case, solids from either a wet scrubber or SDA/FF would most likely be disposed in a landfill.

4.5.6 ECONOMIC IMPACT

USEPA, in preparation for development of the MWC emission guidelines and NSPS published approximate capital and operating costs for a SDA/FF system in the "Municipal Waste Combustion Study", (USEPA, 1987e). USEPA failed to develop similar costs for wet scrubber systems, due to limited application of wet scrubbers to MWCs. Comparative wet scrubber capital costs are developed from supplier quotes supplied during preparation of the BACT review for the proposed Mercer County (New Jersey) Resource Recovery Facility application. These capital costs were scaled to the Unit 3 facility using the "sixth-tenths" rule and escalated to 2001 dollars. The availability of recent wet scrubber cost data from installations on MWCs is limited. Most recent European facilities, as noted previously, are opting for integrated, multi-pollutant control systems such as SDA/FFs.

When considering specific capital costs of the systems for comparative purposes, it was determined to utilize combined costs for the scrubber and particulate removal device as neither the SDA nor the wet scrubber are as effective without added particulate removal equipment. Therefore, costs were developed for SDA/FF and wet scrubber/ESP cases. The ESP would most likely precede the wet scrubber, which significantly enhances wet scrubber acid gas removal ability while reducing the potential for plugging from collected particulate. The FF would follow the SDA to collect dry particulate matter formed in the SDA. It is expected that both systems will provide better than 95% control for HCl, HF and other acid gases. Therefore, cost comparisons will be based on removal of the more difficult pollutant, SO_2, with the SDA/FF at 80% SO_2 removal (1151 tons/year) and the wet scrubber at 90% SO_2 removal (1295 tons/year). Estimated cost removal values are:

SDA/FF	\$1,750-\$2,000 / ton SO_2 removed
Wet Scrubber/ESP	\$3,500-\$4,300 / ton SO_2 removed

These costs did not include waste treatment and disposal, integration of the systems with existing Units 1 and 2 and additional problems with water use and disposal, all of which are expected to be significantly costlier for the wet scrubber/ESP than the SDA/FF.

In general, and with all costs considered, the wet scrubber/ESP option is significantly more costly than the SDA~~SPA~~/FF option, given the small increase (if any) in SO_2 and acid gas control assumed from a wet scrubber as opposed to the SDA/FF. This should also be considered relative to the demonstrated performance of the SDA/FFs currently operating on Units 1 and 2 at the LCERF. Emissions data from 1994-2001 have demonstrated removal efficiencies for SO_2 typically in excess of 90% and removal efficiencies for HCl and HF typically in excess of 95%.

When considering the incremental cost of applying a wet scrubber/ESP over a SDA/FF for assumed increased SO_2 control (additional removal of 144 tons of SO_2), the cost per ton of SO_2 removed increases to the approximate range of $31,000.00 to $38,500.00. This assumes the SDA/FF achieves 80% SO_2 control and wet scrubber/ESP achieves 90% control. As discussed above, actual performance of the SDA/FF has demonstrated higher removal efficiencies that would significantly increase this incremental cost.

Thus, the increase in cost of applying a wet scrubber/ESP system would appear excessive for a technology that offers potential for only a marginal increase in SO_2 control, at best. Furthermore, wet scrubber/ESP systems have not demonstrated the ability for multi-pollutant removal on MWCs that SDA/FFs have.

The SDA/FF system proposed for Unit 3 will be designed and is guaranteed by the supplier to comply with a HCl emission limit of 25 ppmdv at 7% O_2 or 95% control, whichever is least stringent, a HF emission limit of 3.5 ppmdv at 7% O_2, a SO_2 emission limit of 29 ppmdv at 7% O_2 or 80% control, whichever is least stringent and a SAM emission limit of approximately 10~~16.68~~ ppmdv at 7% O_2.

4.5.7 ENERGY IMPACT

Wet scrubber systems are generally more energy intensive than SDA scrubbers systems, which translates to higher energy costs. This higher energy requirement results mainly from the slurry re-circulation pumps, the flue gas reheat system, and the scrubber wastewater treatment systems. After treatment in a wet scrubber, flue gases are typically reheated above saturation to avoid fogging, icing or condensation in the downstream equipment or stack. After treatment in a SDA/FF, flue gases typically are not reheated as temperatures are maintained above saturation. SDA/FF systems also do not require separate wastewater treatment systems or scrubber waste solids treatment and de-watering as wet scrubber systems do. Other significant energy consuming components (e.g., fans, ESPs, rotary atomizers) and additives of wet scrubbers are minor and can be safely assumed to be equivalent to corresponding components in an SDA system.

Differential energy costs were not quantified for this review. Therefore, from an electrical energy standpoint, the wet scrubber systems can be considered more energy intensive than SDA/FF system. With respect to reheat energy, the SDA/FF systems do not utilize flue gas reheat and are thus more energy conservative than wet scrubber systems. These reheat costs alone can be substantial due to continuously fluctuating fuel costs.

4.5.8 SELECTION OF BACT

The preceding analysis identified wet scrubbers and semi-dry SDA scrubbers as the two "top" acid gas control technologies as providing the highest removal efficiencies relative to other technologies. Based on a review of energy, economic and environmental impacts, wet scrubbers are rejected as BACT for the Unit 3 facility. It is generally recognized that wet scrubbers may achieve slightly lower emissions of acid gases than SDA systems; however, their effectiveness in controlling trace metals and trace organic emissions as well as SDA systems is questionable. Test results have shown that wet scrubbers and SDA systems provide comparable reductions in emissions of HCl and HF and nearly equivalent reductions in SO_2 emissions (USEPA, 1988b and USEPA, 1989a). This is also confirmed in available test data from Units 1 and 2 at the LCERF. Whether wet scrubbers provide enhanced control of trace metals and trace organics is inconclusive due to the lack of data showing this relationship. The negative aspects of wet scrubbers with respect to SDA systems include:

- Potential higher ambient impacts due to lower plume buoyancy dispersion factor
- Increased requirement of makeup water over SDA systems
- Production of wastewater effluent requiring treatment prior to discharge
- Higher capital and operating costs associated with wet scrubbers
- Increased energy utilization
- Increased secondary pollutant generation
- It is a relatively undemonstrated control technology for modern municipal waste combustion facilities in the U.S.

Also, extensive test data is available demonstrating the effectiveness of SDA/FF systems for SO_2 and acid gas emissions as well as secondary pollutant (trace organics and trace metals) control. Thus, based on an analysis of energy, economic, and environmental factors and considering the negative aspects of wet scrubbers in comparison to SDA systems, BACT for the control of SO_2 and acid gases at the proposed Unit 3 is determined to be the SDA/FF option.

Additionally, in developing the NSPS for municipal waste combustion facilities, USEPA stated that the best demonstrated technology for reducing emissions of acid gases from large MWCs (i.e., greater than 250 tpd) is a SDA followed by a FF (USEPA, 1989b and USEPA, 1995d). The system proposed for Unit 3 is a SDA system, which is a post furnace injection technology followed by a FF baghouse. The SDA system introduces a finely atomized lime-based slurry into the flue gas stream causing turbulent reaction with SO_2 and acid gases as the slurry evaporates and dries, resulting in a dry product collected in the particulate control device. The SDA system will be designed to achieve SO_2 control levels of 29 ppmdv or 80% removal of uncontrolled emissions (geometric mean 24-hour block average), whichever is least stringent. The emission rates for SO_2 and acid gases are given in Section 3.

4.6 BACT REVIEW FOR NITROGEN OXIDES EMISSIONS

NOx emissions are formed by two mechanisms during the combustion process. The first mechanism is the formation of NOx by high temperature oxidation of atmospheric nitrogen, which is called thermal NOx. The second mechanism is the formation of NOx by the oxidation of fuel-bound nitrogen, also known as fuel NOx. The combination of higher temperature combustion required in municipal solid waste combustion units to destroy organics and air toxics precursors (which tends to increase thermal NOx generation and subsequent emission) and concern about the role of emitted NOx in the formation of ozone and acid rain has caused increased attention on NOx control.

4.6.1 FORMATION MECHANISMS

Nitrogen-based compounds are products of all conventional combustion processes. Nitric oxide (NO) is the predominant form of NOx produced in MWCs along with lesser amounts of nitrogen dioxide (NO_2). However, once emitted, it is assured that NO converts to NO_2 in the atmosphere. The generation of NOx from MSW combustion is primarily the result of the conversion of fuel-bound nitrogen (fuel NOx), although some nitrogen in the combustion air (thermal NOx) may also be converted to NO in the higher temperature regions (Davis, W.T., 2000). Fuel NOx is formed when MSW containing nitrogen and its compounds is burned, and the nitrogen is oxidized in the process. Thermal NOx formation is a result of the relatively high concentration of nitrogen in the ambient air combustion supply (ambient air contains approximately 79% nitrogen by volume). The introduction of ambient air (excess air) to the combustion zone, which is often at high enough temperatures to oxidize the nitrogen in the ambient air, results in thermal NOx formation.

Thus, because of the abundance of available nitrogen present in combustion makeup air, thermal NOx formation is primarily a function of temperature and excess air (oxygen availability). Fuel NOx formation is strongly affected by the local oxygen concentration present in the flame and also by the mixing rate of fuel (MSW) and combustion air. Like thermal NOx, formation of fuel NOx is dominated by the local combustion conditions (specifically how and at what temperature combustion air and MSW are mixed).

4.6.2 SOURCE SEPARATION IMPACT ON NITROGEN OXIDES EMISSIONS

Removing the materials that are relatively high in nitrogen content is one possible way of lowering the mass emission rate of NOx. However, as noted by CARB (1984), the percent reduction in NOx emissions from such efforts is probably not significant. Based on CARB's compilation of available data, nitrogen typically comprises less than 1% (by weight) of the total waste stream (CARB, 1984).

The major nitrogen contributors and their approximate relative percent by weight for typical MSW composition are textiles (5.5%), food wastes (10.4%), yard wastes (15.4%), and, to a lesser degree, plastics (7.5%). The nitrogen content of these respective materials is estimated by CARB as 2.2%, 2.8%, 2.9%, and 1.0%. (CARB, 1984) The largest reduction in fuel nitrogen contents can thus be realized by separation of food wastes and yard wastes. Due to the putrescible nature of food waste, source separation is not a viable option for this material.

The Lee County Materials Separation Plan provides for both residential and commercial recycling of yard and horticultural wastes. Of the remaining solid waste constituents which significantly contribute to the MSW fuel nitrogen content, residential recycling of PET, HDPE, and other plastic consumer products containers is also provided by the Materials Separation Plan. No separation of textiles is planned at this time. Paper products, while containing less than 0.3% by weight of nitrogen, constitute a significant portion of any municipal solid waste stream. Curbside collection of residentially separated corrugated cardboard, kraft paper bags, telephone books, magazines, newspapers and mixed papers is provided by the Materials Separation Plan. Separation and collection of these materials by commercial businesses and institutions is done on a voluntary basis.

While certain materials separation efforts are considered in this document because of their potential to reduce air emissions, the amount of emissions reductions cannot be quantified. For this reason, materials separation activities are discussed in this BACT analysis; however, materials separation should not be imposed as BACT. There is no evidence to demonstrate that source separation of certain components by itself provides for consistent and measurable reductions of NOx. Because it is not possible to quantify the effect of source separation, source separation does not qualify as a technology or clean fuel process.

4.6.3 AVAILABLE CONTROL TECHNOLOGIES

Emissions of NOx can potentially be reduced at municipal waste combustion facilities by two methods: 1) minimizing the quantity of NOx generated during combustion (combustion modification), and 2) reducing the quantity of NOx in the flue gas stream (flue gas controls).

Table 4-2 is a summary based on available data of the NOx control techniques that could potentially be used at municipal solid waste combustion facilities. The information in Table 4-2 also includes the status and the control efficiency of the three major NOx reduction methods. Combustion modifications typically include staged combustion and low excess air (LEA). Other combustion modifications tested on MWCs with mixed or inconclusive results are gas reburning and flue gas recirculation (FGR). Flue gas controls include selective catalytic reduction (SCR), selective non-catalytic reduction (SNCR), wet flue gas denitrification (FGD_n), electron beam treatment (E-Beam) and innovative methods such as SCONOX®. Of these techniques, only combustion modifications, reburning with natural gas, SNCR, and SCR have been successfully demonstrated on municipal solid waste combustion facilities or show significant potential for effective NOx control (USEPA, 1989c). Thus, detailed descriptions of NOx controls will be limited to these technologies.

Combustion Modifications

Techniques available for NOx control that fall within the combustion modification category include LEA, staged combustion, FGR and gas reburning. These technologies achieve NOx emission reductions from MSW combustors by limiting the amount of thermal and fuel NOx formed in the combustion process.

Low Excess Air (LEA) and Staged Combustion

LEA and staged combustion can be used separately or together. With LEA, less air is supplied to the combustor than normal, lowering the supply of oxygen available in the flame zone to react with nitrogen in the combustion air. With staged combustion, the amount of underfire (primary) air is reduced, generating a starved-air region. By creating a starved-air zone, strong reducing atmosphere is generated where part of the fuel-bound nitrogen is converted to ammonia (NH_3). Secondary air to complete combustion is added as overfire air. With proper control of overfire air, NH_3, NOx, and O_2 react to form N_2 and water.

LEA and staged combustion together reduce NOx emission due to a combination of several factors. First, a lack of available oxygen for NOx formation in the fuel rich combustion stage results in off-stoichiometric firing. Second, the flame temperature is generally lower in the first stage than would be expected with single stage combustion at stoichiometric conditions. Third, the peak temperature in the second stage (air rich) is lower. By creating a slow combustion air and fuel (MSW) mixing process, a greater opportunity to convert fuel bound nitrogen to molecular nitrogen occurs rather than allowing it to be converted to NOx. LEA and staged combustion have been demonstrated to be an effective technique for reducing NOx emissions in the design of modern MWCs, and is inherent in the design of the Martin combustion system.

It should be noted that the lower NOx emissions can be partly attributable to a lower quantity of thermal and fuel NOx resulting from lower flue gas temperatures. These conditions are known to lower NOx emissions, but they can also be related to higher CO emissions and lower combustion efficiency. Should the technique be improperly applied, higher emissions of CO, hydrocarbons (HC), and other products of incomplete combustion (PIC) may result.

The formation of thermal NOx is minimized in the Martin combustor by controlling the flame temperatures below 2,400°F (1316C). The distribution of the combustion air is controlled with the Martin reverse reciprocating grate firing system and master combustion control system such that the available oxygen in the primary combustion zone is maintained at desired levels.

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TABLE 4-2
ALTERNATIVE CONTROL METHODS FOR NITROGEN OXIDES

Control Method	**Control Efficiency**	**Status**
Source Separation	Not Quantifiable	Effect on MWC emissions are not quantifiable.
Combustion Modification		
Good Combustion Practices (GCP), including Low Excess Air (LEA) and Staged Combustion	30-60%	Effective but unknown side effects on combustion process and combustion related pollutants
Flue Gas Recirculation	10-25%	Somewhat effective, but the relatively moist flue gas from after the baghouse in combination with GCP may lead to increased emissions of CO and boiler problems.
Gas Reburning	Unknown	Not yet applied to MWCs in the U.S.
Flue Gas Controls		
Selective Catalytic Reduction (SCR)	50-90%[a]	Has not been applied to MWCs in the U.S.
Selective Non-Catalytic Reduction (SNCR)	35-60%	Has been applied to MWCs in the U.S.
Wet Flue Gas Denitrification (FGD_n)	Unknown	Has not been applied to MWCs in the U.S.
Electron-Beam (E-Beam)	Unknown	Has not been applied to MWCs in the U.S.

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[a] Only limited short-term data is available.

The formation of thermal NOx is minimized in the Martin combustor by controlling the flame temperatures below 2,400°F (1316C). The distribution of the combustion air is controlled with the Martin reverse reciprocating grate firing system and master combustion control system such that the available oxygen in the primary combustion zone is maintained at desired levels.

Approximately 60-70% of the combustion air is introduced in the primary combustion zone, below the grates. The remainder of the combustion air is provided by overfire air ports located above the grate to ensure complete oxidation of combustibles. The fuel-rich regions of the primary flame zone cool by radiation before the combustion process is completed with the remaining combustion air. Peak flame temperatures are reduced, thus reducing thermal NOx formation, and fuel-rich combustion regions minimize oxidation of the fuel-bound nitrogen. The lengthening of the flame path via the use of overfire air also has the favorable effect of maintaining low temperatures and thus controlling thermal NOx formation (USEPA, 1989c).

Flue Gas Recirculation (FGR)

In FGR, cooled flue gas (i.e., after the spray dryer baghouse) is mixed with combustion air, thereby reducing the oxygen content of the combustion air supply. The flame temperature is lowered and less oxygen is present in the flame zone, reducing thermal NOx generation. At the Long Beach, CA, mass burn combustor, where FGR was used to supply 10% of the underfire air, reductions in NOx emissions were observed, although available quantitative results are limited. However, due to operational problems, the FGR system at Long Beach has been removed. At the Kita facility in Tokyo, Japan, a Volund mass burn/refractory combustor, where FGR is used to supply 20% of the combustion air, NOx reductions of 10-25% were reported (CARB, 1984). Little increase in NOx reduction was observed with FGR supplying rates in excess of 20% of the combustion air.

FGR for NOx control may increase emissions of other pollutants. Should the technique be improperly applied, higher emissions of CO, HC, and other products of incomplete combustion (PICs) may result. For example, if the excess air is decreased too much, visible emissions and higher CO concentrations may result. If too much flue gas is recirculated, the flame zone can become unstable, causing poor combustion and higher CO emissions (USEPA, 1989c). Also, corrosion and slagging in the boiler may occur. Thus, given the potential problems FGR can introduce, most modern MWCs do not incorporate FGR. Moreover, FGR has not been used in combination with other technologies, such as SNCR in the U.S. MWCs.

Gas Reburning

Gas reburning is a NOx control technique that overlaps combustion modification techniques. LEA is provided in the combustor, with recirculated flue gas introduced above the grate. Natural gas is added to this LEA zone to generate a fuel-rich zone. Air is supplied above the fuel-rich zone to complete combustion. This process is designed to reduce NOx formation without increasing CO emissions.

The goal of gas reburning is to achieve up to 75% NOx reduction when combined with LEA, staged combustion and FGR. To date, most of the available data for gas reburning are for applications on pulverized coal-fired boilers. Initial testing for municipal waste incinerators was conducted on a six tpd pilot-scale combustor. In the pilot-scale unit, NOx emissions without gas reburning ranged from 190 to 260 ppm at 7% O_2. With gas reburning, the NOx emissions were 110-125 ppm at 7% O_2, an average reduction of 50%. The maximum NOx reduction measured was 60-70%. During these tests, 15% (heat input basis) natural gas, 15% FGR (for mixing the natural gas), and 30-40% secondary excess air were used. Neither CO nor hydrocarbon emissions increased with gas reburning (Abbasi, et al., 1989).

Additional tests with natural gas reburning were conducted at the Olmsted County (Minnesota) municipal waste combustion facility by a joint program with the Gas Research Institute (Abbasi, et al., 1991). The test data showed that the natural gas injection of 12% to 15% (heat input basis) and FGR of 6% to 8% resulted in NOx reduction of 60% and CO reduction of 50%. Natural gas reburning also allowed a reduction of excess air from 80% to 40% which provided increased boiler efficiency. The test data also indicated that optimization of residence time in the combustor is important for simultaneous reduction of NOx and CO. However, long-term operational data on natural gas reburning in MWCs is not available.

In general, natural gas reburning has not been utilized as a NOx control technique in new MWCs primarily due to increased fuel costs and operational costs relative to less expensive, yet equally effective, NOx reduction techniques. Natural gas reburning has primarily been applied to fossil fuel boilers as a retrofit NOx control technique or for seasonal NOx reductions, where needed.

Flue Gas Controls

Flue gas controls can generally be placed into one of two categories: SCR and SNCR. Three additional technologies, flue gas denitrification (FGD_n), the electron-beam (E-Beam) process, and other catalytic methods such as SCONOX® have been tested or applied for NOx control on industrial facilities and are discussed below. The following discussion explains the technological aspects of each of these control methods and their associated environmental, energy and economic impacts.

Selective Catalytic Reduction (SCR)

SCR is an add-on control technology for NOx removal. Ammonia (NH_3) is injected into the flue gas downstream of the boiler where it is mixed with the NOx contained in the flue gas and passed through a catalyst bed. In the catalyst bed, NOx is reduced to N_2 by reaction with NH_3. The overall reactions between NOx and NH_3 are:

$$4NO + 4NH_3 + O_2 \rightarrow 4N_2 + 6H_2O$$
$$2NO_2 + 4NH_3 + O_2 \rightarrow 3N_2 + 6H_2O$$

The reactions between NOx and NH_3 occur at temperatures of 375-750°F (191-399C), depending on the specific catalyst and the type and level of competing contaminants in the flue gas.

SCR has been tested and applied at coal, oil, and natural gas-fired facilities in the U.S. Reductions of NOx emissions have ranged from 50-90% and have been measured at these facilities with varying NH_3 to NOx molar ratios and varying operational temperatures. Currently there are no applications of SCR on municipal waste combustion facilities in the U.S. Therefore, no data exists regarding costing, achieved control efficiencies and longevity of systems applied to municipal waste combustors in this country. However, SCR systems have been applied and are operating on municipal waste combustion facilities in Europe and the Far East, and most recently in Canada.

Lee County attempted to obtain information from foreign facilities regarding continuous operation of the SCR units and their long-term emission reduction capabilities. An intensive search for information was initiated, with requests for information submitted to a number of catalyst manufacturers, catalyst system suppliers, individual facilities and government agencies. The focus of the information request was to obtain a list of MWCs employing SCR as well as obtain information on system operation relative to the following four questions:

- Operational history of the SCR units (installation date, life of unit, catalyst life expectancy, problems with unit, catalyst poisoning problems, etc.),
- Specific capital, installation, operating, and miscellaneous costs of SCR on waste incinerators,
- Maximum/minimum/average flue gas concentrations for 1-hour, 3-hours, 24-hours, and annual time periods for nitrogen oxides, sulfur dioxide, volatile organic compounds, and carbon monoxide; and
- Estimated system upset or downtime from SCR malfunction.

It was considered necessary to have this information in order to perform proper feasibility analyses as required by USEPA. A copy of the contact list of this data search is provided in Attachment C to this document. The only information received from this data search was single performance test data for several European facilities and SCR system suppliers as well as one Japanese SCR system supplier with most of the test data collected at startup of the unit. Mitsubishi Heavy Industries, Ltd. (MHI) provided a letter to Covanta Projects, Inc. that included initial performance test data from two facilities collected in 1987. More recent data or a description of system performance since 1987 was not provided. No responses were received that adequately addressed the four questions noted above. This limited data set shows achievable NOx reductions ranging from 62.5% to 85% during specific tests with no indication of system ability to continuously achieve high reductions in the long-term.

Early testing of SCR on refuse-fired boilers in Japan revealed difficulties, primarily due to catalyst fouling by particulates and condensable. In applications where the catalyst was upstream of the particulate removal device, the relatively high particulate grain and/or condensable loading of the flue gas fouled the catalyst, rendering the bed ineffective in NO_2 removal. Particulates eroded the catalyst and substrate material, and poisoned or blinded the catalyst (ENSR, 1991).

According to USEPA, earlier SCR problems such as catalyst poisoning by SO_2, plugging, ammonium bisulfate deposition, production of SO_3 and erosion of the catalyst had generally been overcome on other types of combustion units (ENSR, 1991). However, in scenarios where conventional SCR catalysts (which use a base metal with titanium oxide) were placed at the economizer outlet (to take advantage of the optimum temperature range of 530°F-800°F [277-427 C]), attack of catalyst by hydrochloric acid (HCl) was a persistent problem. Research efforts continue on developing high temperature catalysts resistant to HCl attack, metals poisoning, and high particulate loadings. MHI, which has supplied the catalyst for several Japanese facilities, considers placement of a SCR catalyst upstream of the particulate removal device in municipal solid waste combustion applications as not practical because of potential fouling. Even though MHI indicated that catalysts are available with wider pitches to handle higher particulate loadings, MHI suspects that particulate fouling would still occur (ENSR, 1991). This fouling has been confirmed with additional testing. Attempts to place SCR catalyst as a "hot-side" unit before pollution control in MWCs has continued to show rapid de-activation of the catalyst. In a discussion with a representative of Babcock-Borsig Power, the primary problem that caused catalyst de-activation was lead and other trace metals in the flue gases (Licata, T., 2001). European facilities have overcome this catalyst de-activation by placing the SCR system downstream of pollution control equipment.

Acid gas attack, metals poisoning and particulate fouling may be avoided by placing the catalyst downstream of the pollution control equipment, allowing the SCR unit to treat flue gases free of these contaminants. This is undesirable, however, for two reasons: (1) conventional catalysts do not perform well at the lower temperatures required for effective removal of acid gas and organic constituents and (2) flue gas reheat would be needed to raise the flue gas temperatures to the optimum range, the latter imposing severe energy penalties, while adding additional pollutant emissions to the flue gas. In order to reduce flue gas reheat, catalyst manufacturers have been developing low temperature SCR catalysts. However, the ability of the catalyst to operate at low temperatures is often dependent on the quantity of competing contaminants in the flue gas (Hober, M., 2001a).

Table 4-3 provides a sample list of European municipal waste combustion facilities utilizing SCR. Additional facility listings are provided in Attachment D. As can be seen, the SCR units have often been placed at the end of relatively complex, multi-stage air pollution control trains. As stated previously, many of these facilities were constructed, and the air pollution control equipment installed, with little consideration to cost and thermal efficiency of the plant. The result of this has been a shift in European design of new facilities with fewer control stages (Schüttenhelm, et al., 2000).

Table 4-4 provides NOx outlet emissions information received from a number of European facilities. The data provided consisted only of outlet emissions data. As shown, control efficiencies were not reported as well as averaging times and emissions compliance testing procedures. Although relatively low outlet NOx emissions are reported, it is difficult to determine the true applicability of these levels relative to the requirement to guarantee a continuous emission level tied to a short-term averaging period as required of U.S. MWCs. This problem was highlighted by USEPA during the development of the NSPS for MWCs in that the agency did not utilize European MWC data in the establishment of NOx emission limits (59 FR 48198-48228). The reason for this is that substantial error can be introduced in comparing data collected utilizing test methods and procedures different than those required by U.S. regulatory agencies. Thus, the emissions data presented in Table 4-4 must be viewed as indicators, for these do not provide reasonable assurance of long-term, consistently achievable emission levels that are directly comparative to the U.S. facilities due to differences in test methods.

The most recent identified application of a SCR system applied to a MWC is a system installed at a modified MWC in the Peel region of Ontario, Canada. The KMS Peel facility utilizes five Consumat® two-stage MWC units, each rated at 100 tons per day. The facility experienced design and initial construction problems but commenced operation in the fall of 2001. SCR was chosen as the preferred NOx control technology because it was determined that application of SNCR was technically infeasible with the Consumat® combustors due to their wide temperature variations (Heath, S., 2002). The NOx standard established for the facility is 110 ppmdv at 11% O_2 (154 ppmdv when corrected to 7% O_2) averaged over 24 hours. Three days of preliminary testing of NOx emissions from facility continuous emissions monitors (CEMs) showed 24-hour average values of 90.0, 100 and 95.4 ppmdv at 11% O_2 (127.6, 140.4 and 134 ppmdv at 7% O_2 respectively). With projected inlet NOx concentrations of 270 ppmdv at 11% O_2 (380 ppmdv at 7% O_2), the calculated NOx control efficiency across the SCR unit ranged from 63-66% for this data set. The proposed Unit 3 NOx emission limit is 180 ppmdv at 7% O_2 averaged over a 24-hour period for the first full-year of operation and 150 ppmdv at 7% O_2 averaged over a 24-hour period thereafter, based on application of SNCR. Thus, the Peel facility has a higher allowable NOx emission limit with SCR than the proposed Unit 3 NOx limit with SNCR.

Selective Non-Catalytic Reduction (SNCR)

SNCR involves the intimate contact of injected ammonia (NH_3), urea [$CO(NH_2)_2$] and/or other nitrogen-bearing compounds and NO in the flue gas to control NOx emissions by reducing NOx to N_2 without the use of catalysts. These techniques have been most commonly applied utilizing the injection of anhydrous or aqueous ammonia. A urea injection technique which has been further developed by Fuel-Tech. Inc. (formerly Nalco Fuel-Tech) of Stamford, Connecticut has also been applied to control combustion NOx emissions. To date, both ammonia and urea processes have been demonstrated on municipal waste combustion facilities in the U.S. As a result, discussion of SNCR techniques focuses on ammonia injection and urea injection, as these are the most widely utilized technologies.

TABLE 4-3
SAMPLE LIST OF EUROPEAN MUNICIPAL WASTE COMBUSTION FACILITIES UTILIZING SCR AND THEIR AIR POLLUTION CONTROL EQUIPMENT CONFIGURATION[a][b]

Municipal Waste Combustion Facility Name	Location	Air Pollution Control Equipment Configuration
AVR Rotterdam	Rotterdam City, The Netherlands	ESP, Two Scrubbers, Fixed Carbon Filter, SCR
SITA ReEnergy	Roosendaal, The Netherlands	ESP, Gas Suspension Absorber (lime injection), ACI, FF, SCR
COMMUNAUTE URBAINE DE LILLE	Lille, France	SDA With Rotary Atomizer, FF, Wet Scrubber, SCR
U.V.E. SMEDAR (SICDOM)	Rouen, France	ESP, SDA With Rotary Atomizer, FF, SCR
RMHKW Boblingen	Boblingen, Germany	FF, 2-Stage HCl Scrubber, 1-Stage SO_2 Scrubber, ACR, SCR
MVA Koln	Koln, Germany	Spray Dryer, FF, 1-Stage Prescrubber, 1-Stage SO_2 Scrubber, SCR, ACR
AEZ Kreis Wesel	Wesel, Germany	Spray Dryer, ESP, 1-Stage Prescrubber, 1-Stage SO_2 Scrubber, SCR, ACR
GML	Ludwigshafen, Germany	SDA With Diffusers, ESP, WS, SCR
AVI TWENTE b.v.	Twente, The Netherlands	ESP, SDA With Rotary Atomizer, ESP, WS, Filsorption, SCR

Note: ESP = Electrostatic Precipitator, SCR = Selective Catalytic Reduction
ACI = Activated Carbon Injection, ACR= Activated Carbon Reactor
FF = Fabric Filter Baghouse, SDA = Spray Dry Absorber
WS = Wet Scrubber

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[a] Sources: Fleck, E., 2001; Heath, S., 2001c; Heath, S., 2001e; Licata, T., 2001

[b] See Attachment D of this PSD application for a more complete listing of Municipal Waste Combustion Facilities

TABLE 4-4
EUROPEAN MUNICIPAL WASTE COMBUSTION FACILITY EMISSIONS INFORMATION RECEIVED DURING THE BACT PREPARATION PROCESS[a]

Municipal Waste Combustion Facility (Location)	NOx Emissions (ppmdv)[b]	Averaging Time of Reported Emissions	Testing Procedures Information
AVR (Rotterdam, The Netherlands)	37	24-hour Avg.[c]	Not Specified
SITA ReEnergy (Formerly Heeren) (Roosendaal, The Netherlands)[d]	26-31	Three 1-hour tests	Not Specified
SITA ReEnergy (Roosendaal, The Netherlands)[e]	39, 35, 42[f]	Not Specified	Not Specified
German Municipal Waste Combustion Facilities	19-37	Not Specified	Not Specified
MHKW (Kassel, Germany)	52	Not Specified	Not Specified
Gavi Wijster (The Netherlands)	52	Not Specified	Not Specified
Renova (Gothenburg, Sweden)	45-52	Not Specified	Not Specified
IVAGO (Ghent, Belgium)	37	Not Specified	Not Specified
(Hagen, Germany)	90	Not Specified	Not Specified
NV Huisvuilcentrale N-H (Alkmaar, The Netherlands)	41	Not Specified	Not Specified

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[a] Sources: CRI Catalyst Co. UK, Ltd., 1997; Hartenstein, H. and A. Licata, 1996; Heath, S., 2001a; Heath, S., 2001b; Heath, S., 2001c; Heath, S., 2001d; Heath, S., 2001e; Hober, M., 2001a.

[b] Reported NOx emissions are corrected to 7% O_2 at 20C and 1 Atmosphere.

[c] Average based on reported 1-hour average values over a two-week period.

[d] Reference: CRI Catalyst Co. UK Ltd., 1997.

[e] Reference: Heath, S., 2001c.

[f] First value from year 1998, second value from year 1999, third value from year 2000 (No other information provided).

With the ammonia injection process, either aqueous or anhydrous ammonia is injected into the upper furnace area of the combustor. Ammonia and NO react according to the following competing reactions:

$$4NO + 4NH_3 + O_2 \rightarrow 4N_2 + 6H_2O$$
$$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$$

At 1600-1800°F (871-982C), the first reaction dominates and NO is reduced to N_2. Above 2000°F (1093C), the second reaction dominates and NH_3 is oxidized to NO. Below 1600°F (871C) both reactions proceed slowly and NH_3 remains unreacted. NOx reductions varying from 35-60% can be expected for municipal solid waste combustion facilities.

Furnace temperatures in the upper furnace can vary rapidly due to the variability in combustion characteristics of municipal solid waste. The sensitivity of ammonia-based SNCR reactions to temperature as well as the difficulty in handling and storing anhydrous ammonia (a hazardous substance) are two of the primary reasons behind development of the urea-based process. The only difference between these reagents is the physical form of the reagent. Anhydrous ammonia requires vaporizers to maintain the desired gaseous phase and pressure. Aqueous ammonia is stored in a liquid form with an approximate 20-29 weight percent of ammonia and the remainder being water. Storage and usage of aqueous ammonia instead of anhydrous ammonia has been adopted at numerous facilities to reduce the regulatory burden related to anhydrous ammonia.

Ammonia based SNCR has been applied to numerous municipal waste combustion facilities in the U.S. Significant operational data exists demonstrating the effectiveness of SNCR in reducing NOx emissions from MWCs. The existing LCERF Units 1 and 2 utilize ammonia based SNCR and have consistently achieved permitted NOx emission levels throughout the operational history of the units.

The composition of the gas stream also determines the effectiveness of the SNCR process. Not only are the NOx levels important, but the levels of CO and O_2 (at NH_3 injection points) also affect the process chemistry. High levels of O_2, above 6 percent, generally aid in NOx reduction. The presence of CO above approximately 100 ppm adversely effects SNCR chemistry. The presence of CO in the combustion gases causes a shift and reduction in the effective NOx/NH_3 temperature reaction range (USEPA, 1989c).

Ammonia emissions may result when the NH_3 is injected outside the desired temperature window at a higher than normal rate. Ammonium chloride can sometimes form due to flue gas chemistry and/or atmospheric conditions. However, there are no known absolute relationships for this process. At the Stanislaus County and Long Beach, CA facilities, a detached ammonium chloride plume has been observed downwind of the stack at times when SNCR is used. (ENSR, 1991) Continued application and experience with SNCR has helped to reduce the frequency of visible plumes.

Corrosion of the boiler tubes by corrosive ammonia salts which are formed from unreacted ammonia and SO_2 or HCl has been hypothesized to be a potential problem with SNCR. However, boiler corrosion problems attributable to ammonia salts have not been identified as a major problem at facilities utilizing SNCR.

The NOxOUT Process, a urea based SNCR process developed under EPRI sponsorship, is licensed by Fuel-Tech, Inc. of Stamford, Connecticut. It is similar to the ammonia based SNCR process except that urea is utilized as the reagent which disassociates to ammonia in the higher temperature regions of the MWC, and reacts with NOx producing nitrogen, carbon dioxide and water vapor. The reaction equation is:

$$CO(NH_2)_2 + 2NO + \tfrac{1}{2}O_2 \rightarrow 2N_2 + 2H_2O + CO_2$$

Urea is stored typically as a 50% by weight aqueous solution. From storage, the urea is further diluted with water to a desired concentration and mixed in the flue gas at the desired urea-to-NOx ratio. For MWCs, this concentration usually is about 4-10% urea at the injectors.

The operating range of the NOxOUT process is 1600-2000°F (871-1093C), similar if not the same as the ammonia based SNCR process. However, Fuel-Tech has tested compounds that can be added to the urea to expand the useful temperature range of the process.

At present, Fuel-Tech sells the additive chemicals to urea suppliers. These suppliers dissolve the urea in water, add the specialty chemicals and sell/haul the blend to the end-user. Many facilities purchase urea directly from chemical suppliers without Fuel-Tech proprietary additives.

The Fuel-Tech NOxOUT process has been installed and demonstrated on a number of utility and industrial boilers in North America and Europe, as well as several MWCs. The NOx reductions achieved at U.S. facilities have ranged similarly to the ammonia based SNCR process. The NOxOUT process has also been used in full-scale European municipal waste combustion facilities at Frankfurt, Germany, and Switzerland (CDM, 1991).

Lee County is proposing to install SNCR utilizing direct injection of aqueous ammonia at the Unit 3 combustor to meet an outlet emission level of 180 ppmdv corrected to 7% O_2 averaged over a 24-hour period for the first year and 150 ppmdv corrected to 7% O_2 averaged over a 24-hour basis thereafter.

Wet Flue Gas Denitrification (FGD_n)

FGD_n systems may be divided into at least four major process systems: 1) oxidation-absorption-reduction, 2) oxidation-absorption, 3) absorption-reduction, 4) absorption-oxidation. Of these four types, oxidation-absorption-reduction is somewhat more advanced because it is a derivative of already established FGD systems. It is based on the principle that after the NOx is converted from the relatively insoluble NO form to the more soluble NO_2 form, it can be reduced to N_2 by consuming some of the SO_2 already assimilated by the process. Conversion from NO to NO_2 is accomplished by spraying an oxidant such as ozone into the flue gas stream ahead of the wet scrubbers. It is also possible to add oxidizing agents to the SO_2 absorbent circulating with the scrubber fluid. In this case, both NOx and SO_2 can be stripped simultaneously from the flue gases (BEI, 1986).

An FGD system modified in this manner can also accommodate changes in inlet flue gas conditions without much of a loss in removal efficiency. An advantage of this type of system is that high removal efficiencies can potentially be achieved at the same time for both NOx and SO_2 removal. On the negative side, wet scrubbers have a liquid effluent which must be treated. In addition, the high cost of waste treatment and oxidation chemicals consumption are also cited as disadvantages.

A wet scrubber system utilizing oxidation-absorption is characterized by the addition of an oxidizer, such as sodium chlorite ($NaClO_2$) to the flue gas to oxidize NO to NO_2, which is then removed by a sodium-based wet scrubber. This is normally accomplished in a two-stage system with the addition of $NaClO_2$ to an upstream venturi (HCl) scrubber. The addition of $NaClO_2$ adjusts the pH to 3-4 which oxidizes some NO to NO_2. The NO_2 is then removed in the first scrubber as well as in the following second scrubber along with SO_2 (USEPA, 1988b).

Another approach used to deal with the limited reactivity of flue gas NO and its poor absorption in typical wet scrubber operations is absorption/reduction. This method of NO removal was applied a municipal solid waste combustion in Bremerhaven, West Germany, 1987. In this system, ferrous ions (Fe^{2+}) tie up NO in the liquid phase by the formation of ethylene diamine tetraacetic acid (EDTA) complexes. These complexes, in turn, react with HSO_3^- and SO_3^{2-} ions (from SO_2 absorption) leaving N_2 and sulfate (SO_4^{2-}) as reaction products (USEPA, 1988b). This system has not been applied to another facility in Europe as it was found that operation of the systems and chemical usage were cost-prohibitive relative to lesser expensive, more effective technologies.

Absorption-oxidation processes are not as developed as the other previously described wet NOx control systems. Results from pilot-scale facilities indicate high NOx removal efficiencies are achievable, but suggest that the system faces undesirable operational problems (CARB, 1984).

Supplier information was researched from several corporations specializing in pollution control technology with specific experience with wet FGD_n systems. Tri-Mer Corporation attests to having approximately 50 installations currently operating throughout the U.S. The Tri-Mer TRI-NOx technology is proprietary but appears to be a type of absorption-reduction system with oxidation steps, if necessary. Tri-Mer's technology has not been applied to flue gas from a municipal solid waste combustion facility. Tri-Mer Corporation has specialized in controlling emissions from the chemical and metal finishing industries and normally designs systems to handle flue gas flow rates of between 20 and 20,000 scfm. These flow rates are at best an order of magnitude lower than the flue gas flow rate of Unit 3. Also, the industrial flue gases described normally contains substantially higher concentrations of NOx than is found in the flue gas of municipal waste combustion facilities.

Wet FGD_n, though not technically infeasible, cannot be considered BACT for NOx emissions for the proposed LCERF Unit 3 MWC. A summary of the reasons for this is as follows:

- The technology has not yet been demonstrated on modern municipal solid waste combustion facilities in the U.S.
- Wet FGD_n systems produce a liquid effluent that is difficult and expensive to treat.
- Other trace contaminants in the flue gases of MWCs may inhibit the NOx reduction reactions taking place in the scrubber.
- A reasonable estimate of the cost to install and operate such a system is presently unattainable as these systems are typically applied to lower flow rate, higher NOx concentrated flue gases. Based on systems installed for different source categories, the costs appear prohibitively high.
- Wet FGD_n systems produce additional environmental impacts by producing a liquid effluent that is in itself a pollutant, and by secondary pollutant production if combustion is needed for flue gas reheat.

Electron Beam

Another innovative technology for NOx control, which has been demonstrated in other applications and which has potential for success in NOx control from refuse-burning, is the Electron Beam (E-Beam) process. The E-Beam reacts NH_3 or lime, with NOx and SO_2 in the presence of a high-intensity E-Beam, emitted across the flue gas by an electron gun. The E-Beam provides the necessary activation energy for the NOx reaction which takes place in a steel vessel with a concrete shell for radiation shielding. The higher flue gas temperatures, as required for typical SCR and Thermal DeNOx applications, are not required for this process.

The E-Beam may be fired upstream or downstream of the FF, though an additional NOx removal reactor such as a wet scrubber (followed by flue gas reheat) would be required for the downstream applications. Upstream applications proceed as follows: an open spray absorber, serving as a prescrubber, humidifies the flue gas and removes most of the HCl. The ammonium sulfate, chloride and nitrate by-products which are formed in the prescrubber and E-Beam reactor are removed in the FF.

Early pilot tests on a Japanese steel plant sintering unit using the E-Beam process with ammonia were sufficiently successful to encourage further development. Process demonstration units were developed and operated, but not in refuse-burning applications. Most current applications of E-Beam technology are for control of VOCs and other organics in low-flow flue gas situations.

The E-Beam process, though tested on combustion facilities, has not been tested or demonstrated on modern MWC units. A search of potential providers of E-Beam systems did not identify manufacturers marketing systems for NOx removal on large-scale MWCs. Thus, no cost or operational data could be obtained. It is expected that costs for this system would be substantially higher than other proven NOx control technologies in the marketplace. In addition, due to a lack of E-Beam experience and test data on large scale MWCs additional reaction species are unknown. Thus, other potentially negative environmental impacts are therefore possible.

The E-Beam process, though not technically infeasible, is an undemonstrated technology for NOx control on large scale, modern MWCs that is not expected to remove NOx as efficiently as either SCR or SNCR. This technology cannot be considered BACT and will not be evaluated further.

Innovative NOx Control Methods

Emerichem, LLC (formerly Goalline Environmental Technologies) markets the SCONOX® pollution control technology. SCONOX® is a catalytic control method for NOx that does not utilize ammonia (or urea) as a reagent. SCONOX® has been applied to clean-fuel fired combustion equipment, such as natural gas-fired boilers and turbines, and has demonstrated high NOx removal efficiencies. SCONOX® has not been tested or applied to a large-scale MWC for NOx control and is not currently marketed in this application. Furthermore, a representative of Emerichem stated that the company would decline from offering to provide SCONOX® in this application due to the potential for catalyst fouling and deactivation from trace materials in the flue gases. (Hober, M., 2002a) Hence, this innovative technology must be considered technically infeasible at this time for application to Unit 3.

4.6.4 RANKING OF ALTERNATIVE CONTROL TECHNOLOGIES

Due to technical problems and system non-availability associated with wet FGDn, the E-Beam process, and the SCONOX® process, these technologies will not be evaluated further. Relative to NOx control, the "top" control method to be evaluated is SCR with a stack emission limit of 100 ppm NOx. SNCR with a stack emission limit of 150 ppm NOx is considered the second most effective option and will be evaluated as the "base case" relative to SCR.

4.6.5 ENVIRONMENTAL IMPACT

Neither the SCR, nor SNCR systems produce liquid or solid wastes during continuous operation of the NOx reduction process. Lee County is proposing to utilize aqueous ammonia for the Unit 3 SNCR system. There is a risk associated with the release of aqueous ammonia during shipping, handling, storage, or catastrophic failure of the ammonia storage tank(s). However, use of aqueous ammonia avoids the storage issues associated with anhydrous ammonia while providing the same process capabilities. An environmental concern with any ammonia-based SNCR and SCR process is the ammonia slip produced, which may also result in visible emissions. The presence of ammonia in the flue gases allows the possibility of a visible plume when utilizing either SCR or SNCR.

Additional secondary environmental impacts are expected from the SCR system due to fossil fuel firing for flue gas reheat. Flue gas reheat will not be necessary when utilizing SNCR. The SCR technology will create catalyst waste over time that, if not capable of regeneration, will most likely need to be disposed as a hazardous waste.

4.6.6 ECONOMIC IMPACT

A determination of economic impacts of various control technology options, as previously described, involves an assessment of capital equipment costs, system installation and startup costs and annual operating costs. This is typically derived through literature data on similar applications of the technology to other categorically similar facilities. No U.S. municipal waste combustion facility currently operates with SCR for NOx control. Thus, no capital equipment cost data exists relative to SCR application to a U.S. municipal solid waste combustion facility. Efforts to obtain cost and other information from European and Asian facilities did not yield information useful in development of a capital equipment cost estimate for an economic impact analysis. Significant literature data exists regarding application of SCR to utility boilers and gas-fired turbines. However, the bulk of this information applies to "hot-side" SCR systems with relatively consistent flue gas makeup from fossil fuel combustion. Suppliers of catalysts and catalysts systems to the municipal solid waste industry informed Lee County that the only SCR systems that could be made available are "cold-side" units due to potential catalyst poisons in the flue gas from municipal solid waste combustion. Cold-side SCR units are substantially cost-disadvantageous relative to hot-side units due to the need for flue gas reheat and the fuel costs involved.

Another method of developing a capital equipment cost estimate for an economic impact analysis, in lieu of more applicable data, is to utilize standardized methods presented in the USEPA Office of Air Quality Planning and Standards (OAQPS) Air Pollution Control Costs Manual. Until only recently, this manual did not contain a costing methodology for SCR systems. The most recent (sixth) edition, published in January of 2002 (and revised in April 2002) contained a draft procedure for developing costs for a hot-side SCR system on a utility boiler. As stated on page 2-41 of the procedure "The costs for the tail-end arrangement [cold-side SCR], however, cannot be estimated from this report because they are significantly higher than the high-dust [hot-side SCR] systems due to flue gas reheating requirements." (USEPA, 2002a) As the procedure is not applicable to a cold-side tail-end SCR application, it was decided not to utilize the recent OAQPS procedure for the development of a capital cost estimate for SCR.

In order to prepare the economic impact analysis, budgetary quotes to provide a tail-end SCR system for Unit 3 were solicited from a number of SCR catalyst and catalyst system suppliers including:

- Siemens
- KWH
- Cormetech
- Mitsubishi Heavy Industries
- Babcock Borsig
- Foster Wheeler
- Mobotec
- Alstom Power
- CRI Catalyst Company
- Haldor Topsoe A/S

Four budgetary quotes were received, one each from Babcock-Borsig Power and SEGHERs and two from Haldor Topsoe A/S. Copies of these budgetary estimates, and subsequent correspondence, are contained in Attachment E. Each budgetary estimate provided a capital equipment cost. However, only Babcock-Borsig provided a budgetary installation cost. Significant disparity exists between the three budgetary estimates provided as they were not consistent relative to systems provided and guaranteed NOx reduction levels. Babcock-Borsig estimated that their costs would be within 10% of actual costs based on over 34 installations of SCR units to the municipal solid waste industry. Facility listings provided by these system suppliers were included in Attachment D.

In a personal communication with a representative of Haldor Topsoe, Inc., it was conceded that their estimate could be 25-30% low relative to actual costs. Upon request for references to the application of a Haldor Topsoe catalyst system to a municipal waste combustor, Haldor Topsoe has managed to provide one reference to a municipal solid waste combustion facility in Italy. Additional information about the facility regarding achieved outlet concentrations of NOx, operational history and installation and operational costs were not made available by Haldor Topsoe. Another facility identified as a MSW combustion facility in Spain is actually a liquid waste incinerator for a fine chemicals factory. One problem with the Haldor Topsoe provided system that was communicated by the facility in Spain is a particulate settling problem that requires shutdown and cleaning of the catalyst every 300 hours of operation. As noted, Haldor Topsoe's estimate was the least complete and contained only one reference. Haldor Topsoe is primarily a catalyst supplier that does not specialize in supplying a total control system. Further, they provided two quotes, one with outlet NOx emissions as 100 ppmdv and one at 150 ppmdv. The more stringent control option, 100 ppmdv outlet NOx, was quoted at a lower price than the 150 ppmdv outlet (see Attachment E). Therefore, a high degree of uncertainty exists relative to the accuracy of the Haldor Topsoe quote versus the other two suppliers. Consequently, we have only used the Babcock-Borsig and Seghers cost estimates in the economic impact analysis.

Table 4-5 presents a comparison of the budgetary estimates provided by the three suppliers. As can be seen, the most expensive was the Babcock-Borsig estimate and it was the most inclusive. The Babcock-Borsig estimate also included the longest catalyst life, lowest ammonia slip, and more ancillary systems and components than the other two estimates. Thus, it is expected that actual costs from each supplier would be more similar with consistency in systems and components included in the budgetary estimates.

With capital equipment budgetary estimates provided by catalyst and SCR system suppliers, estimated installation, startup and annual operating costs were derived using typical OAQPS cost estimating factors (USEPA, 2002a). To estimate economic impacts of a particular control option, the capital equipment, installation and startup costs are summed and amortized over an assumed equipment lifetime. The annual costs resulting from the amortization is summed with annual operating costs for total annual cost of the control technology. This total annual cost, when divided by the tons of pollutant (NOx) removed by the control device, defines the economic impact on a dollars per ton of NOx removed basis.

Attachment F contains several evaluations of economic impacts of a tail-end SCR system based on the three budgetary estimates. Each budgetary quote is evaluated for the following five amortization periods:

- 7% interest, 10 years
- 7% interest, 15 years
- 7% interest, 20 years
- 10% interest, 10 years
- 10% interest, 15 years

The multiple evaluations were performed due to the inconsistency of regulatory guidance regarding the proper amortization period and interest rate for perspective control options.

In the USEPA Air Pollution Control Cost Manual, it is stated that "the interest rate employed in this manual differs from that used in non-governmental financial analyses. It represents a social interest rate established by the Office of Management and Budget (OMB) for comparison to public policy issues." (USEPA, 2002a) Although, in the past, OMB has required the use of a 10% interest rate, it is stated in the recent OAQPS update that the OMB has revised this rate to seven percent (USEPA, 2002a). USEPA goes on to state that "However, the social rate of interest is probably not appropriate for industry. When choosing between alternative air pollution control devices, the industrial planner must not only take into consideration the costs of each device, they must also understand how the cost of each fits into the financial structure of their business". (USEPA, 2002a) In this case, it is assumed that USEPA identifies industry as subject to competitive pressures. This is exemplified within the OAQPS cost manual itself in that example problems presented in costing procedures for equipment typical to industry, rather than utility, employ higher interest rates and shorter amortization periods (i.e., thermal incinerators and carbon absorbers at 10 years, 7% versus fabric filters at 20 years, 7%). In the USEPA Alternative Control Techniques Document for Industrial/Commercial/ Institutional (ICI) Boilers (USEPA, 1994), USEPA amortizes NOx control costs utilizing

TABLE 4-5
COMPARISON OF COST ITEMS IN SCR BUDGETARY ESTIMATES RECEIVED DURING BACT PREPARATION

Line Item[a]	**Babcock Borsig**	**SEGHERs**	**Haldor Topsoe**
Estimated Material Costs	US$ 6,300,000	US$ 8,000,000	EUR$ 1,450,000
Ammonia Slip (ppmdv @ 7% O_2)	5	Not Specified	<10
SCR Inlet Duct	Included	Included	Not Included
SCR System Bypass Duct	Included	Not Specified	Not Included
SCR Outlet Duct	Included	Included	Not Included
Heat Exchanger	Gas to Gas	Not Specified	Gas to Gas
Bypass and Isolation Dampers	Included	Not Specified	Not Included
Flue Gas Preheater	Steam/Gas	Gas	Oil/Gas
Reactor Casing and Internals	Included	Included	Included
Catalyst (Initial Loading)	Included	Included	One Charge
Catalyst Life	24,000 Hours	2 Years	16,000 Hours
Foundation Information	Included	Not Specified	Not Included
Structural Steel (Stairs, Platforms, Ladders, etc.)	Included	Included	Not Included
Catalyst Handling System (Hoist)	Included	Not Specified	Not Included
Solid Modeling for Flue Gas Flow Analysis	Included	Not Specified	Not Included
Aqueous NH_3 Storage Systems	2 Storage Tanks	Included	Not Included
NH_3 Delivery System to Inlet	Included	Not Specified	Included
Control System	Included	Included	Included
Instruments for Reactor Control	Included	Included	Included
Operator/Maintenance Training	Included	Not Specified	Not Included
Ammonia Leak Detectors	Included	Not Specified	Not Included
Boiler to Heat Exchanger Duct	Not Included	Not Specified	Not Included
Upgrade of Existing Equipment	Not Included	Not Included	Not Included
Fire Protection Equipment	Not Included	Not Specified	Not Included
Safety Equipment	Not Included	Not Specified	Not Included
SCR Building/Enclosure	Not Included	Not Specified	Not Included
Wind Load Design for Structural Steel	Not Included	Not Specified	Not Specified
Startup, Commissioning, Testing	Included	Not Specified	Not Included

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[a] Note: Items not specified in the budgetary estimate are assumed to be not included in the price provided.

TABLE 4-5
COMPARISON OF COST ITEMS IN SCR BUDGETARY ESTIMATES RECEIVED DURING BACT PREPARATION
(CONCLUDED)

Line Item[a]	Babcock Borsig	SEGHERs	Haldor Topsoe
Estimated Construction Costs	US$ 5,675,000	Not Specified[b]	Not Specified[c]
Erection Labor and Equipment for Installation of Proposed Equipment	Included	Included	Not Included
Foundations and Civil Work	Included	Included	Not Included
Electrical Equipment (Switchgear, MCCs, Wire, etc.)	Included	Included	Not Included
Modification to Existing Structures	Not Included	Not Included	Not Included
Relocation of Overhead and Underground Utilities	Not Included	Not Specified	Not Included
Roads and Civil Betterments	Not Included	Not Specified	Not Included
System Enclosures/Buildings	Not Included	Not Included	Not Included
Hazardous Waste Material Abatement	Not Included	Not Specified	Not Included
Piping, etc.	Included	Included	Not Specified
Painting	Not Specified	Included	Not Specified
Insulation	Not Specified	Included	Not Specified

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[a] Note: Items not specified in the budgetary estimate are assumed to be not included in the price provided.

[b] SEGHERs provided a cost of US$ 8,000,000 for 'Turn Key Capital Cost for SCR'.

[c] Estimated Construction Costs are not specified in the Budgetary Estimate provided by Haldor Topsoe. In telephone conversations between Richard Newland (Haldor Topsoe) and Michael Hober and Scott Heath (RTP Environmental Associates, Inc.) (Hober, M., 2002b) construction costs are estimated at a factor of 2.5 times provided material capital costs.

a 10% interest rate over 10 years. In the USEPA document on the NSPS Subpart Da (1997a), USEPA amortizes NOx control costs for utility boilers utilizing a 7% interest rate over 20 years. One can conclude that USEPA has identified that shorter amortization periods at higher interest rates are necessary when dealing with industrial applications of air pollution control. This is reinforced in the fact that the Internal Revenue Service requires companies to recoup capital investments over eight years. Regardless of the examples provided by USEPA, it is important to note that the agency does not endorse the amortization periods and interest rates provided in example calculations in their guidance documents, especially in the case of industrial applications of pollution control. At all times it is stated that the example calculation uses an "assumed" interest rate and amortization period. USEPA recognizes that the determination of interest rate and amortization period is best left to the industrial applicant to base these cost criteria on "the financial structure of their business" (USEPA, 2002a).

Relative to Unit 3, it was considered that the suggested amortization period and interest rate in the ICI Boiler ACT Document (10% over 10 years) is more representative than that assumed relative to substantially larger utility boilers. However, to address FDEP concerns related to this issue, multiple amortization periods at various interest rates were used to provide a range of economic impacts that are expected to bind the upper and lower levels for the applicable control devices. Economic impact evaluations were developed for the two budgetary estimates. In additional evaluation was done relative to the Babcock-Borsig estimate, which provided the option to use steam for flue gas reheat instead of fossil fuel.

Thus, costs to achieve an outlet NOx emission of 100 ppmdv corrected to 7% O_2 utilizing SCR ranged from $8,388 to $15,844 per ton of NOx removed. Costs to achieve an outlet NOx emission of 150 ppmdv corrected to 7% O_2 utilizing SNCR ranged from $2,016 to $2,586 per ton of NOx removed. Thus, the incremental cost of the application of SCR for increased NOx control would be substantially higher than the costs stated above. The costs presented for application of SCR substantially exceed those typically considered acceptable for the application of a control technology under BACT guidelines.

4.6.7 ENERGY IMPACT

Increased electrical energy is expected for the SCR system over the SNCR system due to the increased fan pressure needed to overcome the pressure drop across the catalyst bed. The SCR system will require a certain amount of flue gas reheat that will utilize a substantial amount of fossil fuel. SNCR does not require flue gas reheat.

4.6.8 SELECTION OF BACT

Based on a review of environmental, economic and energy impacts, SCR is rejected as BACT for Unit 3 at the LCERF and SNCR is determined to be BACT. Lee County is proposing to install SNCR to meet an outlet NOx emission level of 180 ppmdv at 7% O_2 averaged over a 24-hour period for the first year of operation and 150 ppmdv at 7% O_2 thereafter. This is an aggressive limit and will require 'fine tuning' of the SNCR control system. As noted by USEPA (60 Federal Register 65387-65436), the process of achieving 150 ppmdv would require a sufficient time period to balance facility systems in combination with the SNCR system to provide continuous compliance.

4.7 BACT REVIEW FOR CARBON MONOXIDE

CO is formed by the incomplete combustion (oxidation) of carbon containing compounds in the MSW fuel. Elevated emissions of CO in municipal waste combustion facilities may be due to a number of conditions, including:

- Insufficient bulk oxygen levels for variations in waste composition/feed characteristics
- Insufficient combustion temperatures that result in quenching of reactions
- Poor air distribution, and/or inadequate mixing which results in localized oxygen deficient conditions
- Excessive carryover of particulate-bound organics from the furnace into lower temperature regions of the combustion system prior to completion of combustion (USEPA, 1989d and USEPA, 1995d)

Emissions of CO are controlled by minimization of the above-mentioned conditions that promote increased CO emissions. Post-combustion control such as thermal oxidizers and oxidation catalyst systems for the removal of CO in flue gas streams have been utilized with other combustion sources but, have not been employed on MWCs.

4.7.1 FORMATION MECHANISMS

CO is a product of incomplete oxidation of carbon compounds. The source of carbon compounds at MWCs can be the fuel, pyrolysis products formed near the fuel bed, compounds in the combustion air, and/or intermediate combustion products. Factors including fuel-rich conditions and low combustion temperatures cause incomplete oxidation of carbon compounds. Such factors can be produced by introducing overly wet or low BTU content fuel to the furnace, or by suppressing combustion by very high overfire air rates or providing inadequate combustion air and residence times.

The factors that are associated with elevated levels of CO can be divided into five separate components:

- Waste feed rate
- Combustion temperatures and residence time
- Amount and distribution of combustion air
- Air/fuel mixing
- Particulate Matter (PM) carryover

Waste Feed Rate

Combustion characteristics can be affected significantly by variations in waste composition or feed characteristics (e.g., moisture content, heating value, volatiles content). Excursions in waste feed rates or waste properties can deplete local oxygen levels in the furnace, allowing organics to escape complete oxidation. Alternately, combustion of low heating value fuel can lead to quenching of combustion reactions, which also allows CO to escape oxidation. Both of these conditions are accompanied by elevated concentrations of CO. Flue gas CO concentrations are continuously monitored to provide a continuous indication of proper combustion feed conditions. The appropriate design and operating procedures to minimize waste feed excursions vary according to combustor technology, and may include measures such as fuel blending by the crane operator, use of ram feeders, and use of air preheat.

Combustion Temperatures and Residence Time

The ability of a MWC to minimize CO formation is a fundamental requirement of GCP. The occurrence of spatial and temporal temperature variations during normal operating conditions necessitates that municipal waste combustion facilities be designed and operated in a manner that will ensure that all combustion products are exposed to minimum destruction temperatures for sufficient residence times. Furnace combustion gas residence time is also an important requirement to ensure minimum CO formation. Emissions of CO are limited under USEPA's definition of GCP.

Amount and Distribution of Combustion Air

The proper amount and distribution of combustion air are essential for efficient combustion. The amount of excess air introduced to the combustor must be sufficiently high to minimize the existence of fuel-rich pockets and sufficiently low to avoid quenching of combustion reactions. The range of excess air levels that will satisfy these objectives varies for each combustor technology. CO emissions typically increase when insufficient O_2 is available to complete combustion, or when excessive amounts of O_2 quench combustion reactions. High excess air levels can also cause PM carryover.

For large MWCs such as Unit 3, total combustion air is typically split between primary and secondary supplies. The amount and distribution of primary (underfire) air controls bed burning stoichiometry and waste burnout. Secondary air is used to adjust local stoichiometry to levels needed to achieve complete combustion, to control flame height, and to complete the mixing process. Failure to distribute combustion air in the correct proportions to primary and secondary supplies can result in elevated CO emissions and PM carryover.

Air/Fuel Mixing

Mixing of combustion products and air is a key requirement to ensure destruction of CO in the furnace. The most common method used to achieve good mixing in MWCs is properly designed and operated secondary (overfire) air systems. Mixing can also be effected through combustor design measures such as bull noses, baffles, turns, and changes in duct shape or cross-sectional area. Mixing failures can be accompanied by spikes or bulk increases in CO emissions.

Particulate Matter (PM) Carryover

PM carryover is defined as the amount of entrained particulate matter, which is carried out of a combustor with flue gases. The amount of PM carryover from municipal waste combustion facilities can affect the ultimate emission of other pollutants in addition to CO. Carryover of unburned carbon from the furnace into lower temperature regions of the combustion system prior to completion of combustion will result in elevated emissions levels of CO and products of incomplete combustion. Parameters affecting PM carryover include operating load, excess air levels, and primary/secondary air ratios.

4.7.2 SOURCE SEPARATION IMPACT ON CARBON MONOXIDE

The Lee County Materials Separation Plan encourages residents to separate newsprint, magazines, corrugated cardboard, kraft paper bags, and telephone books; glass bottles; aluminum cans and foil; steel cans; and plastic containers. Commercial businesses and institutions voluntarily separate recyclable materials for collection.

While certain materials separation efforts are considered in this document because of their potential to reduce air emissions, the amount of emissions reductions cannot be quantified. For this reason, materials separation activities are discussed in this BACT analysis; however, materials separation should not be imposed as BACT. There is no evidence to demonstrate that source separation of certain components by itself provides for consistent and measurable reductions of CO. Because it is not possible to quantify the effect of source separation, source separation does not qualify as a technology or clean fuel process.

4.7.3 AVAILABLE CONTROL TECHNOLOGIES

Emissions of CO can potentially be reduced at municipal waste combustion facilities by two main methods: 1) utilizing good combustion design and operation to maximize the oxidation of CO to CO_2, and 2) reducing the quantity of CO in the post-combustion flue gas stream (flue gas controls).

GCP, as established by USEPA, involves continuous compliance of three parameters: a CO emission limit, a load limit, and a temperature limit at the inlet of the particulate matter control device. The use of GCP reduces CO emissions by promoting more thorough combustion.

Tail gas control techniques for CO have most commonly consisted of oxidation catalyst systems or thermal oxidizers. The presence of an oxidation catalyst in the flue gas pathway allows the oxidation reaction converting CO to CO_2 to proceed at a lower temperature than would otherwise be needed. Oxidation catalysts for CO control have been installed on a number of combustion turbines fired with natural gas or clean gas derivatives (e.g., digester gas or refinery gas) in the U.S. and abroad. Oxidation catalysts have not been demonstrated with facilities that combust mixed fuel or MSW that can contain trace contaminants that would deactivate (poison) the catalyst.

Thermal oxidizers employed in industrial applications include recuperative oxidizers, catalytic oxidizers and regenerative thermal oxidizers.

Oxidation Catalyst Systems

Oxidation catalysts are precious or semi-precious metal catalysts that tend to be easily poisoned by contaminants such as sulfur, phosphorous, and trace metals in flue gases. Oxidation catalysts generally cannot be installed for sources burning sulfur emitting fuels. Therefore, fuel sulfur must be limited for oxidation catalyst applications to avoid catalyst poisoning problems (EPRI, 1989).

A number of catalysts manufacturers and suppliers were researched to obtain information concerning the state-of-the-art in catalytic control of CO for municipal waste combustion facilities. Several of these companies have oxidation catalyst systems currently operating on combustion sources. It was not identified that these companies have installed oxidation catalyst systems on a municipal solid waste combustion facility. The main reason for non-application of this technology to municipal waste combustion facilities was inferred as the non-homogeneous nature of MSW, and thus, the non-homogeneous nature of the flue gas. Current species of oxidation catalysts could be quickly poisoned by potential trace contaminants in a municipal waste combustion facility's flue gas and would be prohibitively expensive to continuously replace.

Therefore, application of an oxidation catalyst to a municipal waste combustion facility is considered technically infeasible at this time. Hence, tail gas control of CO emissions from Unit 3 utilizing a CO catalyst system cannot be considered as a viable option for BACT.

Thermal Oxidation

Thermal oxidation has been accomplished at industrial facilities utilizing three main types of thermal oxidizers:

- Recuperative Thermal Oxidizer (RCTO)
- Catalytic Thermal Oxidizer (CTO)
- Regenerative Thermal Oxidizer (RTO)

Thermal oxidation, regardless of type, works on the principal of raising the flue gas temperature to the oxidation temperature of CO for conversion to CO_2. Recuperative thermal oxidizers achieve oxidation temperatures typically through direct flame incineration. Hence, RCTOs are typically the costliest option relative to fuel use. Also, thermal efficiency of RCTOs is typically limited to a maximum of 70% before capital costs for heat exchange increase steeply. Thermal oxidizers incorporating catalysts utilize catalysts to lower the oxidation temperature of CO to reduce fuel costs. However, it is expected that the catalyst would experience deactivation and/or fouling from contaminants in the flue gas; thus, CTOs will not be considered further. Regenerative thermal oxidizers, like recuperative oxidizers, achieve CO control through heating flue gas to proper oxidation temperatures. However, in regenerative thermal oxidizers, the heat is contained in a series of ceramic beads that are alternately heated and re-heated to maximize heat efficiency. RTOs tend to have higher capital costs than catalytic or recuperative thermal oxidizers. However, RTOs typically have significantly lower operating costs due to the greater heat efficiency of the ceramic bed design which results in substantially lower fuel usage than catalytic or recuperative thermal oxidizers. RTOs have experienced problems with fouling of the ceramic heat exchange surface from flue gas contaminants and may require added filtration of flue gases prior to entry into the RTO.

Based on available data, catalytic oxidizers, recuperative thermal oxidizers, and RTOs have not been specified as BACT for MWCs nor were they evaluated as part of the USEPA's effort to establish the NSPS for new and existing MWCs. However, as thermal oxidation cannot be considered technically infeasible, application of a thermal oxidizer (either RCTO or RTO) will be evaluated on the basis of energy, environmental and economic feasibility.

4.7.4 RANKING OF ALTERNATIVE CONTROL TECHNOLOGIES

With oxidation catalyst systems and catalytic thermal oxidizers determined to be technically infeasible, thermal oxidation utilizing either a RCTO or RTO is assumed to provide enhanced CO control over good combustion design and operation and is ranked higher. In the case of Unit 3, the MWC will be designed to achieve very low CO emissions inherently; thus, thermal oxidation will only reduce CO emissions from the already low emissions resulting from the facility. It is assumed that 90% of emitted CO (113.25 tons) is controlled by the thermal oxidizer. This is questionable in that Lee County is proposing CO emissions of 100 ppmdv with good combustion design and operation. A 90% reduction would reduce CO emissions to levels below which current instruments could accurately monitor. Also, most thermal oxidizer manufacturers will not guarantee outlet CO emissions below 50 ppmdv.

4.7.5 ENVIRONMENTAL IMPACT

As has been previously described, implementation of good combustion design and operation will provide the lowest environmental impact for control of CO. Based on current information, no adverse environmental impacts are projected from utilization of this technology. Utilization of thermal oxidation will result in secondary pollutant production from combustion of fossil fuels to maintain flue gas temperatures at the CO oxidation temperature.

4.7.6 ECONOMIC IMPACT

No adverse economic consequences are foreseen utilizing good combustion design and operation as it is the baseline operational requirement and it will be inherent in the design of the Martin combustor. The economic impact of applying a RCTO or RTO were determined using cost estimation algorithms provided in the USEPA's EPA Air Pollution Control Cost Manual, Sixth Edition (USEPA, 2002a). At an assumed CO reduction efficiency of 90% (113.25 tons CO), estimated costs for a RCTO ranged from $21,200.00-$22,600.00 per ton of CO removed. Estimated costs for a RTO ranged from approximately $12,000.00-$13,600.00 per ton of CO removed. Actual costs would most likely exceed these monetary values.

4.7.7 ENERGY IMPACT

No adverse energy utilization consequences are foreseen in the use of good combustion design and operation as the proposed control technology for CO. Application of either a RCTO or RTO would require increased electrical energy and fan power to drive the system. In addition, substantial amounts of fossil fuel would need to be fired to maintain temperatures for the thermal oxidizer to operate properly. Annual energy impacts based on OAQPS estimates ranged from approximately $697,500.00 for the RTO to approximately $1,990,000 for the RCTO.

4.7.8 SELECTION OF BACT

Based on a review of energy, environmental and economic impacts, thermal oxidation utilizing a RCTO or RTO is rejected as BACT and good combustion design and operation is determined to be BACT for CO. The BACT for CO will be achieved through the design and control of the combustion process. CO emissions will be limited to 100 ppmdv at 7% O_2 for 4-hour block averaging periods, exclusive of start-up, shut-down, and malfunction conditions. The emission rate for CO given in Section 3 represents the BACT as per PSD regulations and FDEP requirements.

4.8 BACT REVIEW FOR MWC ORGANICS

MWC organics are defined by the USEPA in 40 CFR 60.51b as organic compounds emitted in the exhaust gases from municipal waste combustor units and includes tetra- through octa- chlorinated dibenzo-p-dioxins and dibenzofurans. MWC organics can be formed and/or emitted as a result of incomplete combustion of carbon containing compounds in MSW fuel.

Stack emissions of MWC organics are controlled by utilizing GCP and by utilization of post-combustion flue gas controls. GCP, as defined by USEPA, consists of three components: a CO emission limitation, a load limit, and a temperature limitation at the inlet of the PM control device (USEPA, 1995d). Post combustion control such as thermal oxidizers and oxidation catalyst systems for the removal of MWC organics in flue gas streams have not been employed on MWCs in the U.S.

4.8.1 FORMATION MECHANISMS

MWC organics are products of incomplete oxidation of carbon compounds. The source of carbon compounds at MWCs can be the fuel, pyrolysis products formed near the fuel bed, compounds in the combustion air, and/or intermediate combustion products. The actual formation of MWC organics in the flue gases is not well understood. USEPA has determined that three continuous compliance parameters: CO emissions, load limit, and temperature at the inlet of the PM control device, have been shown to correlate with either the formation or emission of MWC organics (USEPA, 1995d).

4.8.2 SOURCE SEPARATION IMPACT ON MWC ORGANICS

The Lee County Materials Separation Plan encourages residents to separate newsprint, magazines, corrugated cardboard, kraft paper bags, and telephone books; glass bottles; aluminum cans and foil; steel cans; and plastic containers. Commercial businesses and institutions voluntarily separate recyclable materials for collection.

While certain materials separation efforts are considered in this document because of their potential to reduce air emissions, the amount of emissions reductions cannot be quantified. For this reason, materials separation activities are discussed in this BACT analysis; however, materials separation should not be imposed as BACT. There is no evidence to demonstrate that source separation of certain components by itself provides for consistent and measurable reductions of MWC organics. Because it is not possible to quantify the effect of source separation, source separation does not qualify as a technology or clean fuel process.

4.8.3 AVAILABLE CONTROL TECHNOLOGIES

Emissions of MWC organics can potentially be reduced at municipal waste combustion facilities by two main methods: 1) GCP which utilize good combustion design and operation to maximize the oxidation of CO to CO_2, and 2) flue gas controls, which reduce the quantity of MWC organics in the post-combustion flue gas stream.

Flue gas control techniques for organic compounds have most commonly consisted of thermal oxidizers. Thermal oxidizers employed in industrial applications include recuperative oxidizers, catalytic oxidizers and regenerative thermal oxidizers.

Good Combustion Practices

Good combustion practices were developed by the USEPA to minimize both formation and emissions of dioxins/furans and other trace organics. GCP involves continuous compliance of three parameters: a CO emission limit, a load limit, and a temperature limit at the inlet of the particulate matter control device. All three of these continuous compliance parameters have been shown to correlate with either formation or emission of dioxins/furans (USEPA, 1995d). The use of GCP reduces emissions of MWC organics by promoting thorough combustion, minimization of particulate carryover and condensation of vapor phase constituents through baghouse temperature control.

Low CO level is a surrogate parameter used to indicate the operation at combustion conditions conducive to the furnace destruction of trace organics. The load limit is used to control excessive entrainment PM (PM carryover) which can lead to formation of dioxins/furans downstream of the combustor. The PM control device inlet temperature limit is to limit formation of dioxins/furans on fly ash within the PM control device by controlling formation rates. Peak formation rates occur near 300 C (570 °F) and decrease with decreasing temperatures. Below about 225 to 250 C (435-480 °F) the formation rates are negligible. The temperature limit also controls partitioning of dioxin/furan between the solid and vapor phases. At lower temperatures, dioxins/furans remain absorbed on PM and are disposed with the collected fly ash. There is no evidence that dioxins/furans absorbed on fly ash can be volatized at ambient temperatures nor leached in landfills (USEPA, 1995d).

The USEPA spent a substantial amount of resources investigating, developing and documenting GCP. USEPA's data gathering efforts were presented in a report on the combustion control of organics, *Municipal Waste Combustion Study - Combustion Control of Organic Emissions* (USEPA, 1987b and USEPA, 1995d).

Thermal Oxidation

Thermal oxidation has been accomplished at industrial facilities utilizing three main types of thermal oxidizers:

- Recuperative Thermal Oxidizer (RCTO)
- Catalytic Thermal Oxidizer (CTO)
- Regenerative Thermal Oxidizer (RTO)

Thermal oxidation, regardless of type, works on the principal of raising the flue gas temperature to the oxidation temperature of CO for conversion to CO_2. Recuperative thermal oxidizers achieve oxidation temperatures typically through direct flame incineration. Hence, RCTOs are typically the costliest option relative to fuel use. Also, thermal efficiency of RCTOs is typically limited to a maximum of 70% before capital costs for heat exchange increase steeply. Thermal oxidizers incorporating catalysts utilize catalysts to lower the oxidation temperature of organics to reduce fuel costs. However, it is expected that the catalyst would experience deactivation and/or fouling from contaminants in the flue gas; thus, CTOs will not be considered further. Regenerative thermal oxidizers, like recuperative oxidizers, achieve organics control through heating flue gas to proper oxidation temperatures. However, in regenerative thermal oxidizers, the heat is contained in a series of ceramic beads that are alternately heated and re-heated to maximize heat efficiency. RTOs tend to have higher capital costs than catalytic or recuperative thermal oxidizers. However, RTOs typically have significantly lower operating costs due to the greater heat efficiency of the ceramic bed design which results in substantially lower fuel usage than catalytic or recuperative thermal oxidizers. RTOs have experienced problems with fouling of the ceramic heat exchange surface from flue gas contaminants and may require added filtration of flue gases prior to entry into the RTO.

Based on available data, catalytic oxidizers, recuperative thermal oxidizers, and RTOs have not been specified as BACT for MWCs nor were they evaluated as part of the USEPA's effort to establish the NSPS for new and existing MWCs. However, as thermal oxidation cannot be considered technically infeasible, application of a thermal oxidizer (either RCTO or RTO) will be evaluated on the basis of energy, environmental and economic feasibility.

4.8.4 RANKING OF ALTERNATIVE CONTROL TECHNOLOGIES

Oxidation catalyst systems and catalytic thermal oxidizers are determined to be technically infeasible based on analysis presented in Section 4.7. Thermal oxidation utilizing either a RCTO or RTO is assumed to provide enhanced MWC organics control over GCP and is ranked higher. In the case of Unit 3, the MWC will be designed to incorporate GCP inherently; thus, thermal oxidation will only reduce MWC organics emissions from the already low emissions resulting from GCP. For purposes of developing a conservative estimation of economic impacts, it is assumed that 90% of emitted MWC organics can be controlled by the thermal oxidizer. This assumption is conservative because Lee County is proposing MWC organics emissions of 13 ng/dscm at 7% O_2 with GCP. It is not typically possible to achieve a control level of 90% with such a low inlet level.

4.8.5 ENVIRONMENTAL IMPACT

As has been previously described, implementation of GCP will provide the lowest environmental impact for control of MWC organics. Based on current information, no adverse environmental impacts are projected from utilization of this technology. Utilization of thermal oxidation will result in secondary pollutant production from combustion of fossil fuels to maintain flue gas temperatures at the MWC organics oxidation temperature.

4.8.6 ECONOMIC IMPACT

No adverse economic consequences are foreseen utilizing GCP as it is the baseline operational requirement and it will be inherent in the design of the Martin combustor. The economic impact of applying a RCTO or RTO were determined using cost estimation algorithms provided in the USEPA's EPA Air Pollution Control Cost Manual, Sixth Edition (USEPA, 2002a). At an assumed MWC organic reduction efficiency of 90%, estimated costs for both the RCTO and a RTO would substantially exceed $1,000,000 per ton removed.

4.8.7 ENERGY IMPACT

No adverse energy utilization consequences are foreseen in the use of GCP as the proposed control technology for MWC organics. Application of either a RCTO or RTO would require increased electrical energy and fan power to drive the system. In addition, substantial amounts of fossil fuel would need to be fired to maintain temperatures for the thermal oxidizer to operate properly. Annual energy impacts based on OAQPS estimates ranged from approximately $697,500 for the RTO to approximately $1,990,000 for the RCTO.

4.8.8 SELECTION OF BACT

Based on a review of energy, environmental and economic impacts, thermal oxidation utilizing a RCTO or RTO is rejected as BACT and GCP is determined to be BACT for MWC organics. The BACT for MWC organics will be achieved through the advanced design of the combustion chamber and temperature control found in the Martin combustor. MWC organics emissions will be limited to 13 ng/dscm at 7% O_2. The emission rate for MWC organics given in Section 3 represents the BACT as per PSD regulations and FDEP requirements.

4.9 BACT REVIEW FOR MERCURY EMISSIONS

Mercury (Hg) is a metal that exists in the liquid phase and is relatively volatile at ambient temperatures. Mercury, as a product of combustion, is quantitatively a function of the Hg content of the waste.

4.9.1 FORMATION MECHANISMS

Mercury and mercuric compounds have boiling points ranging from 575-1200°F (302-649C). These compounds vaporize when heated due to their relatively low vapor pressures and can have a tendency to remain in the vapor phase at the outlet of the air pollution control equipment (BEI, 1986). It is theorized that flue gas cooling encourages deposition or enrichment of these compounds on fine particulate matter.

4.9.2 SOURCE SEPARATION IMPACT ON MERCURY EMISSIONS

The USEPA sponsored a field research program (Franklin Associates, 1991) to identify the characteristics of products containing mercury in MSW. An analysis of mercury in municipal solid waste for 1989 indicated the following categories:

Batteries	88%
Lighting	5%
Thermometers	2%
Thermostats	2%
Pigments	2%
Others	1%
	100%

This analysis demonstrates that discarded batteries contributed to the majority of mercury emissions at the time of the study. Since this study, no more relevant data representing the mercury content of MSW has been issued in the public domain. Later USEPA documents presenting projections of mercury content were based on this same data (Marks, M. 2002a; and Marks, M., 2002b). Two types of batteries are accountable for the mercury value: alkaline and mercury zinc. Voluntary reductions of mercury content by the battery manufacturers have significantly reduced the potential for mercury emissions from MWCs (Franklin Associates, 1991). This has been validated in annual reports prepared by the National Electrical Manufacturers Association (NEMA) regarding analyses of mercury from consumer batteries in the waste stream. In analyses conducted on a sample quantity of batteries collected annually in the Lee County Materials Separation Program from 1996 to 2000, the percentage of consumer batteries containing no added mercury increased from 62% in 1996 to 88% in 2000. This change led NEMA to project that "the average mercury level will decline exponentially, decreasing by approximately 50% every two years. This would result in mercury levels from batteries in the waste stream falling to background levels (less than 5 parts per million) by the year 2008 (NEMA, 2001)." Additionally, source separation of all of the other products above will further reduce the potential for mercury emissions Unit 3.

Another study of typical MSW stream components showed approximately 85% of the Hg content in normal household waste is contained in metal components (primarily household batteries), 5% in plastics, and 3% in paper products (Shaub, 1988). Thus, an effective means of reducing Hg components in the MSW stream would be separation of batteries, paper and plastics. As discussed earlier, the Lee County Materials Separation Plan provides curbside collection for residential recycling of batteries and various paper and plastic materials. Commercial businesses and institutions also voluntarily recycle these materials, thus removing more from the waste stream. Lead-acid vehicle batteries are excluded from the normal waste stream for collection at established centers.

While certain materials separation efforts are considered in this document because of their potential to reduce air emissions, the amount of emissions reductions cannot be quantified. For this reason, materials separation activities are discussed in this BACT analysis; however, materials separation should not be imposed as BACT. There is no evidence to demonstrate that source separation of certain components by itself provides for consistent and measurable reductions of Hg. Because it is not possible to quantify the effect of source separation, source separation does not qualify as a technology or clean fuel process.

4.9.3 AVAILABLE CONTROL TECHNOLOGIES

The control technologies for removing Hg emissions from MWC flue gases are continuing to evolve. Methods of reducing mercury include:

- Reagent injection such as sodium sulfide or activated carbon upstream, within, or downstream of the SDA and upstream of the FF (or ESP)

- Wet scrubbing techniques
- Spray dryer followed by an FF (or ESP)
- Flue gas cooling
- Activated carbon reactor
- Source separation

In developing the MWC emissions guidelines and NSPS for mercury emissions, USEPA evaluated data and conducted tests of an activated carbon injection system at two U.S. MWCs, Stanislaus County (California) and Camden County (New Jersey). Stanislaus County utilized a SDA/FF and SNCR and the Camden facility utilized a SDA/ESP and SNCR. Use of activated carbon was evaluated, because at that time available data had shown that this reagent effectively removed mercury, and activated carbon was less expensive than other sorbents in use at that time. Based on these tests, USEPA determined that the two primary variables affecting both Hg emission and control efficiency were reagent (carbon) feed rate and uncontrolled Hg levels. Reductions in excess of 80% were achieved with high carbon feed rates. At low carbon feed rates, Hg emissions were much more variable. In addition, SNCR reagents did not appear to interfere with Hg removal nor did Hg leach from the ash over a 28-day period (USEPA, 1992b). This led to establishment of the Subpart Eb NSPS level of 80 milligrams per dry standard cubic meter (dscm) or 85% control, whichever is least stringent.

Though the Stanislaus County and Camden County testing is dated, stack test results from numerous MWCs in the U.S., including LCERF Units 1 and 2, utilizing reagent (activated carbon) injection have demonstrated compliance with the NSPS Hg emission limits. Tested levels at Lee County Units 1 and 2 from 1994 to 2000 have ranged from non-detected to 75 mg/dscm at 7% O_2. USEPA has recognized reagent (activated carbon) injection in combination with a FF as a very effective control system for mercury.

For mercury emissions, Unit 3 will benefit from source separation and removal of mercury containing wastes due to both nationwide and local efforts. Flue gas temperatures will be cooled in the SDA/FF to assist in removal and collection of mercury. Reagent (activated carbon) is proposed for enhanced mercury control. Thus, of the available control methods discussed above, only wet scrubbers and activated carbon reactors may warrant further evaluation in comparison to reagent injection.

Reagent Injection

As stated, Lee County is proposing installation of an activated carbon injection system with subsequent collection in the downstream FF for mercury control. Other reagents such as sodium sulfide and Sorbalit® have been tested and used at other facilities. However, testing has shown that other existing reagents/sorbents are no more effective than activated carbon and typically these materials are substantially more expensive. In fact, several facilities that started utilizing these other sorbents have since switched to activated carbon.

USEPA tests and recent data from operating U.S. MWCs have shown that activated carbon injection effectively limits outlet Hg emissions to levels below the USEPA NSPS and Florida Mercury Rule levels.

Wet Scrubbing Techniques

It has been reported (Vogg, et al., 1986) that wet scrubber systems can provide effective control of Hg emissions from MWCs. However, for this to be effective, measures must be taken to avoid secondary reduction reactions of Hg compounds with SO_2. This can be done by utilizing a strong acid scrubbing solution or a similar method such as addition of an oxidizing agent (Vogg, et al., 1986).

Test results from the Coburg, Germany, facility equipped with a SDA/FF and wet scrubber have indicated that the Hg emission rates are similar to the emission rates from facilities equipped with SDA/FF only (Ogden Martin Systems, Inc., 1991).

No other more recent data relative to Hg emissions reductions from MWCs equipped with wet scrubbers was identified that showed that potential for higher removal capability than activated carbon injection.

Activated Carbon Reactors

European facilities have incorporated activated carbon reactors as tail gas control method for Hg, as well as other trace metals and air toxics. These can be either fixed bed carbon adsorbers or circulating carbon beds. In European designs, these are used as flue gas polishing steps at the end of the pollution control train, but typically before the NOx SCR step to allow as contaminant free flue gas as possible to enter the SCR reactor and if installed, the oxidation catalyst system. This flue gas polishing step has been installed on some European MWCs in response to a political desire in several countries (including Germany, Austria, Switzerland and the Netherlands) to reduce all air pollutants to the maximum extent possible, typically without regard to cost or the effect on plant efficiency (Hartenstein, et al, 1996). No data has been identified that indicates that significant additional Hg removal would occur with the activated carbon reactor over carbon injection with a SDA/FF. In fact, with activated carbon in the filter cake of the FF, a similar effect of an activated carbon reactor is created. Thus, for purposes of this review, it is considered that activated carbon injection in conjunction with a SDA/FF would provide equivalent control as an activated carbon reactor.

4.9.4 RANKING OF ALTERNATIVE CONTROL TECHNOLOGIES

Control of Hg emissions have been demonstrated via proper operation of acid gas/particulate control devices with low scrubber outlet temperature in conjunction with activated carbon injection. Wet scrubbers or activated carbon reactors have not demonstrated a higher removal efficiency for Hg from MWC flue gases. Using this criteria for ranking, it appears that an SDA/FF and additional control by reagent (activated carbon injection) ranks as the most effective or “top” technology for flue gas Hg removal.

4.9.5 SELECTION OF BACT

Based upon the previously set forth rationale, the proposed control technology for Hg is injection of activated carbon in conjunction with a semi-dry scrubber system consisting of an SDA and FF. This technology is considered to be the most effective in controlling Hg and therefore represents the highest ranking control technology from a top-down BACT perspective.

Hg emissions will be controlled to a level of 70 mg/dscm corrected to 7% O_2 or 85% control, whichever is least stringent.

4.10 SUMMARY OF PSD APPLICABLE POLLUTANTS AND PROPOSED BACT

Table 4-6 below summarizes those pollutants that are subject to PSD review for the proposed Unit 3 project at the LCERF. Table 4-6 also includes a summary of the proposed BACT for each pollutant.

TABLE 4-6
POLLUTANTS APPLICABLE TO PSD REVIEW AND PROPOSED BACT

PSD Pollutant	Proposed BACT
PM_{10}	FF
MWC Metals (as PM)	FF
MWC Acid Gases[a]	SDA/FF
SO_2	SDA/FF
SAM	SDA/FF
NOx	SNCR
CO	GCP
Mercury	ACI
MWC Organics[b]	GCP

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[a] MWC Acid Gases as HCl, HF, and SO_2.

[b] MWC Organics as Total Dioxins and Furans (measured as total tetra- through octa- chlorinated dibenzo-p-dioxins and dibenzo furans).

LEE COUNTY ENERGY RECOVERY FACILITY
PREVENTION OF SIGNIFICANT DETERIORATION
APPLICATION FOR MUNICIPAL WASTE COMBUSTOR UNIT 3

SECTION 5
EXISTING AMBIENT AIR QUALITY

Revised February 17, 2003

SECTION 5
EXISTING AMBIENT AIR QUALITY

The two main factors influencing air quality are the types and amounts of pollutants, both natural and man-made, emitted directly into the atmosphere (i.e., "primary" pollutants) and the subsequent atmospheric (i.e., meteorological) conditions that disperse and transport these emissions. Meteorological conditions also determine the rate of chemical reactions that form "secondary" pollutants like ozone, which are not emitted directly from emission sources.

5.1 AMBIENT AIR QUALITY STANDARDS

The effect of pollutants on ambient air quality depends on the duration and level of pollutant concentrations. Ambient air quality standards (AAQS) specify the allowable limits of pollutant concentrations for specific durations. National AAQS have been promulgated by the U.S. Environmental Protection Agency (USEPA) in Title 40, Part 50 of the Code of Federal Regulations (40 CFR 50). Primary AAQS are designed to protect public health with an adequate margin of safety for sensitive groups of individuals (e.g., children and asthmatics). Secondary AAQS are designed to protect the public welfare from any known or anticipated adverse effects associated with air pollution. Protection of the public welfare includes the protection of property, materials, plants and animal life. The State of Florida has adopted State AAQS in Chapter 62-204, Florida Administrative Code (F.A.C.) that are at least as stringent as the National AAQS. AAQS were promulgated by USEPA and Florida for six "criteria" pollutants: sulfur dioxide (SO_2); nitrogen dioxide (NO_2); carbon monoxide (CO); lead (Pb); ozone (O_3); and particulate matter less than 10 microns (PM_{10}). Compliance with the SO_2, NO_2, CO, and Pb AAQS requires the second-highest short-term concentration (24-hours or less) and the long-term average concentrations (quarterly and annual) measured each year at a particular monitoring site to be less than or equal to the AAQS. Compliance with the short-term O_3 and PM_{10} AAQS requires the fourth-highest concentration over three consecutive years to be less than or equal to the AAQS for "complete" datasets. These National and Florida AAQS are shown on Table 5-1.

5.2 AMBIENT MONITORING DATA

Air quality in Florida is measured by the Florida Department of Environmental Protection (FDEP) and local agencies. Table 5-2 shows the nearest monitoring sites to the Lee County Energy Recovery Facility (LCERF). Because of the LCERF's rural location, there are few monitoring sites in the immediate vicinity. Most nearby monitors are located in more urban or suburban areas. Because of their more urbanized setting, these monitoring locations are conservative for determining baseline air quality (i.e., measured concentrations would be higher than expected for the LCERF vicinity). The nearest PM_{10} monitors are located 12 kilometers (km) from the LCERF in Lee County at the Fort Myers Water Treatment Plant and 56 km from the facility in Collier County. There are two O_3 monitor sites in Lee County -- in Cape Coral 20 km from the LCERF and in Fort Myers Beach 24 km from the LCERF. The nearest

TABLE 5-1
NATIONAL AND FLORIDA STATE AMBIENT AIR QUALITY STANDARDS[a]

Pollutant/Averaging Time	Florida AAQS	National AAQS	Primary/Secondary
SO_2 3-Hour Average	1300 ug/m^3 (0.5 ppm)	0.5 ppm (1300 ug/m^3)	Secondary
SO_2 24-Hour Average	260 ug/m^3 (0.1 ppm)	0.14 ppm (365 ug/m^3)	Primary
SO_2 Annual Arithmetic Mean	60 ug/m^3 (0.02 ppm)	0.030 ppm (80 ug/m^3)	Primary
NO_2 Annual Arithmetic Mean	100 ug/m^3 (0.05 ppm)	0.053 ppm (100 ug/m^3)	Primary & Secondary
CO 1-Hour Average	35 ppm (40,000 ug/m^3)	35 ppm (40,000 ug/m3)	Primary
CO 8-Hour Average	9 ppm (10,000 ug/m^3)	9 ppm (10,000 ug/m3)	Primary
PM_{10} 24-Hour Average[b]	150 ug/m^3	150 ug/m^3	Primary & Secondary
PM_{10} Annual Arithmetic Mean	50 ug/m^3	50 ug/m^3	Primary & Secondary
Lead Quarter Arithmetic Mean	1.5 ug/m^3	1.5 ug/m^3	Primary & Secondary
O_3 Max. Daily 1-Hour Average[b]	0.12 ppm (235 ug/m^3)	0.12 ppm (235 ug/m^3)	Primary & Secondary

SOURCE: Rule 62-204.240, F.A.C. (Ambient Air Quality Standards) for Florida AAQS and 40 CFR 50 (National Primary and Secondary Ambient Air Quality Standards) for National AAQS.

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[a] Except as noted, short-term AAQS (i.e., averaging times of 24-hour or less) are not to be exceeded more than once a calendar year and long-term AAQS (i.e., quarterly and annual averaging times) are never to be exceeded.

[b] Compliance with 24-hour PM_{10} and 1-hour O_3 AAQS is achieved, in simplest terms, when the expected number of days exceeding the AAQS is less than or equal to 1.0 per calendar year when averaged over a consecutive three year period. Or, if data completeness criteria are met, when the fourth-highest daily maximum concentration in three consecutive years is less than or equal to the AAQS.

TABLE 5-2
NEAREST AMBIENT AIR QUALITY MONITORING SITES[a]

County/Site ID	Measured Pollutant(s)	UTM Coord. (km) East, North	Distance (km), Direction[b] from LCERF
Lee County			
071-0005	PM_{10}	412.492, 2942.575	12.1, WSW
071-2001	O_3	404.400, 2945.800	19.8, W
071-3002	O_3	400.824, 2940.837	23.9, WSW
Collier County			
021-0003	PM_{10}	423.500, 2890.430	55.3, S
Sarasota County			
115-0014	CO	358.780, 2995.250	82.1, NW
115-0013	PM_{10}	350.800, 3019.350	104.0, NW
115-1002[c]	SO_2, O_3	349.150, 3020.375	105.9, NW
115-1006[c]	SO_2, O_3	353.620, 3025.910	106.8, NW
115-1004	CO	348.530, 3024.360	109.1, NW
115-1005	SO_2, O_3	344.600, 3021.250	109.7, NW
Hillsborough County			
057-0081	NO_2, SO_2, O_3	355.544, 3069.100	141.2, NNW
057-1066[d]	Pb	364.000, 3093.400	159.5, NNW
057-1073[d]	Pb	364.310, 3093.990	159.9, NNW
057-1074[d]	Pb	364.050, 3094.640	160.6, NNW
Broward County			
011-0031	NO_2, O_3	570.365, 2905.871	151.5, ESE
Pinellas County			
103-0024[e]	Pb, CO	329.745, 3075.255	160.3, NW
103-3005[e]	Pb	333.000, 3084.420	166.0, NNW
Palm Beach County			
099-0018	Pb	584.561, 2964.829	161.5, E

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[a] Only the two nearest monitoring sites for each pollutant are shown in this table.

[b] Distance (km) and direction are measured from the LCERF's UTM coordinates (Zone 17) of 424.2 km East and 2945.7 km North.

[c] Site was moved in mid-1999 (ID changed from 115-1002 to 115-1006) - considered as one site.

[d] The Hillsborough County lead monitoring sites were not used for background because these are special purpose monitors for an industrial lead emissions source.

[e] The lead monitoring at site 103-0024 (Pinellas County) was discontinued in early 1999. Lead monitoring site 103-3005 (Pinellas County) was initiated in 1999, so both are considered a single site for lead.

CO and SO_2 monitors are located in Sarasota County -- CO is measured at two locations 82 and 109 km from the LCERF while SO_2 is measured at different locations 106 and 110 km from the LCERF. The two closest NO_2 monitoring stations are in Hillsborough (141 km) and Broward (152 km) counties.

Lead monitoring has been discontinued in most areas of Florida, including Lee County. Lead concentrations in general are very low and have been decreasing statewide. Lead concentrations at the nearest monitoring sites in Hillsborough County were not considered because these monitors are special purpose monitors used to measure localized lead impacts in the vicinity of an industrial emission source. Lead concentrations at the next closest monitors (approximately 160 km away in Palm Beach and Pinellas Counties) have been used to determine background levels.

Maximum ambient concentrations measured during the last three available calendar years (1998-2000) are shown on Table 5-3. Three years are shown when available because this is the time period generally used by USEPA for determining compliance with AAQS as described above and in Table 5-1. Concentrations were generally higher in 1998 due to widespread fires in Florida and Mexico. Some, but not all, of the high PM_{10} and O_3 concentrations due to the 1998 wildfires were excluded by USEPA from the data as extraordinary events. In spite of the high concentrations remaining in the database for 1998-2000, the data show that the area surrounding the LCERF is in compliance with the AAQS.

5.3 BASELINE AIR QUALITY

Baseline or background air quality represents the air quality in the project vicinity prior to operation of the proposed source. It is generally based on actual measurements of ambient air quality. Maximum concentrations from the two nearest monitoring sites are summarized on Table 5-4 as a conservative estimate of background air quality. Baseline concentrations are shown on Table 5-4 in the form of the applicable AAQS (e.g., the high second-high 8-hour CO concentration over three years).

The status of baseline air quality is generally evaluated by comparing baseline concentrations to the AAQS. Baseline SO_2 and NO_2 concentrations are less than one-fifth of the most restrictive National or State AAQS for all averaging times. Baseline CO concentrations are about one-third and two-thirds of the 1-hour and 8-hour AAQS, respectively. Baseline PM_{10} concentrations are less than one-third and one-half of the PM_{10} 24-hour and annual AAQS, respectively. Baseline O_3 concentrations are about 80% of the 1-hour AAQS. Maximum measured quarterly Pb concentrations are generally below the detection limits of the monitoring methods and are less than 1% of the quarterly AAQS. Thus, baseline ambient air quality as summarized above complies with all AAQS. Since the air quality monitoring sites are from more urbanized areas than the LCERF site, the baseline concentrations selected are a conservative representation of the project location (i.e., the baseline concentrations are higher than ambient concentrations which would actually be measured near the Facility).

TABLE 5-3
NEARBY AMBIENT AIR QUALITY DATA

Pollutant/Avg. Time/ Year	Concentration at Nearest Monitoring Site	Concentration at Next Closest Monitoring Site
SO_2/3-hour Second-Highest Concentration (ppm)		
1998	**0.057 ppm**[a] Sarasota County	0.056 ppm Sarasota County
1999	0.033 ppm 115-1002 (98-99)	0.032 ppm 115-1005
2000	0.044 ppm 115-1006 (99-00)	0.045 ppm
SO_2/24-hour Second-Highest Concentration (ppm)		
1998	**0.019 ppm** Sarasota County	0.014 ppm Sarasota County
1999	0.011 ppm 115-1002 (98-99)	0.011 ppm 115-1005
2000	0.016 ppm 115-1006 (99-00)	0.019 ppm
SO_2/Annual Arithmetic Mean Concentration (ppm)		
1998	0.002 ppm Sarasota County	**0.003 ppm** Sarasota County
1999	0.003 ppm 115-1002 (98-99)	0.002 ppm 115-1005
2000	0.002 ppm 115-1006 (99-00)	0.002 ppm
NO_2/Annual Arithmetic Mean Concentration (ppm)		
1998	0.006 ppm Hillsborough County	0.009 ppm Broward County
1999	0.007 ppm 057-0081	**0.010 ppm** 011-0031
2000	0.008 ppm	0.009 ppm
CO/1-hour Second-Highest Concentration (ppm)		
1998	5.5 ppm Sarasota County 115-0014	**10.9 ppm** Sarasota County 115-1004
1999	3.7 ppm	4.5 ppm
2000	4.2 ppm	6.6 ppm
CO/8-hour Second-Highest Concentration (ppm)		
1998	2.6 ppm Sarasota County 115-0014	**5.6 ppm** Sarasota County 115-1004
1999	2.6 ppm	3.3 ppm
2000	2.1 ppm	4.3 ppm
O_3/1-hour Maximum, Fourth-Highest Day over three years (ppm)[b]		
1998-2000	0.096 ppm Lee County 071-2001	**0.098 ppm** Lee County 071-3002

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[a] The baseline concentration selected (i.e., the maximum concentration appropriate for the AAQS) from both nearest monitoring sites is **bolded** and shown on Table 5-4.

[b] Round to two significant digits before AAQS comparison as required by regulations (i.e., 0.098 ppm rounds to 0.10 ppm).

TABLE 5-3
NEARBY AMBIENT AIR QUALITY DATA
(CONCLUDED)

Pollutant/Avg. Time/ Year	Concentration at Nearest Monitoring Site	Concentration at Next Closest Monitoring Site

PM_{10}/24-hour Fourth-Highest Concentration over three years (ug/m3)

1998-2000	36 ug/m^3 Lee County 071-0005	**39 ug/m^{3a}** Collier County 021-0003

PM_{10}/Annual Arithmetic Mean Concentration (ug/m3)

1998	18 ug/m^3 Lee County 071-0005	19 ug/m^3 Collier County 021-0003
1999	**19 ug/m^3**	17 ug/m^3
2000	19 ug/m^3	18 ug/m^3

Pb/Maximum Quarterly Arithmetic Mean Concentration (ug/m3)

1998	**0.01 ug/m^3** Pinellas County	0.00 ug/m^3 Palm Beach County
1999	0.01 ug/m^3 103-0024 (98-99)	0.00 ug/m^3 099-0018
2000	0.01 ug/m^3 103-3005 (99-00)	N/A (1999 shutdown)

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[a] The baseline concentration selected (i.e., the maximum concentration appropriate for the AAQS) from both nearest monitoring sites is **bolded** and shown on Table 5-4.

TABLE 5-4
COMPARISON OF BASELINE CONCENTRATIONS TO AMBIENT AIR QUALITY STANDARDS

Pollutant Name	Averaging Time	Baseline Concentrations (ug/m^3)[a]	AAQS[b] (ug/m^3)	Percent of AAQS
SO_2	3-Hour	149	1,300	11%
SO_2	24-Hour	50	260	19%
SO_2	Annual	8	60	13%
NO_2	Annual	19	100	19%
CO	1-Hour	12,535	40,000	31%
CO	8-Hour	6,440	10,000	64%
PM_{10}	24-Hour	39	150	26%
PM_{10}	Annual	19	50	38%
Pb	Quarter	0.01	1.5	<1%
O_3	1-Hour	196	235	83%

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[a] Baseline concentrations are the appropriate maximum concentrations for the applicable AAQS at the two nearest monitoring sites for the most recently available three years of data. Short-term concentrations (24-hours or less) are high second-high concentrations over three years while long-term concentrations (quarterly and annual) are the maximum concentration over three years except for 24-hour PM_{10} and 1-hour O_3 (fourth-highest daily maximum concentration over three consecutive years). SO_2, NO_2, CO and O_3 ppm converted from ppm to ug/m^3 using 2620, 1881, 1150 and 1963 ug/m^3 per ppm, respectively.

[b] AAQS shown are generally the Florida AAQS, which are more restrictive than the National AAQS.

5.4 ATTAINMENT STATUS

Under Section 107 of the Clean Air Act, each state is required to develop a State Implementation Plan (SIP) which specifies the manner by which all areas within the state will achieve and maintain compliance with the National AAQS. All areas in the United States are designated as either attainment, nonattainment, or unclassifiable with the National AAQS for each criteria pollutant. Attainment areas are areas which are currently in compliance with the National AAQS and continued compliance is expected under the current SIP requirements. Nonattainment areas are areas which either currently do not comply with the National AAQS or which significantly contribute to nearby areas which do not comply with the National AAQS. Nonattainment areas can also be areas which previously did not comply with the National AAQS and necessary SIP revisions have not yet been approved by USEPA. Unclassifiable areas are areas where insufficient data exists to classify the area as either attainment or nonattainment and are assumed to be in attainment with the National AAQS.

Lee County is part of the Southwest Florida Intrastate Air Quality Control Region (AQCR), which includes Charlotte, Collier, De Soto, Glades, Hendry, Highlands, Lee and Sarasota Counties (40 CFR 81.97). Lee County and all of Florida is designated as attainment or unclassifiable (and presumed to be in attainment) with the National AAQS for all currently regulated criteria pollutants (Total Suspended Particulates [TSP], SO_2, NO_2, CO, Pb, and 1-hour O_3 at 40 CFR 81.310 and PM_{10}, SO_2, NO_2, CO, Pb, and 1-hour O_3 at Rule 62-204.340, F.A.C.).

Areas that were once considered to be nonattainment for one or more AAQS but are now designated as attainment or unclassifiable are considered to be "maintenance" areas. The name refers to the various regulatory requirements applied to state agency and/or emission sources in order to "maintain" future compliance with AAQS. In Florida, there are maintenance areas for O_3, Pb, and TSP, which was replaced by the AAQS for PM_{10}). The nearest maintenance areas are in the Miami and Tampa metropolitan areas. The Miami O_3 maintenance area, consisting of Broward, Dade, and Palm Beach Counties, is more than 85 km east of the LCERF. The Tampa O_3 maintenance area (Pinellas and Hillsborough Counties) is about 120 km from the facility while the Tampa Pb and TSP maintenance areas (portions of Hillsborough County) are about 150 km north-northwest of the LCERF. None of these maintenance areas are considered to be "nearby" for regulatory purposes (less than 50 km) so no permitting requirements apply to the LCERF as a result of these maintenance areas.

LEE COUNTY ENERGY RECOVERY FACILITY
PREVENTION OF SIGNIFICANT DETERIORATION
APPLICATION FOR MUNICIPAL WASTE COMBUSTOR UNIT 3

SECTION 6
AIR QUALITY IMPACT ANALYSES

Revised February 17, 2003

SECTION 6
AIR QUALITY IMPACT ANALYSES

Air quality impact analyses for the immediate project vicinity required by the Prevention of Significant Deterioration (PSD) regulations (see Section 2) are addressed in this section. Air quality impact analyses for the Everglades National Park (a Class I area), Air Quality Related Values (AQRV), and other modeling analyses such as the deposition analyses for the Human Health and Ecological Risk Assessments are given in Section 7.

As discussed in Section 1, Lee County intends to expand the Lee County Energy Recovery Facility (LCERF) by adding a third municipal waste combustor (MWC) to the two existing units. Air pollution control (APC) equipment for the new unit will be similar to APC equipment for the two existing units. The APC system will include a spray dry absorber (SDA), a fabric filter (FF) baghouse, an activated carbon injection (ACI) system, and a selective non-catalytic reduction (SNCR) system.

Maximum increases in facility impacts for the criteria pollutants due to the new MWC were determined for comparison to significant impact levels (SILs) as required by the regulations and modeling guidance. As will be shown, these maximum increases are less than the SILs, so additional multi-source modeling analyses are not required. Since such small increases are considered negligible, no assessment of compliance with ambient air quality standards (AAQS) and Class II PSD increments is required. Plume rise for the two existing units will be enhanced by the addition of the third unit so the increases in facility impacts will be less than the proportional increases in facility emissions. Although not required by the modeling guidelines, modeling analyses were performed for all three MWC units to demonstrate that the LCERF will continue to comply with all AAQS and PSD increments. In addition, a comparison of maximum increases in facility impacts to the de minimis monitoring levels is included for PSD pollutants. Finally, a comparison of maximum increases in facility impacts to Florida Ambient Reference Concentrations (ARCs) is included for non-criteria pollutants.

6.1 MODEL SELECTION AND OPTIONS

Air quality models are employed to assess the potential impacts of proposed sources on ambient air quality. The models mathematically simulate the dispersion of pollutants in the atmosphere. The models estimate potential concentrations at user-specified locations (i.e., "receptors") based on the source characteristics, meteorological data, and model options selected by the user. A modeling protocol was submitted to the Florida Department of Environmental Protection (FDEP), Region IV of the U.S. Environmental Protection Agency (USEPA), and the National Park Service (NPS) Federal Land Manager. The modeling of the LCERF was performed in accordance with the modeling protocol and the agency comments.

The LCERF vicinity is relatively flat, with no terrain approaching the height of the facility stack. Therefore, a "simple" terrain model is required for the impact assessment (i.e., complex terrain model not required) and terrain heights were not considered in the modeling analyses. Since less than 50% of the area within 3 kilometers (km) of the LCERF stack is considered to be urban land uses (i.e., commercial, industrial, or compact residential areas), rural dispersion curves are required in the impact assessment. Therefore, the latest version of the USEPA Industrial Source Complex -- Short-Term (ISCST3) model was selected to estimate facility impacts. ISCST3 is the USEPA-recommended model for estimating point source impacts in simple terrain under rural dispersion conditions.

In addition to flat terrain and rural dispersion curves, other ISCST3 options include concentration estimates assuming non-reactive gaseous emissions using the default regulatory option. Since ISCST3 only considers non-reactive pollutants, secondary pollutants not emitted directly by the facility such as ozone and particulate matter with an aeronautical diameter less than 2.5 microns ($PM_{2.5}$) (with significant contributions from nitrates and sulfates) were not considered. Also, all nitrogen oxides (NOx) emissions (predominantly in the form of nitric oxide [NO]) were assumed to be nitrogen dioxide [NO_2] for comparison to AAQS, SILs, and PSD increments (i.e., the ozone limiting and ambient ratio methods were not used). No plume decay or depletion was considered for the PSD analyses in this section. Wet and dry deposition considering both gaseous and particulate pollutant distributions is discussed in Section 7 for the Risk Assessments. Averaging times of 1-hour, 3-hours, 8-hours, 24-hours, and annual periods appropriate for each pollutant based on the AAQS, SILs, PSD increments, and ARCs were modeled. Maximum and second-high short-term concentrations (24-hours or less) for each year of meteorological data modeled were output from ISCST3 along with annual concentrations for each year. Maximum short-term and annual concentrations from all years were used for comparison to SILs, de minimis monitoring levels, and ARCs. High second-high short-term concentrations and maximum annual concentrations were used for comparison to AAQS and PSD increments. The use of the 24-hour high second-high concentration is more conservative for comparison to the 24-hour PM_{10} AAQS than the sixth-highest concentration over five years sometimes used. Also, maximum modeled 24-hour lead concentrations were conservatively used in place of quarterly concentrations.

Information necessary to execute ISCST3 includes hourly averages of meteorological data, emission source conditions (release height, stack diameter, etc.), and the locations for estimating facility impacts (receptors). These are described below.

6.2 METEOROLOGICAL DATA

ISCST3 considers the effect of meteorology on plume rise and dispersion in order to estimate ambient pollutant concentrations due to modeled emissions sources. Hourly averages of surface meteorological data -- wind speed and direction, temperature, atmospheric stability, pressure, relative humidity, and precipitation -- from the Fort Myers Airport (Page Field) were used in this case. The Fort Myers Airport (Page Field) is the nearest National Weather Service (NWS) surface station and is about 12 kilometers (km) southwest of the LCERF. Given the similar exposure and close physical proximity, data from the Fort Myers (Page Field) airport are very representative of surface meteorological conditions at the LCERF. Radiosonde data from Tampa International

Airport, about 165 km to the north, were also used. Twice-daily mixing heights processed by the National Climatic Data Center (NCDC) for Tampa, the nearest NWS upper air station on the Gulf Coast, are similar to the project site due to similar exposures along the Florida Gulf Coast.

Meteorological data for input to the ISCST3 model were processed with USEPA program PCRAMMET for calendar years 1990 through 1994, the last five full years of complete and available records. Surface characteristics representative of the project vicinity input to PCRAMMET were Minimum Monin-Obukhov length of 2 meters (m), measurement and project site surface roughness lengths of 0.20 m, noontime albedo of 0.20, Bowen ratio of 0.5, fraction of net radiation absorbed by the ground of 0.15, and anthropogenic heat flux of 0 Watts/square-meter. These surface characteristics are based on PCRAMMET recommendations (USEPA, 1999c, pp. 3-6 to 3-8 and Appendix B) for rural agricultural areas or summer values for cultivated land. The Fort Myers anemometer height is 20 feet.

6.3 RECEPTOR DATA

Impacts are calculated by ISCST3 only for locations specified by the user. A careful selection of receptor grids is therefore required to ascertain the magnitude and location of maximum modeled impacts. For the proposed project, ambient areas outside the facility fenceline were modeled in accordance with USEPA modeling guidance. Receptor locations were based on the Universal Transverse Mercator (UTM) coordinate system. Due to the flat terrain in Lee County and southern Florida, terrain (i.e., receptor and source elevations) were not considered in the modeling analyses (FLAT model option). Flagpole receptors were also not used.

While the main facility stack meets Good Engineering Practice (GEP) criteria, maximum facility impacts are still expected in the immediate vicinity (i.e., at or near the facility fenceline) due to the flat terrain and the relatively low exhaust temperatures caused by the spray dry absorber. Therefore, along the facility fenceline and for the area within two kilometers of the stack, "fine grid" receptors spaced 100-meters apart were modeled (the minimum spacing typically required for the stack heights and fenceline distances in this modeling analysis). For two to ten kilometers from the stack, "coarse grid" receptors spaced 500-meters apart were used. Based on the coarse and fine grid results, additional 100-meter "fine grid" receptors were required west-southwest of the original fine grid to locate the maximum annual impact and location (i.e., to cover all areas within 90% of the overall maximum and second-highest impacts for all applicable averaging times with 100-meter spaced receptor grids). This additional "fine grid" was included in all the ISCST3 modeling analyses to determine maximum impacts.

6.4 SOURCE DATA

Like most modern MWCs, there are very few fugitive or minor sources associated with the LCERF. Municipal solid waste (MSW) is delivered to the enclosed tipping floor. Air from the tipping floor is used as makeup air for the combustion process, keeping this area under negative pressure and minimizing fugitive emissions and odors. Bottom ash from the furnace grate and flyash from the APC equipment is kept wet and handled by covered conveyors or within enclosed areas (i.e., buildings). Therefore, except for increased truck traffic, there will be only negligible increases in fugitive or secondary onsite emissions due to the increase in facility throughput for Unit 3.

The only existing minor point sources at the LCERF regulated by the Title V permit are particulate matter emissions sources -- the lime silo dust collector vent and the ash building baghouse vent. Stack and emission characteristics for these two existing sources are included in Table 6-1. Other insignificant and unregulated sources listed by the Title V permit and not considered for the modeling analysis include small chemical storage tanks and silos and the cooling tower.

USEPA Method 5 stack tests in 1998 and 1999 of the ash building vent measured an average outlet grain loading of only 0.00030 grains per cubic foot (gr/cf) and an average flowrate of 16,500 cubic feet per minute (cfm), or only 0.0424 lbs/hour [0.00030 gr/cf x 16,500 cf/min x 60 min/hr x lb/7000 gr] (Ogden Energy Group, Inc., 1998, 1999a). The ash building vent operates almost continuously (8760 hours per year [hrs/yr]), with actual annual emissions of about 0.2 tons/year (0.0424 lb/hr x 8760 hrs/yr x ton/2000 lbs). Outlet grain loadings and PM emissions would be expected to be relatively insensitive to inlet grain loadings due to the design of the baghouses, the obviously low particulate concentrations inside the ash handling building, and the very low particulate emission rate. Therefore, the change in facility throughput would not be expected to affect PM emissions from the ash building vent. Even if operation of Unit 3 causes a 50% increase in actual emissions, it would only be 186 lbs/year. As can be seen, actual emissions are very much less than permitted emissions of 0.010 gr/cf and 26,290 cfm (2.25 lbs/hr), so no changes are needed to permitted emission levels.

The existing lime silo stores pebble lime used to control acid gas emissions from the two existing MWCs. Unlike volatile organic compound (VOC) storage tanks (with gaseous vapors), no breathing losses would be expected. The only emissions would occur during filling operations when about 26 tons of pebble lime is added to the silo by delivery truck. Filling the existing lime silo typically takes less than 100 minutes. There are approximately 74 deliveries per year under existing conditions based on records for the first half of calendar year 2000. The only permit limit for the existing lime silo dust collector is no visible emissions (less than 5% opacity) during filling operations.

A second lime silo will be added for the proposed third MWC Unit. PM emissions during filling of the additional lime silo will be controlled with a dust collector designed for an outlet grain loading of 0.015 grains per dry standard cubic foot (gr/dscf) and equipped with a fan/motor rated at 1200 scfm. Filling the new proposed lime silo is expected to take about one hour for 20 tons of lime. Based on the current 74 fills/year (at 26 tons per fill) for the existing lime silo, the new lime silo will require about 48 fills/year (at 20 tons per fill). This gives short-term emissions of 0.154 lb/fill (0.015 gr/dscf x 1200

TABLE 6-1
STACK CHARACTERISTICS

FACILITY SOURCES	ENGLISH UNITS	METRIC UNITS
MAIN FACILITY STACK[a]		
Stack Height Above Base	275 feet	83.82 meters
Flue Diameter – New And Old Units	6 feet 2.00 inches	1.880 meters
Effective Diameter – 2 Units	8 feet 8.65 inches	2.658 meters
Effective Diameter – 3 Units	10 feet 8.17 inches	3.256 meters
Stack Location:		UTM Zone 17
East	81° 45' 41" West Longitude	424.20 UTM kilometers
North	26° 37' 54" North Latitude	2945.70 UTM kilometers
EXISTING LIME SILO DUST COLLECTOR VENT[b]		
Stack Height Above Base	102 feet	31.09 meters
Exit Temperature	Ambient	Ambient
Vent Diameter	12 inches	0.305 meters
Exit Flows	1000 acfm[c]	6.5 meters/second
Short-Term PM Emissions (1 fill/day)	0.214 lb/fill	1.12E-3 g/s
Annual PM Emissions (74 fills/year)	15.836 lb/year	2.28E-4 g/s
PROPOSED LIME SILO DUST COLLECTOR VENT[d]		
Stack Height Above Base	85 feet	25.91 meters
Exit Temperature	Ambient	Ambient
Vent Diameter	8 inches	0.203 meters
Exit Flows	1200 acfm[e]	17.5 meters/second
Short-Term PM Emissions (1 fill/day)	0.154 lb/fill	8.09E-4 g/s
Annual PM Emissions (48 fills/year)	7.39 lb/year	1.06 E-4 g/s
ASH HANDLING BUILDING DUST COLLECTOR VENT[f]		
Stack Height Above Base	58 feet 7.25 inches	17.86 meters
Exit Temperature	Ambient	Ambient
Vent Diameter	2.8 feet	0.853 meters
Exit Flows (Design)	25000 acfm	20.6 meters/second
Exit Flows (Actual)	16500 acfm	13.6 meters/second
PM Emissions		
Permit Limit (0.010 gr/cf @ 26290 acfm)	2.25 lb/hr	0.2835 grams/second
Actuals (0.00030 gr/cf @ 16500 acfm)	0.0424 lb/hr	0.0053 grams/second
Actual Increases/Short-Term	0.0212 lb/hr	0.0027 grams/second
Actual Increases/Annual (8760 hrs/yr)	186 lb/yr	0.0027 grams/second

---

[a] Since the actual stack height (276 feet) is greater than GEP stack height (275 feet), GEP stack height is used in the modeling analyses.

[b] Existing lime silo dust collector vent location (UTM Zone 17): 424.249 km East and 2945.699 km North. Since the actual stack height (102 feet) is less than formula GEP stack height (275 feet), building dimensions were input into ISCST to include building wake effects on this emission source.

[c] There is no lime silo fan – exhaust is due to the displacement caused by the pebble lime and the excess air used to pump the lime into the silo. Approximately 26 tons of pebble lime are delivered in 100 minutes through a pneumatic 4-inch delivery hose. Actual volumetric flow rates would be around 1000 acfm (115 x 26 tons x 2000 lbs/ton / [60 lb/ft^3 x 100 minutes]) assuming a 115:1 air to lime volumetric ratio. This should be conservative in that the pebble lime and air would need to pass through the 4-inch diameter delivery hose at about 130 mph.

[d] Proposed lime silo dust collector vent location (UTM Zone 17): 424.249 km East and 2945.717 km North. Since the actual stack height (85 feet) is less than formula GEP stack height (275 feet), building dimensions were input into ISCST to include building wake effects on this emission source.

[e] Actual flowrates are conservatively assumed to be equal to the dry standard design flowrate and the exhaust temperature is conservatively assumed to be ambient temperature.

[f] Ash handling building dust collector vent location (UTM Zone 17): 424.203 km East and 2945.758 km North. Since the actual stack height (58.6 feet) is less than formula GEP stack height (275 feet), building dimensions were input into ISCST to include building wake effects on this emission source.

dscf/min x 60 min/fill / 7000 gr/lb) and annual emissions of 7.39 lb/year (0.154 lbs/fill x 48 fills/year). Assuming the same outlet grain loading for the existing silo, current emissions are 0.214 lbs/fill (0.015 gr/acf x 1000 acf/min x 100 min/fill / 7000 gr/lb) and 15.836 lb/year (0.214 lb/fill x 74 fills/year). Because these emission rates are negligible, modeling analyses for the three minor PM sources were only included in the final PM modeling analyses. The lime silo information presented above is provided to allow an assessment of the impact from this type of operation based on prior operations. These values should not be included as a permit condition since emissions are insignificant and the County is only requesting an opacity limit.

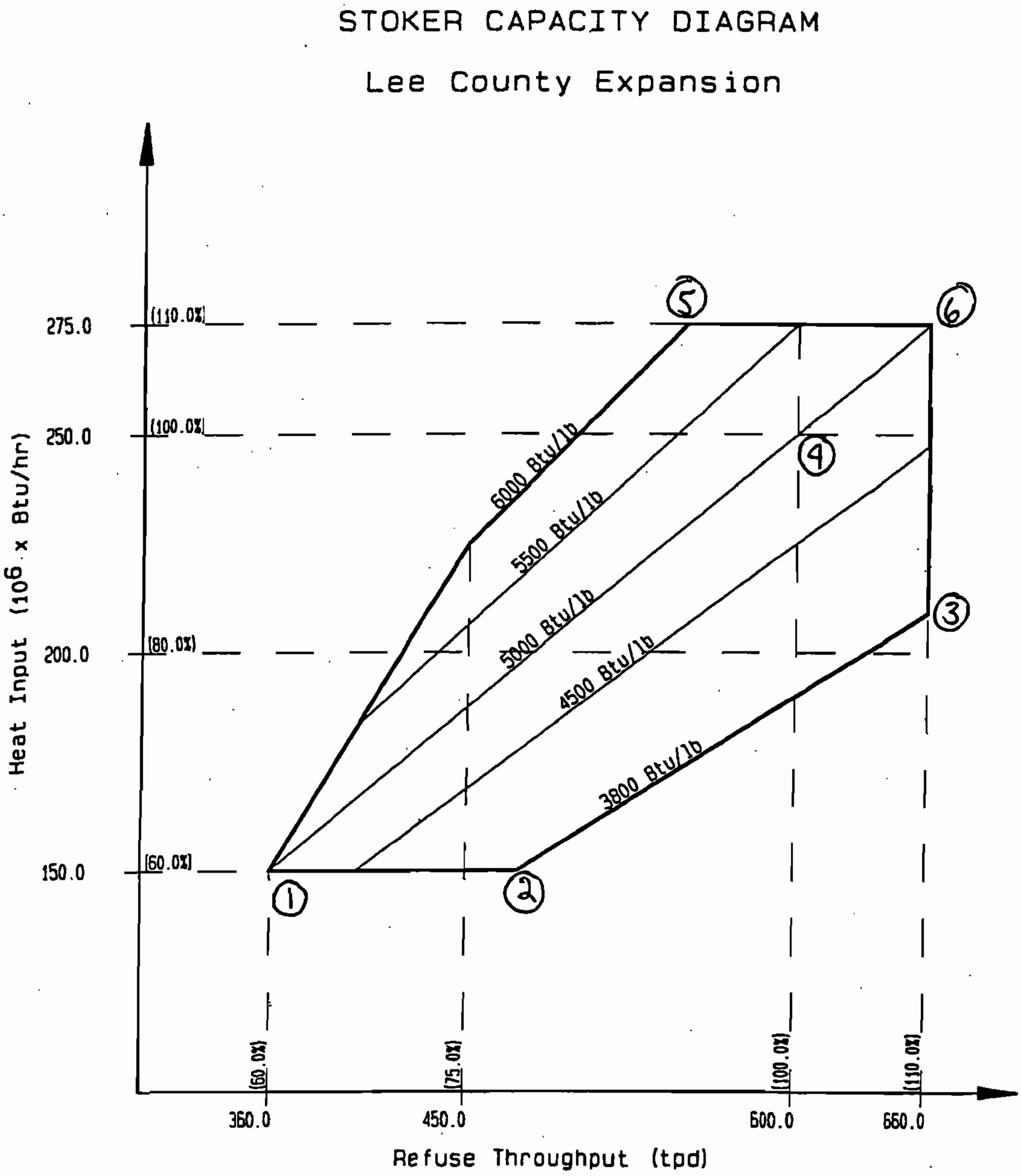
The only PSD significant increase in emissions is due to the proposed MWC unit itself. Emissions for Unit 3 will be vented from a third flue in the existing facility stack shell, which already contains two flues for the existing units. An equivalent stack diameter was therefore used to represent the total area of the flues in service when performing both screening and refined modeling analyses. The main facility stack characteristics are shown on Table 6-1.

Input data to the dispersion models include emissions and stack characteristics. Emission rates reflect the requirements of the best available control technology (BACT) analysis described elsewhere. Due to the heterogeneous nature of MSW, each MWC can operate under a range of conditions. The proposed third unit will be capable of operating under a variety of thermal loads (from 60% to 110% of a nominal 250 million British Thermal Units per hour (MMBTU/hr) gross heat input) and refuse throughputs (from 60% to 110% of a nominal 600 tons/day) based on a wide range of possible MSW heat contents (from about 3,800 to 6,000 BTU per pound of MSW). This operating window is shown on Figure 6-1. Stack characteristics such as flue gas volume, temperature, and emissions for six conditions which bound the operating window are shown on Table 6-2 for the proposed MWC unit.

“Formula” GEP stack height is defined for each nearby structure, or combination of nearby structures, as the structure height plus 1.5 times the lesser of the projected structure height or width. If multiple structures result in more than one GEP stack height for a particular source, then the maximum GEP stack height is controlling. Only "nearby" structures are considered in the GEP analysis. "Nearby" structures are considered to be structures located less than 5.0 times the lesser of the structure height or maximum projected width from the source location. The modeled stack height in air quality analyses for PSD purposes is limited to formula GEP stack height or 65 meters, whichever is greater, for stack heights greater than GEP stack height. Air quality modeling for stacks less than formula GEP stack height must consider building-induced turbulence effects.

The tallest structure at the LCERF is the boiler enclosure building, 110 feet above grade as shown in the cross-sectional view on Figure 6-2. Since this structure is very much wider than tall and within five building heights of all the modeled sources as shown in the plan view on Figure 6-3, GEP stack height for all modeled sources is 275 feet (2.5 times

FIGURE 6-1
MUNICIPAL WASTE COMBUSTOR UNIT 3 OPERATING WINDOW



Date: 10/3/01

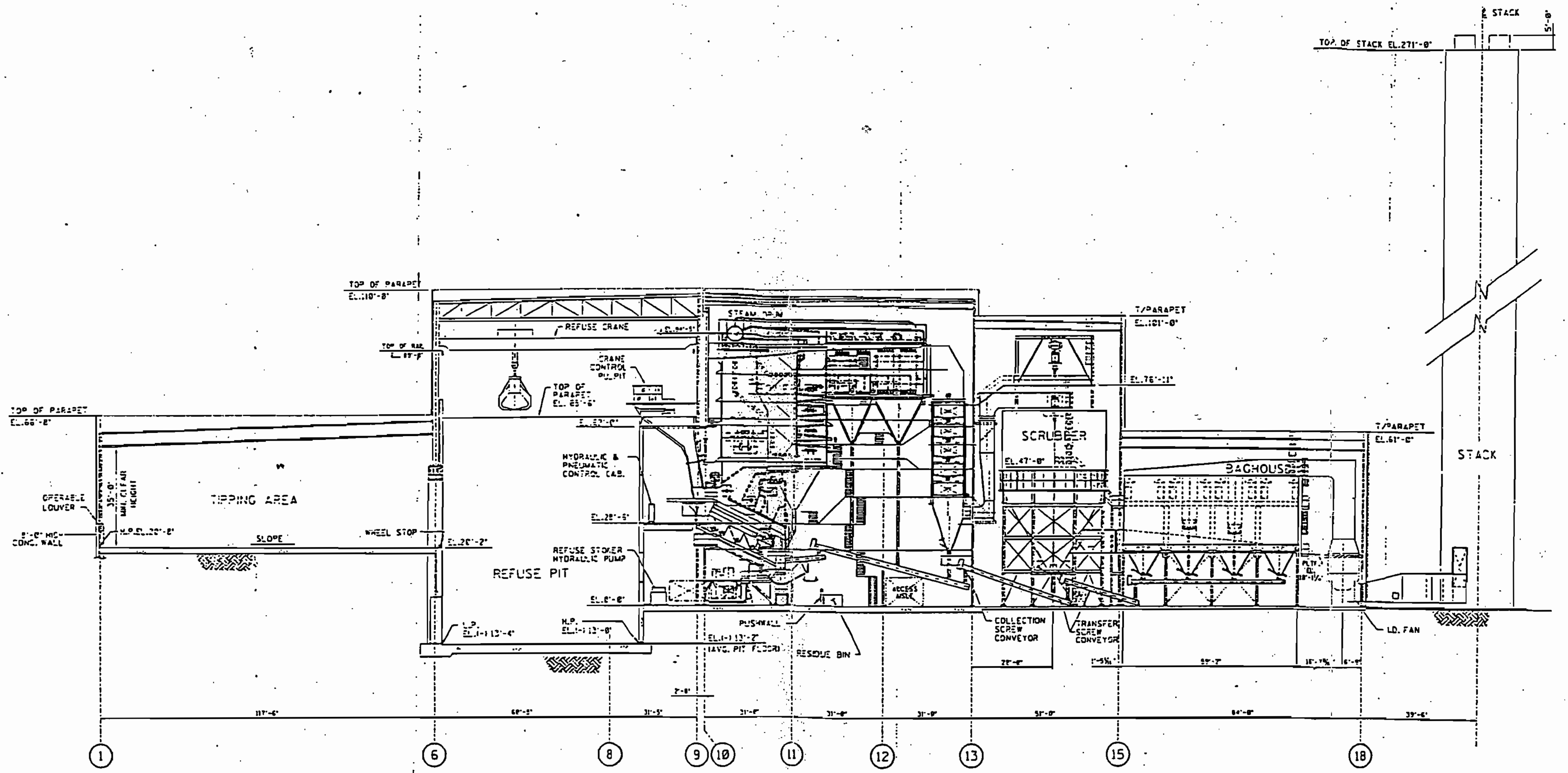
Prepared by:
RTP Environmental Associates, Inc.

TABLE 6-2
STACK GAS CONDITIONS FOR PROPOSED MWC UNIT 3

Case Number	**1**	**2**	**3**	**4**	**5**	**6**
BTU/lb HHV	5000	3800	3800	5000	6000	5000
Tons MSW/day	360	474	660	600	550	660
MMBTU/hour	150	150	209	250	275	275
Exit Temperature (°F)	270	270	270	270	270	270
Volumetric Flow (acfm)	82,423	80,174	109,918	137,611	155,805	151,111
Exit Velocity (m/s)	14.019	13.637	18.696	23.406	26.501	25.702
DSCFM at Actual %O_2	49,490	46,026	63,058	82,645	96,091	90,732
Actual %O2 (Dry Basis)	10.90%	10.38%	10.39%	10.90%	11.38%	10.90%
DSCFM at 7% O2	35,598	34,845	47,711	59,461	65,868	65,264

POLLUTANT EMISSIONS FOR PROPOSED MWC UNIT (LB/HR)

CO (100 ppmdv)	15.527	15.199	20.811	25.936	28.730	28.467
NO_x (150 ppmdv)	38.258	37.449	51.276	63.904	70.790	70.141
SO_2 (29 ppmdv)	10.300	10.082	13.805	17.204	19.058	18.883
80% Control (100 ppmdv)	35.517	34.765	47.602	59.325	65.718	65.115
HCl (25 ppmdv)	5.054	4.947	6.774	8.442	9.352	9.266
95% Control (125 ppmdv)	25.271	24.737	33.870	42.211	46.760	46.331
PM (0.009 gr/dscf)	2.746	2.688	3.681	4.587	5.081	5.035
Cd (20 ug/dscm)	2.67e-03	2.61e-03	3.57e-03	4.46e-03	4.94e-03	4.89e-03
Pb (200 ug/dscm)	2.67e-02	2.61e-02	3.57e-02	4.46e-02	4.94e-02	4.89e-02
Hg (70 ug/dscm)	9.33e-03	9.14e-03	1.25e-02	1.56e-02	1.73e-02	1.71e-02
85% Control (172.5 ug/dscm)	2.30e-02	2.25e-02	3.08e-02	3.84e-02	4.26e-02	4.22e-02
Total PCDD/F (13 ng/dscm)	1.73e-06	1.70e-06	2.32e-06	2.90e-06	3.21e-06	3.18e-06
HF (3.5 ppmdv)	0.388	0.380	0.520	0.648	0.718	0.712
VOC (30 ppmdv)	2.667	2.611	3.575	4.456	4.936	4.890
Beryllium (0.16 ug/dscm)	2.13e-05	2.09e-05	2.86e-05	3.56e-05	3.95e-05	3.91e-05
Sulfuric Acid (16.68 ppmdv)	9.070	8.878	12.156	15.150	16.782	16.628
Arsenic (10.74 ug/dscm)	1.43e-03	1.40e-03	1.92e-03	2.39e-03	2.65e-03	2.63e-03
Ammonia (50 ppmdv)	4.712	4.612	6.315	7.871	8.719	8.639



SECTION A-A

REVISIONS

A-09/04/92-PRE
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REVIEW & COMM

B-12/04/92-REV
BOILER AREA, SCR
BAGHOUSE, I.D. FA
SCREW CONVEYOR

C-02/08/93-REV
APC AREA & SC
CONVEYORS, REFU
CRANE ELEVATION
90% ISSUE FOR C
REVIEW & COMME

0-03/23/93-ISSU
CONSTRUCTION

1-10/20/93-REV
DWGS. ACCESS
TO BAGHOUSE.

2-02/14/95-REC

FIGURE 6-2

United Engineers
& Constructors
A Raytheon Company

GENERAL ARRANGEMENT
SECTION A-A
LEE COUNTY SOLID WASTE RESOURCE RECOVERY FA

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D.L.B. 12/04/92

C-1033

SUBCONTRACT	FOR	FOR	FOR

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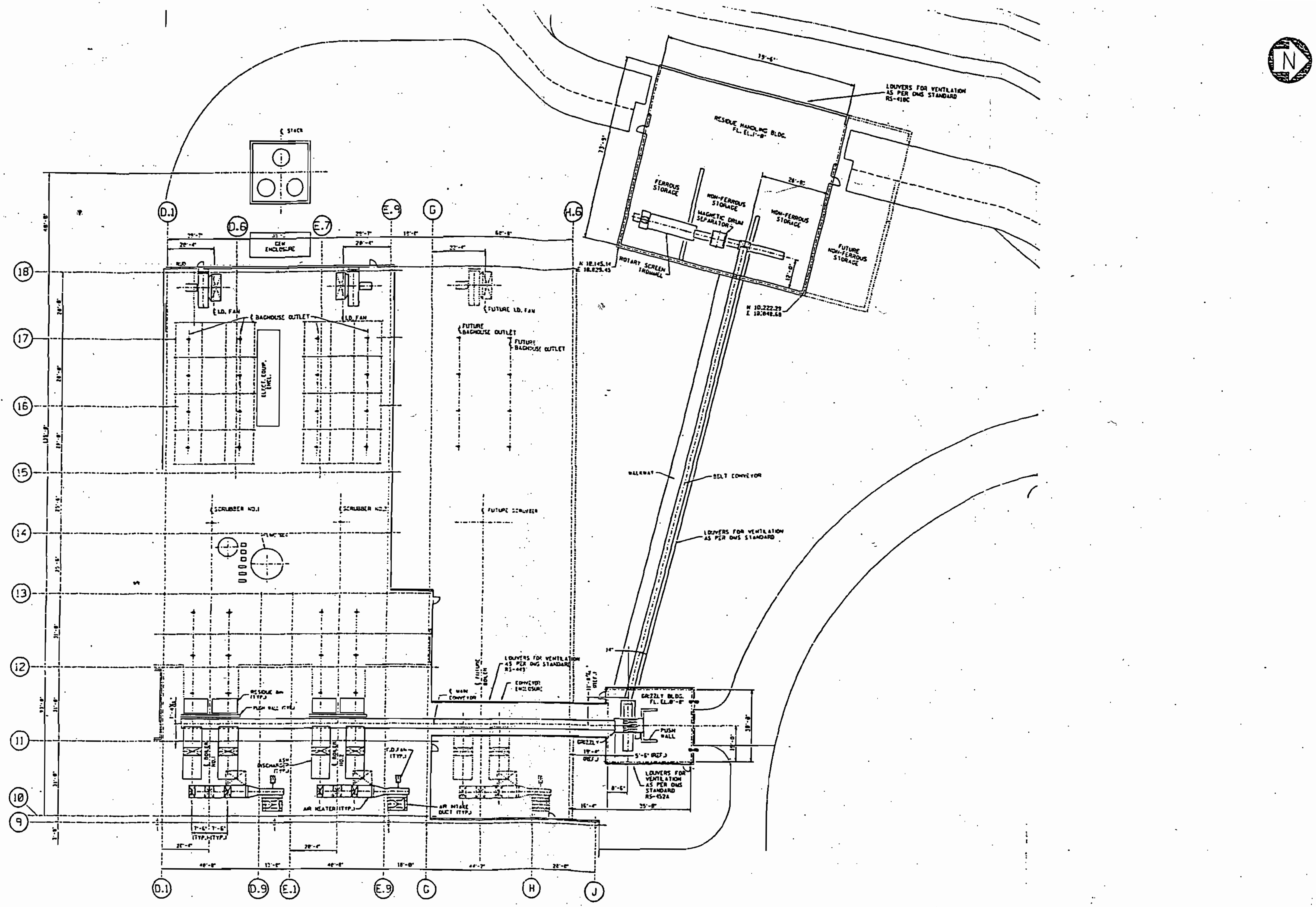

FIGURE 6-3

SUBCONTRACT OR PURCHASE ORDER	FOR BIDDING	FOR AWARD	FOR CONSTRUCTION

COMPANY CONFIDENTIAL

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C-1033

WCD 4/14/93 7102-E-260500

110 feet). Since the main facility stack height of 276 feet is greater than GEP stack height of 275 feet, 275 feet was used as the stack height in all the air quality modeling analyses. Building-induced turbulence need not be considered in the modeling analysis for the main facility stack. However, GEP stack height for the two minor PM sources of 275 feet is greater than their actual stack heights so building wake effects must be considered for these sources. Therefore, Building Profile Input Program (BPIP) was used to determine appropriate building dimensions for input to the final PM_{10} ISCST modeling analyses.

6.5 SCREENING MODELING ANALYSIS

Due to the variability in operating conditions, a screening analysis was performed to determine the "worst-case" source configuration. For the proposed MWC, ISCST3 modeling was performed for each source configuration shown on Table 6-2. These source conditions consider various MSW heat contents (from 3,800 to 6,000 BTU/lb) and facility throughputs (from 360 to 660 tons/day). Since emission limits are specified in ppmdv, gr/dscf, or ug/dscm for dry standard conditions at 7% oxygen, emissions for the proposed MWC unit are proportional to the dry standard flow rates corrected to 7% oxygen. Therefore, for the screening analyses, "unitized" emissions were ratioed from the dry standard flow rates to give MWC unit emissions of 1 gram/second (g/s) at nominal conditions (600 tons/day and 5000 BTU/lb).

In order to tabulate the modeling results for each pollutant shown on the bottom of Table 6-3, the "unitized" screening results shown on the top of Table 6-3 for the appropriate averaging time are multiplied by the emission rates for each pollutant shown on Table 6-2 for nominal (Case 4) conditions and 0.126 g/s per lb/hr (the "unitized" emission rates modeled already include the difference between nominal emissions and emissions for each Case) as follows:

$$\text{Conc(pollutant)}_{\text{Case\_X}} = \text{Conc(unitized)}_{\text{Case\_X}} \times \text{Q lb/hr}_{\text{Case\_4}} \times 0.126 \text{ g/s per lb/hr}$$

Maximum ISCST3 screening results are shown on Table 6-3 using all five years (1990-1994) of Fort Myers meteorological data. For the proposed unit, maximum impacts occur for Cases 5 and 6 -- the unit operating at its maximum rated gross heat input capacity of 275 MMBTU/hour with differing BTU/lb wastes. Case 6 represents 660 tons/day at 5,000 BTU/lb while Case 5 represents 550 tons/day at 6,000 BTU/lb. These two cases were also the same cases previously predicted as worst-case in the original PSD permit application (in the original application, these two cases were essentially identical since emissions and dry standard flow rates were based on gross heat input). Generally, Case 5 produces higher impacts for 1-hour and 3-hour maximum impacts and high second-high 24-hour impacts while Case 6 produces higher impacts for maximum and high second-high impacts for other averaging times. Since Case 5 and 6 impacts are similar, the remaining modeling for the PSD permit application considered both cases.

TABLE 6-3
ISCST3 SCREENING RESULTS FOR PROPOSED MWC UNIT ONLY

Case Number	1	2	3	4	5	6
"UNITIZED" EMISSION RATES FOR MODELING PROPOSED UNIT (g/s)[a]						
1 Unit (New)	0.599	0.586	0.802	1.000	1.108	1.098
SCREENING RESULTS FOR "UNITIZED" EMISSION RATES FOR PROPOSED MWC UNIT (ug/m^3)						
1-Hour Maximum	2.05193	2.00739	2.65909	3.24606	3.56857	3.54312
1-Hour High Second-High	1.68613	1.67602	1.84911	1.96352	2.00918	2.06690
3-Hour Maximum	1.16398	1.15890	1.26647	1.29323	1.40802	1.39931
3-Hour High Second-High	0.99772	0.99048	1.11431	1.17944	1.21170	1.21212
8-Hour Maximum	0.70835	0.70475	0.78457	0.85150	0.87588	0.88387
8-Hour High Second-High	0.63273	0.63044	0.68940	0.72073	0.73925	0.74682
24-Hour Maximum	0.31877	0.31684	0.36245	0.38743	0.39863	0.40190
24-Hour High Second-High	0.26549	0.26239	0.24129	0.27316	0.28999	0.28916
Annual Maximum	0.02193	0.02183	0.02428	0.02580	0.02653	0.02677
ISCST3 SCREENING RESULTS BY POLLUTANT (ug/m^3)						
CO 1-Hour Maximum	6.706	6.560	8.690	10.608	11.662	11.579
CO 8-Hour Maximum	2.315	2.303	2.564	2.783	2.862	2.888
NO_x Annual Maximum	0.177	0.176	0.196	0.208	0.214	0.216
SO_2 3-Hour Maximum	8.701	8.663	9.467	9.667	10.525	10.460
SO_2 24-Hour Maximum	2.383	2.368	2.709	2.896	2.980	3.004
SO_2 Annual Maximum	0.164	0.163	0.181	0.193	0.198	0.200
HCl 1-Hour Maximum	10.913	10.676	14.143	17.264	18.980	18.844
HCl Annual Maximum	0.117	0.116	0.129	0.137	0.141	0.142
PM_{10} 24-Hour Maximum	0.184	0.183	0.209	0.224	0.230	0.232
PM_{10} Annual Maximum	0.013	0.013	0.014	0.015	0.015	0.015
Cd 1-Hour Maximum	1.15e-03	1.13e-03	1.49e-03	1.82e-03	2.01e-03	1.99e-03
Cd Annual Maximum	1.23e-05	1.23e-05	1.36e-05	1.45e-05	1.49e-05	1.50e-05
Pb 1-Hour Maximum	1.15e-02	1.13e-02	1.49e-02	1.82e-02	2.01e-02	1.99e-02
Pb Annual Maximum	1.23e-04	1.23e-04	1.36e-04	1.45e-04	1.49e-04	1.50e-04
Hg 1-Hour Maximum	9.93e-03	9.71e-03	1.29e-02	1.57e-02	1.73e-02	1.71e-02
Hg Annual Maximum	1.06e-04	1.06e-04	1.17e-04	1.25e-04	1.28e-04	1.30e-04
Total PCDD/F 1-Hour Max	7.50e-07	7.34e-07	9.72e-07	1.19e-06	1.30e-06	1.29e-06
Total PCDD/F Annual Max	8.01e-09	7.98e-09	8.87e-09	9.43e-09	9.69e-09	9.78e-09
HF 1-Hour Maximum	1.68e-01	1.64e-01	2.17e-01	2.65e-01	2.91e-01	2.89e-01
HF Annual Maximum	1.79e-03	1.78e-03	1.98e-03	2.11e-03	2.17e-03	2.19e-03
Be 1-Hour Maximum	9.20e-06	9.00e-06	1.19e-05	1.46e-05	1.60e-05	1.59e-05
Be Annual Maximum	9.84e-08	9.79e-08	1.09e-07	1.16e-07	1.19e-07	1.20e-07
H_2SO_4 1-Hour Maximum	3.917	3.832	5.076	6.196	6.812	6.763
H_2SO_4 Annual Maximum	0.042	0.042	0.046	0.049	0.051	0.051
As 1-Hour Maximum	6.18e-04	6.05e-04	8.01e-04	9.78e-04	1.07e-03	1.07e-03
As Annual Maximum	6.60e-06	6.57e-06	7.31e-06	7.77e-06	7.99e-06	8.06e-06
Ammonia 1-Hour Maximum	2.035	1.991	2.637	3.219	3.539	3.514
Ammonia Annual Maximum	0.022	0.022	0.024	0.026	0.026	0.027

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[a] "Unitized" emissions for screening purposes are calculated by ratioing the dscfm flowrate at 7% O_2 for each case to normal conditions (Case 4), or $g/s_{\text{Case X}} = DSCFM_{\text{Case X}} / 59461$ dscfm at 7% O_2.

6.6 REFINED MODELING ANALYSIS

Since the new MWC unit will be operating in addition to the existing units, additional modeling was performed to determine the maximum increase in facility impacts as well as maximum impacts due to the combined facility (proposed unit + existing units). The stack characteristics and permitted emissions for the existing facility are shown on Table 6-4. Stack characteristics from the original PSD application and permitted emission rates are shown as Cases A and B for one and two units, respectively. These two cases were modeled by themselves (as Cases A and B) as well as in combination with Cases 5 and 6 for the proposed unit -- giving rise to Cases C and D for Case 5 conditions and Cases E and F for Case 6 conditions. For the combined (existing + proposed) conditions, stack exit temperatures and oxygen contents were weighted for dry standard flowrates at actual % O_2 conditions shown on Tables 6-2 and 6-4. Dry standard flowrates at actual % O_2 conditions were added and new acfm and dry standard flowrates at 7% O_2 calculated accordingly. The modeled stack diameter was set equal to the equivalent diameter for the number of flues in service as shown on Table 6-1.

Modeling results for the existing (Cases A and B) and combined (Cases C through F) facility configurations are shown on Table 6-5. In order to tabulate the modeling results for each pollutant shown on the bottom of Table 6-5, the "unitized" screening results shown on the top of Table 6-5 for the appropriate averaging time are multiplied by the emission rates shown on Table 6-4 for the appropriate case and 0.126 g/s per lb/hr (since the "unitized" emission rate modeled on this table is 1 g/s for all cases [unlike the previous Table 6-3], emissions from the appropriate case on Table 6-4 must be used) as follows:

$$\text{Conc(pollutant)}_{\text{Case\_X}} = \text{Conc(unitized)}_{\text{Case\_X}} \text{ x Q lb/hr}_{\text{Case\_X}} \text{ x } 0.126 \text{ g/s per lb/hr}$$

As can be seen on Table 6-5, maximum facility impacts occur with two (Case E) or three (Case F) operating units under Case 6 conditions for the new MWC unit (660 tons/day/unit at 5000 BTU/lb). Maximum 1-hour impacts are greater for two operating units than three due to a single hour of unusual meteorological conditions of limited vertical mixing and plume rise for two vs. three units. Maximum and high second-high impacts for other averaging times (including 1-hour high second-high) occurred for the expected worst-case of three operating units (Case F). In general, all of the impacts from one to three operating units were similar. As can be seen on the bottom of Table 6-6, maximum criteria pollutant impacts for three units are generally only twice the maximum impacts for one proposed or existing unit because there is enhanced plume rise caused by venting the emissions from closely spaced flues in a common stack shell.

In addition to estimating facility impacts due to emissions from both existing and proposed MWC units, modeling analyses were also performed to determine the maximum increase in facility impacts due to the proposed MWC unit. Operation of Unit 3 by itself would be expected to cause the largest increase in facility impacts. This is because plume rise for one or two existing units would be enhanced by the addition of Unit 3. However, netting analyses were included to determine the increase in facility

TABLE 6-4
STACK GAS CONDITIONS FOR LEE COUNTY FACILITY

Facility Configuration	Existing Facility Only		Proposed Case 5 + Existing Facility		Proposed Case 6 + Existing Facility	
Number of Operating Units (Case)	1 (Case A)	2 (Case B)	2 (Case C)	3 (Case D)	2 (Case E)	3 (Case F)
BTU/lb HHV	6000/5000 (Case 5/6)		6000 (Case 5)		5000 (Case 6)	
Tons MSW/Day/Unit	550/660 (Case 5/6)		550 (Case 5)		660 (Case 6)	
MMBTU/Hour/Unit	275 (Case 5/6)		275 (Case 5)		275 (Case 6)	
Exit Temperature (deg. F)	240		256	251	256	251
Volumetric Flow (acfm)	127,000	254,000	238,130	343,406	230,721	335,997
Exit Velocity (m/s)	21.601	21.601	20.251	19.470	19.621	19.050
DSCFM at Actual %O_2	79,409	158,817	175,500	254,908	170,141	249,549
Actual %O_2 (Dry Basis)	10.01%		10.76%	10.52%	10.49%	10.33%
DSCFM at 7% O_2	62,213	124,426	128,055	190,268	127,473	189,686

Pollutant (Existing Unit Basis)	POLLUTANT EMISSIONS (LB/HR)					
CO (100 ppmdv)	27.2	54.4	55.930	83.130	55.667	82.867
NO_x (180 ppmdv)	80	160	150.790	230.790	150.141	230.141
SO_2 (29 ppmdv)	18	36	37.058	55.058	36.883	54.883
80% Control (66 ppmdv)	41	82	106.718	147.718	106.115	147.115
HCl (25 ppmdv)	8.85	17.70	18.202	27.052	18.116	26.966
95% Control (50 ppmdv)	17.70	35.40	64.460	82.160	64.031	81.731
PM (0.010 gr/dscf)	5.34	10.68	10.421	15.761	10.375	15.715
Cd (40 ug/dscm)	9.3e-03	1.86e-02	1.42e-02	2.35e-02	1.42e-02	2.35e-02
Pb (440 ug/dscm)	0.103	0.206	1.52e-01	2.55e-01	1.52e-01	2.55e-01
Hg (70 ug/dscm)	1.63e-02	3.26e-02	3.36e-02	4.99e-02	3.34e-02	4.97e-02
85% Control (162.4 ug/dscm)	3.79e-02	7.58e-02	8.05e-02	1.18e-01	8.01e-02	1.18e-01
Total PCDD/F (30 ng/dscm)	7.0e-06	1.4e-05	1.02e-05	1.72e-05	1.02e-05	1.72e-05
HF (5.0 ppmdv)	0.96	1.92	1.678	2.638	1.672	2.632
VOC (37 ppmdv)	5.80	11.60	10.736	16.536	10.690	16.490
Beryllium (0.16 ug/dscm)	3.70e-05	7.40e-05	7.65e-05	1.14e-04	7.61e-05	1.13e-04
Sulfuric Acid (10.35 ppmdv)	9.85	19.70	26.632	36.482	26.478	36.328
Arsenic (10.74 ug/dscm)	2.50e-03	5.00e-03	5.15e-03	7.65e-03	5.13e-03	7.63e-03
Ammonia (50 ppmdv)	8.235	16.47	16.954	25.189	16.874	25.109

TABLE 6-5
ISCST3 REFINED RESULTS FOR LEE COUNTY FACILITY

Facility Configuration	Existing Facility Only		Proposed Case 5 + Existing Facility		Proposed Case 6 + Existing Facility	
Number of Operating Units (Case)	1 (Case A)	2 (Case B)	2 (Case C)	3 (Case D)	2 (Case E)	3 (Case F)
"Unitized" Emissions (g/s)	1.000	1.000	1.000	1.000	1.000	1.000
ISCST3 REFINED RESULTS FOR "UNITIZED" FACILITY EMISSION RATE (ug/m^3)						
1-Hour Maximum	3.31027	2.96878	2.35895	1.48248	2.97061	1.48618
1-Hour High Second-High	2.29284	1.58058	1.48567	1.17293	1.58028	1.19054
3-Hour Maximum	1.57179	0.99821	0.99523	0.82491	1.00247	0.82994
3-Hour High Second-High	1.38477	0.87191	0.86257	0.69521	0.88086	0.70336
8-Hour Maximum	0.97361	0.64143	0.63554	0.53232	0.64899	0.53702
8-Hour High Second-High	0.84916	0.52055	0.51756	0.39811	0.52647	0.40546
24-Hour Maximum	0.44950	0.29177	0.28942	0.23134	0.29480	0.23494
24-Hour High Second-High	0.29721	0.23136	0.23003	0.14612	0.23274	0.14854
Annual Maximum	0.02993	0.01895	0.01883	0.01482	0.01924	0.01505
ISCST3 REFINED RESULTS BY POLLUTANT (ug/m^3)						
CO 1-Hour Maximum	11.345	20.349	16.624	15.528	20.836	15.518
CO 8-Hour Maximum	3.337	4.397	4.479	5.576	4.552	5.607
NO_x Annual Maximum	0.302	0.382	0.358	0.431	0.364	0.436
SO_2 3-Hour Maximum	8.120	10.314	13.382	15.354	13.404	15.384
SO_2 24-Hour Maximum	2.322	3.015	3.892	4.306	3.942	4.355
SO_2 Annual Maximum	0.155	0.196	0.253	0.276	0.257	0.279
HCl 1-Hour Maximum	7.383	13.242	19.159	15.347	23.967	15.305
HCl Annual Maximum	0.0667	0.0845	0.1529	0.1534	0.1552	0.1550
PM_{10} 24-Hour Maximum	0.302	0.393	0.380	0.459	0.385	0.465
PM_{10} Annual Maximum	0.020	0.026	0.025	0.029	0.025	0.030
Cd 1-Hour Maximum	3.88e-03	6.96e-03	4.23e-03	4.40e-03	5.31e-03	4.40e-03
Cd Annual Maximum	3.51e-05	4.44e-05	3.38e-05	4.40e-05	3.44e-05	4.45e-05
Pb 1-Hour Maximum	4.30e-02	7.71e-02	4.53e-02	4.77e-02	5.69e-02	4.77e-02
Pb Annual Maximum	3.88e-04	4.92e-04	3.62e-04	4.77e-04	3.68e-04	4.83e-04
Hg 1-Hour Maximum	1.58e-02	2.84e-02	2.39e-02	2.21e-02	3.00e-02	2.21e-02
Hg Annual Maximum	1.43e-04	1.81e-04	1.91e-04	2.21e-04	1.94e-04	2.24e-04
Total PCDD/F 1-Hour Max	2.92e-06	5.24e-06	3.03e-06	3.21e-06	3.81e-06	3.22e-06
Total PCDD/F Annual Max	2.64e-08	3.34e-08	2.42e-08	3.21e-08	2.47e-08	3.26e-08
HF 1-Hour Maximum	4.00e-01	7.18e-01	4.99e-01	4.93e-01	6.26e-01	4.93e-01
HF Annual Maximum	3.62e-03	4.58e-03	3.98e-03	4.93e-03	4.05e-03	4.99e-03
Be 1-Hour Maximum	1.54e-05	2.77e-05	2.27e-05	2.12e-05	2.85e-05	2.12e-05
Be Annual Maximum	1.40e-07	1.77e-07	1.82e-07	2.12e-07	1.84e-07	2.14e-07
H_2SO_4 1-Hour Maximum	4.108	7.369	7.916	6.815	9.911	6.803
H_2SO_4 Annual Maximum	0.037	0.047	0.063	0.068	0.064	0.069
As 1-Hour Maximum	1.04e-03	1.87e-03	1.53e-03	1.43e-03	1.92e-03	1.43e-03
As Annual Maximum	9.43e-06	1.19e-05	1.22e-05	1.43e-05	1.24e-05	1.45e-05
Ammonia 1-Hour Max	3.435	6.161	5.039	4.705	6.316	4.702
Ammonia Annual Max	0.031	0.039	0.040	0.047	0.041	0.048

TABLE 6-6
MAXIMUM CRITERIA POLLUTANT IMPACTS FOR THE LEE COUNTY FACILITY EXPANSION

MAXIMUM INCREASES (ug/m^3) DUE TO PROPOSED UNIT

Facility Configuration	**Proposed Unit 3 Only**		**Proposed Case 5 + Existing Facility**		**Proposed Case 6 + Existing Facility**	
Number of Operating Units (Case)	1 (Case 5)	1 (Case 6)	2 vs 1 (Case C)	3 vs 2 (Case D)	2 vs 1 (Case E)	3 vs 2 (Case F)
CO 1-hr Maximum	11.662	11.579	8.312	4.981	10.326	4.971
CO 1-hr High Second-High	6.566	6.754	5.038	3.867	5.494	3.841
CO 8-hr Maximum	2.862	2.888	1.649	1.410	1.721	1.434
CO 8-hr High Second-High	2.416	2.441	1.464	0.908	1.484	0.911
NO$_x$ Annual Maximum	0.214	0.216	0.074	0.060	0.078	0.064
SO$_2$ 3-hr Maximum	10.525	10.460	7.436	6.300	7.958	6.282
SO$_2$ 3-hr High Second-High	9.057	9.061	5.696	4.525	6.062	4.573
SO$_2$ 24-hr Maximum	2.980	3.004	1.797	1.405	1.838	1.438
SO$_2$ 24-hr High Second-High	2.168	2.161	1.637	0.910	1.648	0.929
SO$_2$ Annual Maximum	0.198	0.200	0.105	0.084	0.109	0.087
PM$_{10}$ 24-hr Maximum	0.230	0.232[a]	0.115	0.088	0.118	0.091
PM$_{10}$ 24-hr High Second-High	0.168	0.167[a]	0.111	0.062	0.113	0.062
PM$_{10}$ Annual Maximum	0.0153	0.0155[a]	0.006	0.005	0.006	0.005

MAXIMUM IMPACTS (ug/m^3) FOR COMBINED FACILITY

Number of Operating Units	**One Unit**		**Two Units**		**Three Units**
Facility Configuration	Proposed Unit Only	One Existing Unit	Both Existing Units	Existing (1) + Proposed (1)	Existing (2) + Proposed (1)
CO 1-hr Maximum	11.662	11.345	20.349	20.836	15.528
CO 1-hr High Second-High	6.754	7.858	10.834	11.084	12.431
CO 8-hr Maximum	2.888	3.337	4.397	4.552	5.607
CO 8-hr High Second-High	2.441	2.910	3.568	3.693	4.234
NO$_x$ Annual Maximum	0.216	0.302	0.382	0.364	0.436
SO$_2$ 3-hr Maximum	10.525	8.120	10.314	13.404	15.384
SO$_2$ 3-hr High Second-High	9.061	7.154	9.009	11.778	13.038
SO$_2$ 24-hr Maximum	3.004	2.322	3.015	3.942	4.355
SO$_2$ 24-hr High Second-High	2.168	1.535	2.390	3.112	2.753
SO$_2$ Annual Maximum	0.200	0.155	0.196	0.257	0.279
PM$_{10}$ 24-hr Maximum	0.232	0.302	0.393	0.385	0.465[b]
PM$_{10}$ 24-hr High Second-High	0.168	0.200	0.311	0.304	0.294[b]
PM$_{10}$ Annual Maximum	0.015	0.020	0.026	0.025	0.030[b]

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[a] Impacts with minor particulate sources are 0.398, 0.276 and 0.054 ug/m^3 for 24-hour maximum, 24-hour high second-high, and annual maximum, respectively.

[b] Impacts with minor particulate sources are 1.177, 0.814 and 0.161 ug/m^3 for 24-hour maximum, 24-hour high second-high, and annual maximum, respectively.

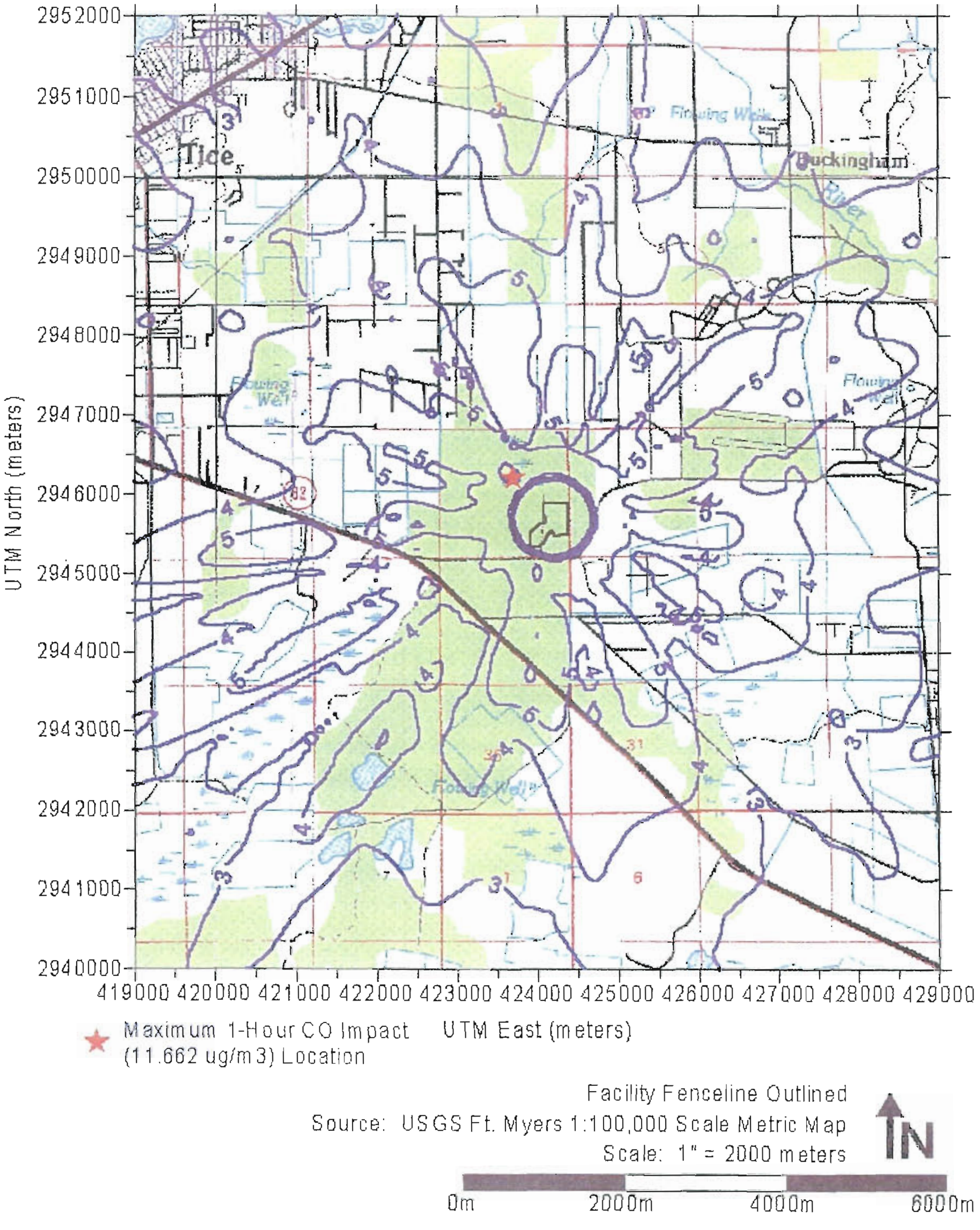
impacts due to the new MWC unit when the existing units are operating as shown on the top of Table 6-6. This is done by modeling future conditions of two or three units with positive emissions and existing conditions with one or two units with negative emissions. ISCST3 then outputs the maximum increase in ambient impacts due to the additional new MWC unit. Accordingly, to determine the maximum increase for "2 vs 1" units, Cases C and E (two units) were modeled with positive emissions and Case A (one unit) was modeled concurrently with negative emissions. For determining maximum increases for "3 vs. 2" units, Cases D and F (three units) were modeled with positive emissions and Case B (two existing units) was modeled with negative emissions. For example, the top of Table 6-6 shows that the maximum annual increase in annual NOx impacts due to the additional MWC unit is 0.060 ug/m^3 for Case D. This maximum increase in modeled concentration was calculated by ISCST by modeling the impact for the future facility consisting of three MWC units (two existing and proposed Case 5) with an emission rate of 230.790 lbs/hr (Case D on Table 6-4). Concurrently, ISCST modeled the existing facility for two operating units with a negative emission rate of 160 lbs/hr (Case B on Table 6-4). The difference in emissions of 70.79 lbs/hr (230.790 lbs/hr-160 lbs/hr) that is modeled is therefore the proposed MWC unit Case 5 (see Table 6-2). When ISCST adds the resulting concentrations of 0.405 and -0.345 ug/m^3 for Case D and Case B, respectively (i.e., “3 vs. 2”), it obtains the resultant increase of 0.060 ug/m^3 at that receptor for that time period. Since the ratio of the mass emission rates (lb/hr) between the existing and proposed units vary for each pollutant, separate modeling analyses are required for each pollutant. Therefore, the netting analysis was restricted to the main criteria pollutants (CO, NO_X, SO_2, and PM_{10}).

Results of the netting analysis are shown on the top of Table 6-6. As expected, maximum impacts due to the new MWC unit operating alone are always greater than when either or both of the existing MWC units are operating. Maximum increases in facility impacts (i.e., the new MWC unit operating alone) are shown in Figures 6-4 and 6-5 for 1-hour and 8-hour CO concentrations, Figure 6-6 for annual NO_x concentrations, and Figures 6-7, 6-8, and 6-9 for 3-hour, 24-hour, and annual SO_2 concentrations. Concentrations shown in these figures are the maximum impacts for any of the five years of meteorological data and for either Case 5 or Case 6.

Since the existing MWC units now operate at more than 90% availability, operation of the new MWC unit by itself would be expected to be a relatively rare occurrence. As a practical matter, one of the LCERF's primary purposes is to reduce the volume of materials to be landfilled, so the most likely choice is between the new unit operating by itself versus one of the old units operating. Unit 3 will have emissions similar to or less than the existing MWC units. This case of one operating unit (i.e., the new MWC alone) would actually result in little change in modeled facility impacts.

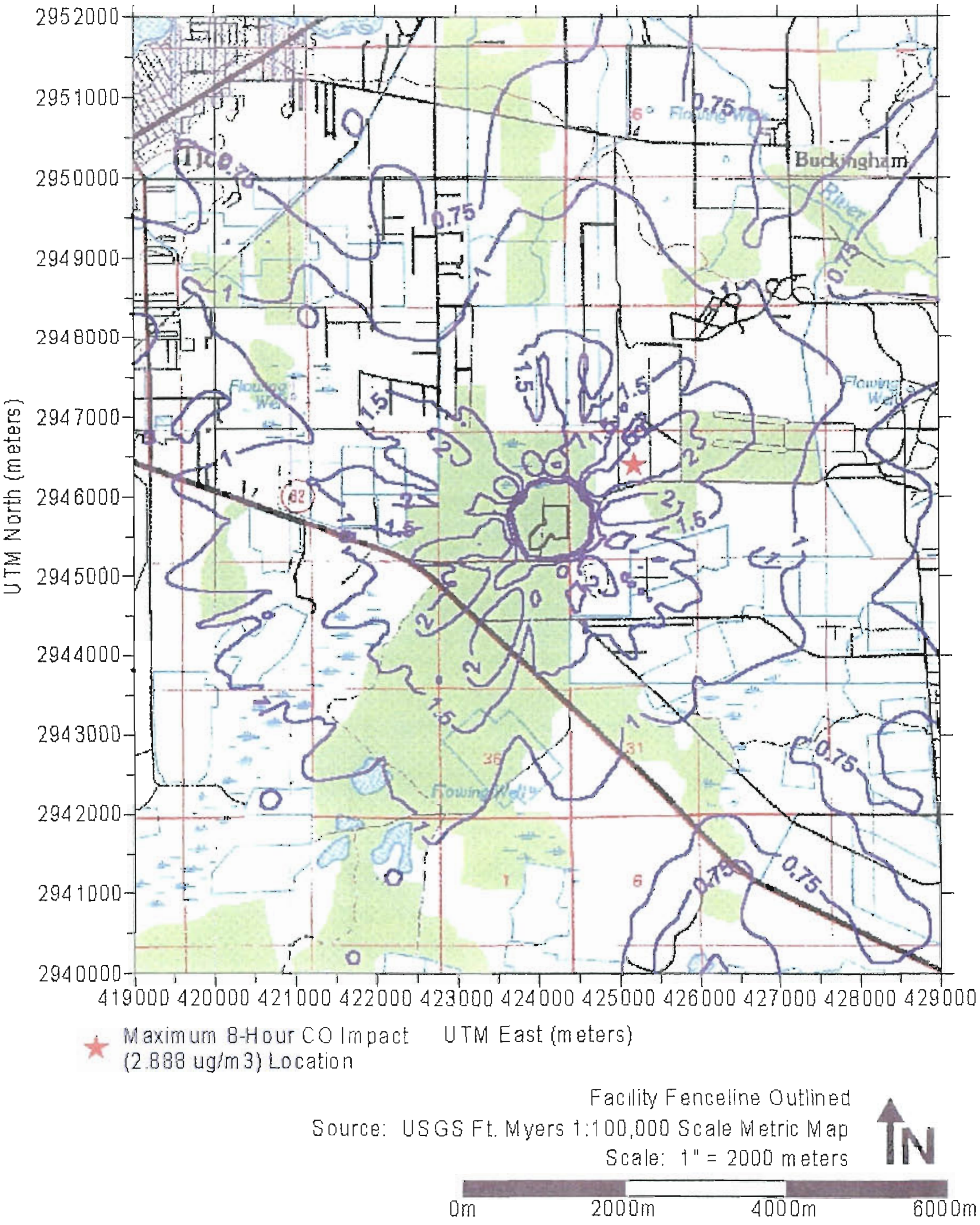
Since compliance with PSD increments and ambient air quality standards is based on modeling high second-high short-term impacts, these impacts are included on Table 6-6. The bottom of Table 6-6 also includes a summary of the combined facility impacts for one, two, or three operating units from Tables 6-3 and 6-5 for the criteria pollutants. As can be seen, maximum impacts for the proposed unit are similar to maximum impacts for

FIGURE 6-4
MAXIMUM INCREASES IN FACILITY 1-HOUR CO IMPACTS (ug/m^3)



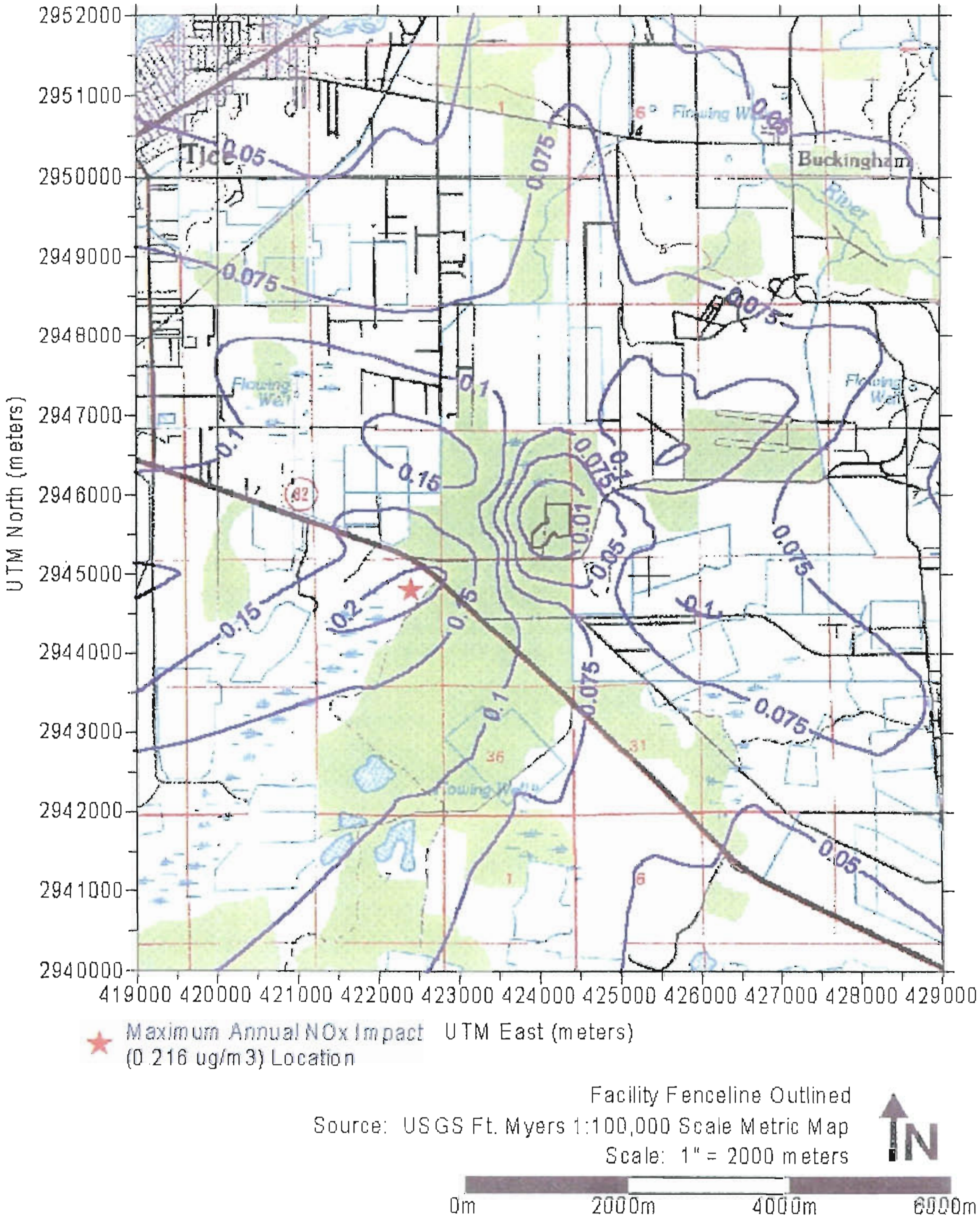
Source: USGS Ft. Myers 1:100,000 Scale Metric Map
Scale: 1" = 2000 meters

FIGURE 6-5
MAXIMUM INCREASES IN FACILITY 8-HOUR CO IMPACTS (ug/m^3)



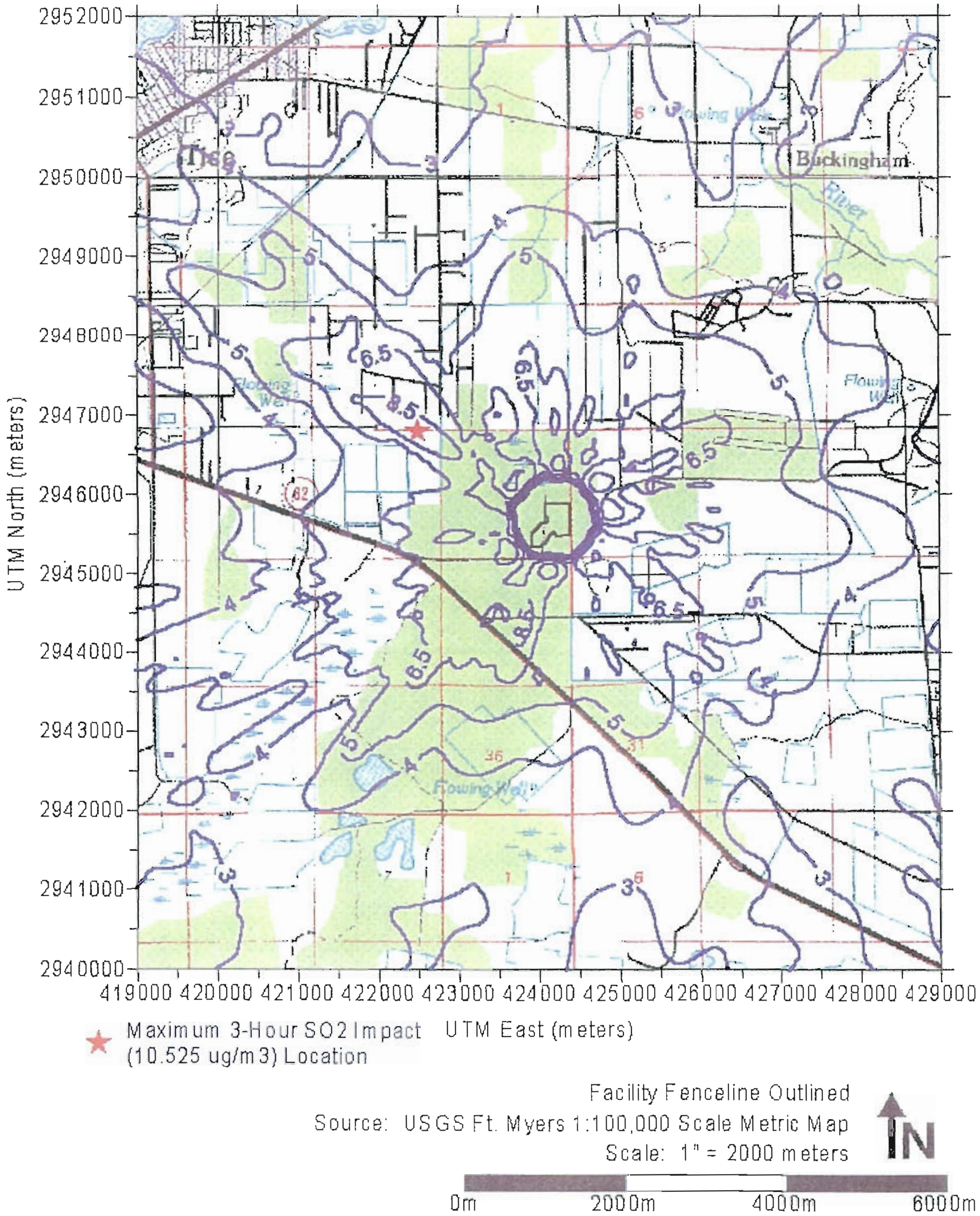
Facility Fenceline Outlined
Source: USGS Ft. Myers 1:100,000 Scale Metric Map
Scale: 1" = 2000 meters

FIGURE 6-6
MAXIMUM INCREASES IN FACILITY ANNUAL NO_X IMPACTS (ug/m^3)



Facility Fenceline Outlined
Source: USGS Ft. Myers 1:100,000 Scale Metric Map
Scale: 1" = 2000 meters

FIGURE 6-7
MAXIMUM INCREASES IN FACILITY 3-HOUR SO_2 IMPACTS (ug/m^3)



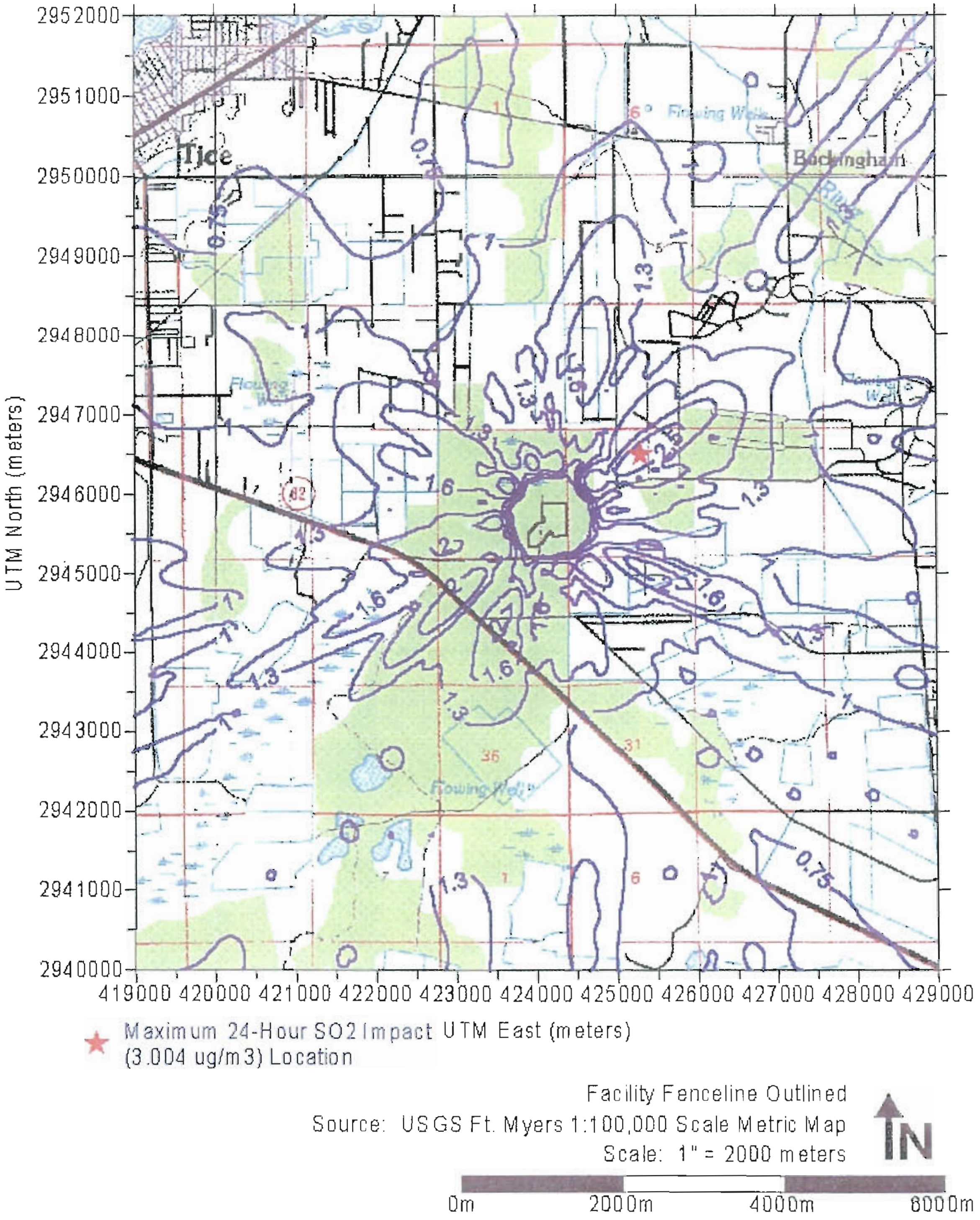
★ Maximum 3-Hour SO2 Impact (10.525 ug/m3) Location

Facility Fenceline Outlined

Source: USGS Ft. Myers 1:100,000 Scale Metric Map

Scale: 1" = 2000 meters

FIGURE 6-8
MAXIMUM INCREASES IN FACILITY 24-HOUR SO_2 IMPACTS (ug/m^3)

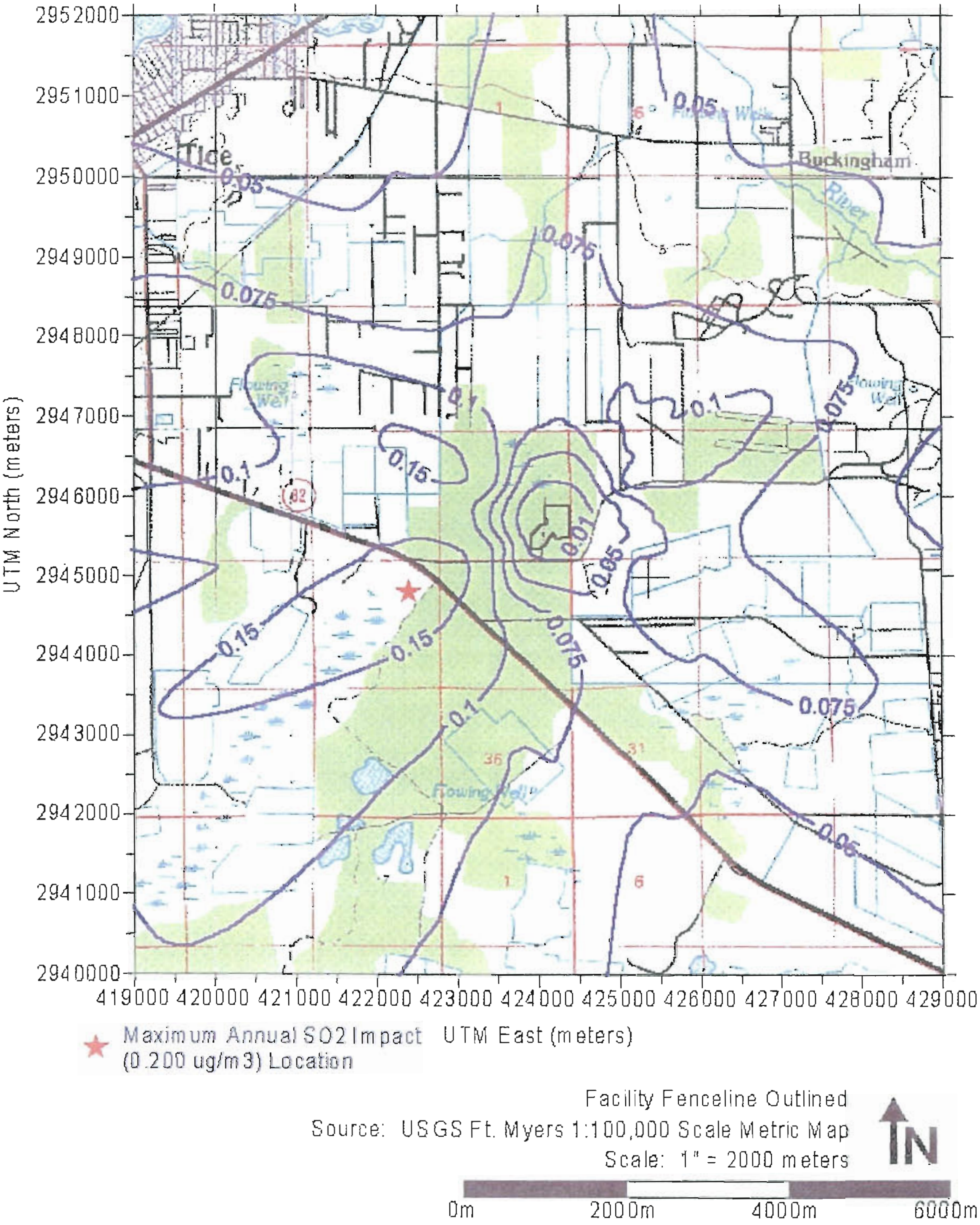


Facility Fenceline Outlined

Source: USGS Ft. Myers 1:100,000 Scale Metric Map

Scale: 1" = 2000 meters

FIGURE 6-9
MAXIMUM INCREASES IN FACILITY ANNUAL SO_2 IMPACTS (ug/m^3)



Facility Fenceline Outlined

Source: USGS Ft. Myers 1:100,000 Scale Metric Map

Scale: 1" = 2000 meters

a single existing unit. Similarly, maximum impacts for the two existing units are similar to impacts for one existing unit plus the proposed Unit 3. Included in the PM_{10} impacts for the worst-case scenarios are the minor PM sources. Maximum increases in 24-hour and annual facility PM_{10} impacts due to the new MWC unit (Case 6) including possible increases in minor PM source emissions are shown in Figures 6-10 and 6-11.

6.7 SIGNIFICANT IMPACT LEVELS

Maximum increases in facility impacts due to Unit 3 are compared on Table 6-7 to the USEPA SILs for Class II areas. Maximum increases in facility impacts are less than the Class II SILs for all criteria pollutants (PM_{10}, SO_2, NO_X, CO and Pb). Impacts are less than 10% of the SILs for CO, PM_{10} and Pb, about 20% of the SIL for NO_X, and 60% or less of the SILs for SO_2. Since SILs are concentrations below which impacts are indistinguishable from background concentrations, they are generally considered to be representative of insignificant or negligible impacts. Accordingly, the proposed modification would be considered insignificant with respect to local air quality (Class I impacts in the Everglades are addressed in Section 7). Therefore, no additional impact analyses are required under PSD regulations for any of these pollutants. Maximum combined facility impacts are also compared to the SILs on Table 6-7. Again, maximum impacts for the entire facility (i.e., existing and proposed MWC units) for all criteria pollutants are less than the SILs.

6.8 DE MINIMIS MONITORING LEVELS

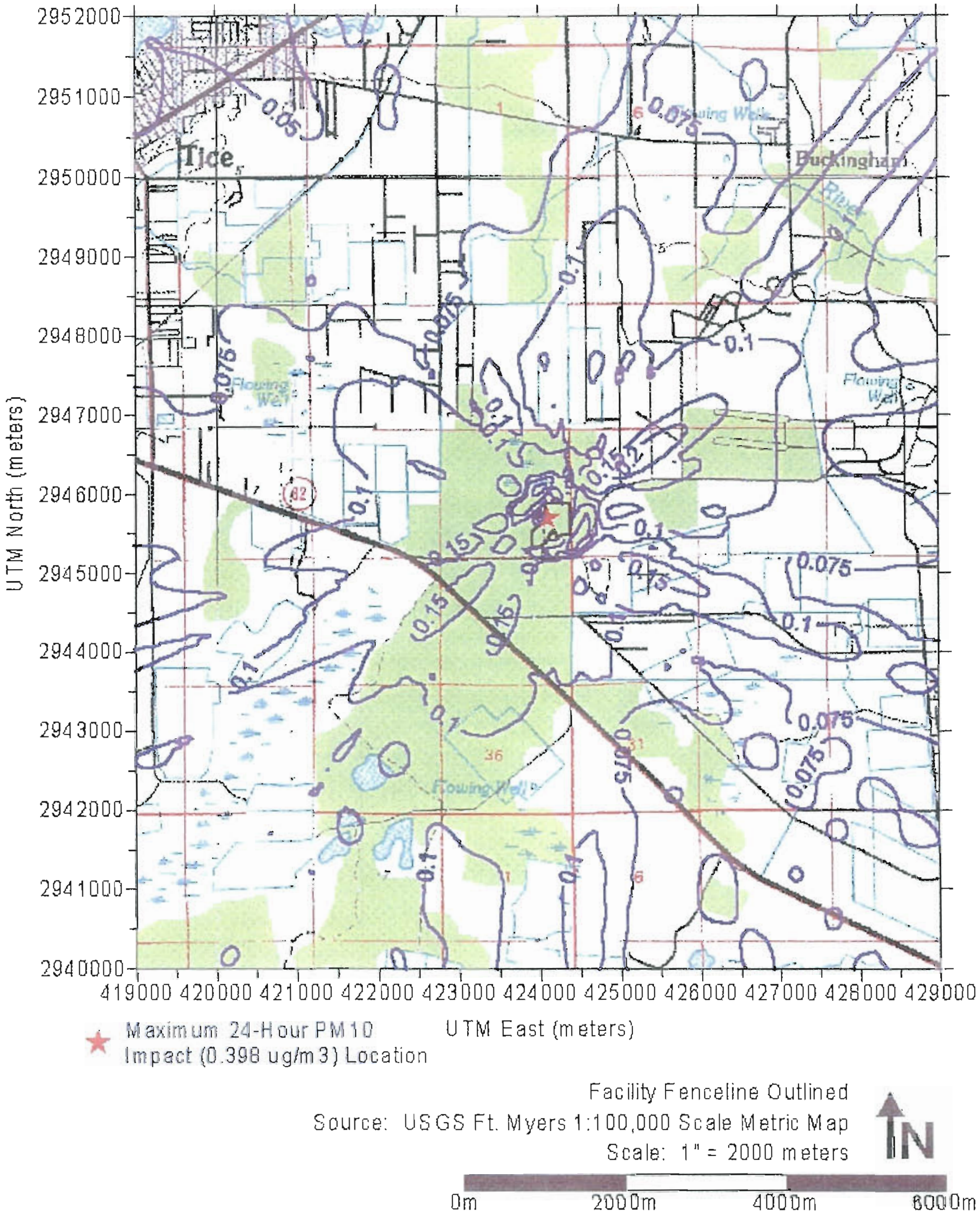
A proposed facility that is considered a major source under the PSD regulations is required to evaluate ambient air quality levels in the vicinity of the facility. One of the first assessments to be made is to evaluate whether ambient air quality monitoring will be required to define background air quality prior to submitting the air permit application.

Maximum increases in facility impacts due to the proposed MWC unit are compared on Table 6-8 to the USEPA de minimis monitoring levels. Maximum increases in facility impacts due to the new MWC are less than the de minimis monitoring levels for all applicable criteria and non-criteria pollutants. Since de minimis monitoring levels have been set near the lower detection limits for ambient monitoring equipment, preconstruction monitoring would not be useful because facility impacts would be difficult to detect. Therefore, no preconstruction monitoring would typically be required under PSD regulations and an exemption from ambient monitoring is requested. Maximum combined facility impacts are also compared to the de minimis monitoring levels on Table 6-8. Maximum impacts for the entire facility (i.e., existing and proposed MWC units) for all applicable pollutants are less than the de minimis monitoring levels.

6.9 PSD CLASS II INCREMENTS

Under the original 1970 Clean Air Act (CAA), major source growth was allowed as long as violations of the AAQS would not occur. In the CAA amendments of 1977, Congress included a detailed section on PSD, designed to preserve ambient air quality levels in

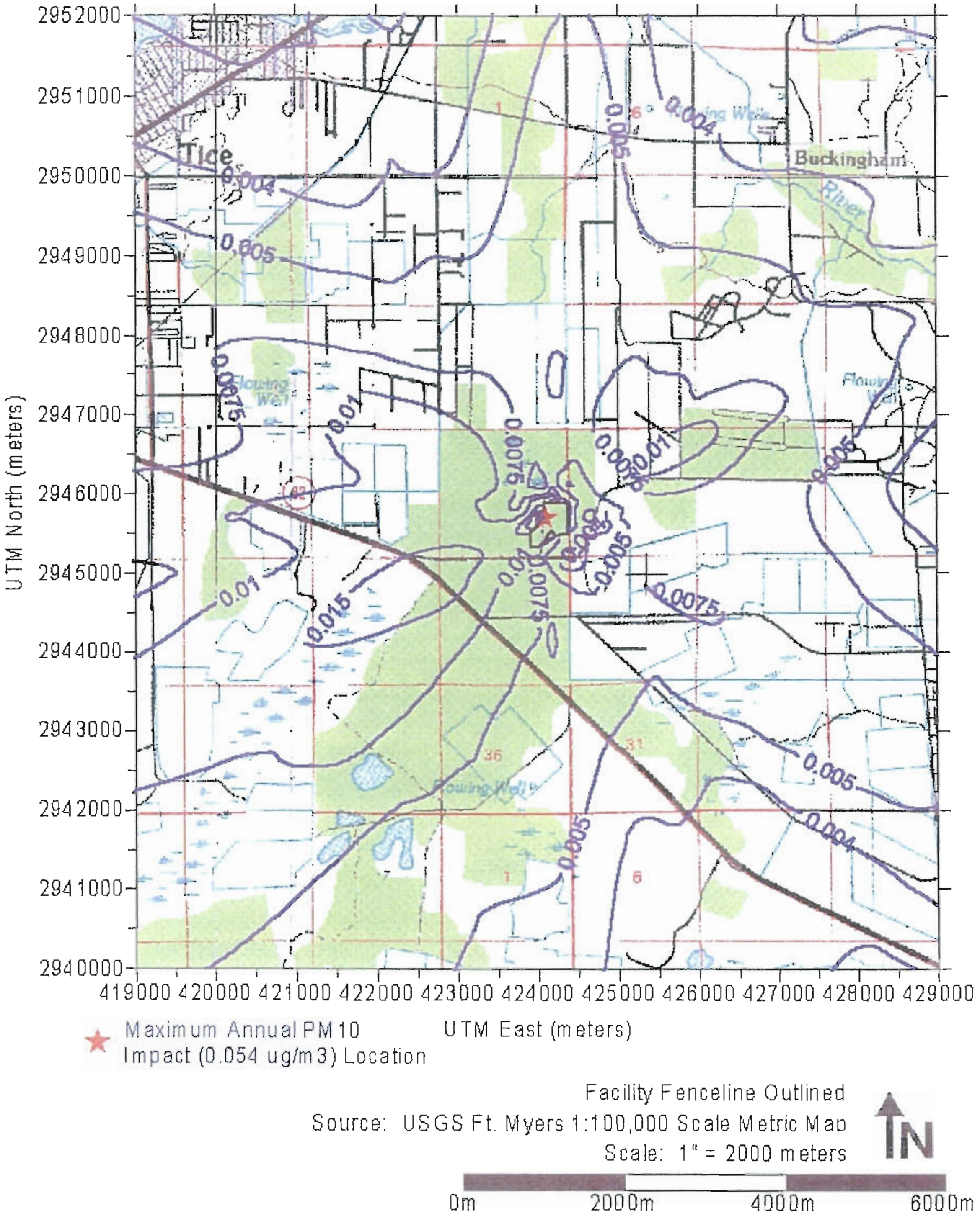
FIGURE 6-10
MAXIMUM INCREASES IN FACILITY 24-HOUR PM_{10} IMPACTS (ug/m^3)



★ Maximum 24-Hour PM10 Impact (0.398 ug/m3) Location

Facility Fenceline Outlined
Source: USGS Ft. Myers 1:100,000 Scale Metric Map
Scale: 1" = 2000 meters

FIGURE 6-11
MAXIMUM INCREASES IN FACILITY ANNUAL PM_{10} IMPACTS (ug/m^3)



★ Maximum Annual PM10 Impact (0.054 ug/m3) Location

Facility Fenceline Outlined

Source: USGS Ft. Myers 1:100,000 Scale Metric Map

Scale: 1" = 2000 meters

TABLE 6-7
COMPARISON OF MAXIMUM INCREASES AND FACILITY IMPACTS TO SIGNIFICANT IMPACT LEVELS

Pollutant	SILS[a] (ug/m^3)	Max Increase[b] for Proposed Unit (ug/m^3)	Percent of SIL	Max Impact[b] for Facility (ug/m^3)	Percent of SIL
CO 1-Hour	2000	11.662	0.6%	20.836	1.0%
CO 8-Hour	500	2.888	0.6%	5.607	1.1%
NO_x Annual	1	0.216	21.6%	0.436	43.6%
SO_2 3-Hour	25	10.525	42.1%	15.384	61.5%
SO_2 24-Hour	5	3.004	60.1%	4.355	87.1%
SO_2 Annual	1	0.200	20.0%	0.279	27.9%
PM_{10} 24-Hour	5	0.398	8.0%	1.177	23.5%
PM_{10} Annual	1	0.054	5.4%	0.161	16.1%
Pb Quarter[c]	0.03	0.0023	7.5%	0.0075	25.2%

---

[a] From Rules 62-204.200(29) (Definition of Significant Impact) and 62-210.200(232) (Definition of Significant Impact), F.A.C.

[b] Maximum short-term and long-term impacts.

[c] The maximum 24-hour modeled concentrations were used to conservatively determine compliance with quarterly value.

TABLE 6-8
COMPARISON OF MAXIMUM INCREASES AND FACILITY IMPACTS TO DE MINIMIS MONITORING LEVELS

Pollutant	De Minimis[a] Monitoring Level (ug/m^3)	Max Increase[b] for Proposed Unit (ug/m^3)	Percent of de Minimis	Max Impact[b] for Facility (ug/m^3)	Percent of de Minimis
CO 8-Hour	575	2.888	0.5%	5.607	1.0%
NO_x Annual	14	0.216	1.5%	0.436	3.1%
SO_2 24-Hour	13	3.004	23.1%	4.355	33.5%
PM_{10} 24-Hour	10	0.398	4.0%	1.177	11.8%
Pb Quarter[c]	0.1	0.0023	2.3%	0.0075	7.5%
Hg 24-Hour	0.25	0.0019	0.8%	0.0035	1.4%
HF 24-Hour	0.25	0.0328	13.1%	0.0779	31.2%
Be 24-Hour	0.001	1.8e-06	0.2%	3.35e-06	0.3%
Vinyl Chloride 24-Hour	15	No Vinyl Chloride Emissions are Expected from Existing or Proposed Units			
Total Reduced Sulfur 1-Hour	10	No Total Reduced Sulfur Emissions are Expected from Existing or Proposed Units			
Reduced Sulfur Compounds 1-Hour	10	No Reduced Sulfur Compounds Emissions are Expected from Existing or Proposed Units			
H_2S 1-Hour	0.2	No H_2S Emissions are Expected from Existing or Proposed Units			

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[a] From Table 62-212.400-3, F.A.C. (De Minimis Ambient Impacts) and 40 CFR 51.166(i)(8)(i). No de minimis air quality level is provided for ozone. However, any net increase of 100 tons per year (tpy) or more of volatile organic compounds (VOCs) is subject to preconstruction review and would be required to perform an ambient impact analysis, including the gathering of ambient air quality data. Since the proposed net increase of VOC is 21.6 tpy, no preconstruction monitoring should be required.

[b] Maximum short-term and long-term impacts.

[c] The maximum 24-hour modeled concentrations were used to conservatively determine compliance with the lead quarterly value.

areas which were appreciably better (i.e., ambient concentrations considerably less) than the AAQS. The PSD increments established the maximum allowable increase in pollutant concentrations above some assumed baseline level. Increases in source emissions at all sources (whether major PSD sources or minor sources) permitted or installed after the "baseline date" consume increment. PSD increments are promulgated for SO_2, NO_2, and PM_{10}. Unlike AAQS, PSD increments are not uniform everywhere.

Three classes of PSD areas, each with specific increments, were established. Class I increments are designed to protect pristine areas such as national parks or wilderness areas. The nearest PSD Class I area to the LCERF is Everglades National Park. A discussion of Class I impacts and increments for this area is contained in Section 7. Most areas in the United States are regulated by Class II increments, designed for moderate growth. Class III increments were developed to allow concentrated industrial growth in limited areas. However, no Class III areas have been designated to date and the vast majority of the United States, including the project vicinity, is classified as a PSD Class II area. Therefore, PSD Class II increments will be considered here.

The refined modeling analyses demonstrated that maximum increases in facility impacts due to the third unit would be negligible. Although not required by PSD modeling guidelines, high second-high short-term and maximum annual impacts are compared to PSD increments in the project vicinity (both with respect to increases due to the proposed MWC unit as well as combined facility impacts). These impacts are compared on Table 6-9 to the PSD Class II increments (Class I increments are addressed in Section 7). As can be seen, maximum increases in facility impacts are 2.4% or less of the applicable Class II increments and maximum facility impacts are 3.4% or less of the same increments. Therefore, pollutant impacts for all three MWC units represent only a small percentage of the total Class II PSD increments available in the project vicinity.

6.10 AMBIENT AIR QUALITY STANDARDS

The CAA of 1970 mandated promulgation of AAQS to protect the public health and welfare. As a result, the USEPA defined AAQS for a set of criteria pollutants which have been demonstrated historically to have the ability to cause widespread, adverse health impacts. "National primary ambient air quality standards define levels of air quality which the Administrator [of the USEPA] judges are necessary, with an adequate margin of safety, to protect the public health [state of general health of a community or population]" (40 CFR 50.2(b)). "National secondary ambient air quality standards define levels of air quality which the Administrator judges necessary to protect the public welfare [non-human features and ecosystems associated with the human environment] from any known or anticipated adverse effects of a pollutant" (40 CFR 50.2(b)). To more fully address facility compliance with AAQS, maximum background values must be considered. Baseline air quality data for the study area is described in Section 5 along with discussions on the forms of the various AAQS.

Although not required by PSD regulations, overall high second-high short-term and maximum annual impacts of the facility after the addition of the third unit are compared

TABLE 6-9
COMPARISON OF MAXIMUM INCREASES AND FACILITY IMPACTS TO PSD CLASS II INCREMENTS

Pollutant	Class II Increment[a] (ug/m^3)	Max Increase[b] for Proposed Unit (ug/m^3)	Percent of PSD Class II Increment	Max Impact[b] for Facility (ug/m^3)	Percent of PSD Class II Increment
NO_x Annual	25	0.216	0.9%	0.436	1.7%
SO_2 3-hour	512	9.061	1.8%	13.038	2.5%
SO_2 24-hour	91	2.168	2.4%	3.112	3.4%
SO_2 Annual	20	0.200	1.0%	0.279	1.4%
PM_{10} 24-hour	30	0.276	0.9%	0.814	2.7%
PM_{10} Annual	17	0.054	0.3%	0.161	0.9%

---

[a] From Rule 62-204.260(2), F.A.C (Prevention of Significant Deterioration Increments).

[b] Based on high second-high short-term and maximum long-term impacts.

on Table 6-10 to AAQS. As shown on the top of Table 6-10, maximum increases in facility impacts are less than 1% of the AAQS for all modeled pollutants. Maximum facility impacts after construction of the third unit are less than 2% of the AAQS as shown on the bottom of Table 6-10. As is typical with most sources, background levels are much greater than maximum modeled impacts for the facility. However, even after appropriate maximum baseline concentrations determined in Section 5 are added to the facility's impacts, compliance with the AAQS is still indicated by a wide margin.

Maximum combined facility impacts (i.e., existing and proposed MWC units including background) range from 1% (quarterly Pb) to 64% (8-hour CO) of the applicable AAQS. Thus, no AAQS are in risk of contravention due to facility emissions combined with maximum measured baseline values. As discussed above, maximum impacts are predicted to be less than the SILs in all Class II areas. Therefore, the facility will not cause or significantly contribute to existing or potential AAQS violations, regardless of their location.

6.11 AMBIENT REFERENCE CONCENTRATIONS

Section 6.10 and Table 6-10 compare the maximum increases in facility impacts to AAQS promulgated by the USEPA and State of Florida. At the request of USEPA Region IV, maximum air quality impacts of the proposed modification were also addressed for pollutants without AAQS (termed "non-criteria pollutants). The Florida Air Toxics Working Group developed a list of ARCs for a large number of non-criteria pollutants based on a number of widely accepted reference sources. Ambient air concentrations less than the applicable ARC were deemed to pose no meaningful risk to human health. While the FDEP has ruled that the ARCs are not rules and hence do not have any statutory or legal authority (March 1, 2000 DARM-PER-28 guidance memo), they are still useful for evaluating the magnitude of non-criteria pollutant impacts.

Non-criteria pollutant impacts are compared to the latest available ARCs from the Florida Air Toxics Working Group on Table 6-11. Maximum increases in facility impacts due to the proposed unit were calculated using the equation presented in Section 6.5 with the Case 4 emissions on Table 6-2 and the maximum 8-hour, 24-hour, and annual "unitized" impacts on the top of Table 6-3 for all six cases (1-6). Maximum facility impacts including existing and proposed MWC units were calculated using the equation presented in Section 6.6 with the Case A through Case F emissions on Table 6-4 and the maximum 8-hour, 24-hour, and annual "unitized" impacts on the top of Table 6-5 for all six cases (A-F). The overall maxima for all six cases modeled (i.e., Cases 1 to 6 for the new MWC unit and Cases A to F for the overall facility) are shown in Table 6-11. Maximum increases in facility impacts due to the proposed MWC unit are less than one-third of the ARC for sulfuric acid mist (SAM or H_2SO_4) and less than 13% of the ARC for hydrochloric acid (hydrogen chloride or HCl). Maximum impacts for all other pollutants are less than 10% of the ARC. Maximum facility impacts after construction of Unit 3 are also less than one-half of the ARCs for all pollutants and averaging times. Since the ARCs were developed from a wide variety of references and include conservative safety factors when appropriate (e.g., occupational exposure levels), construction and operation

TABLE 6-10
COMPARISON OF MAXIMUM INCREASES AND FACILITY IMPACTS TO AMBIENT AIR QUALITY STANDARDS

MAXIMUM INCREASES (ug/m^3) DUE TO PROPOSED UNIT

Pollutant	AAQS[a] (ug/m^3)	Baseline (ug/m^3)	Max Increase[b] for Proposed Unit (ug/m^3)	Percent of AAQS	Increase + Baseline (ug/m^3)	Percent of AAQS
CO 1-Hour	40,000	12,535	6.754	0.02%	12,542	31.35%
CO 8-Hour	10,000	6,440	2.441	0.02%	6,442	64.42%
NO_x Annual	100	19	0.216	0.22%	19.2	19.22%
SO_2 3-Hour	1,300	149	9.061	0.70%	158	12.16%
SO_2 24-Hour	260	50	2.168	0.83%	52	20.06%
SO_2 Annual	60	8	0.200	0.33%	8.2	13.67%
PM_{10} 24-Hour	150	28	0.276	0.18%	28.3	18.87%
PM_{10} Annual	50	19	0.054	0.11%	19.1	38.20%
Pb Quarter[c]	1.5	0.01	0.0023	0.15%	0.012	0.82%

MAXIMUM IMPACTS (ug/m^3) FOR COMBINED FACILITY

Pollutant	AAQS[a] (ug/m^3)	Baseline (ug/m^3)	Max Impact[b] for Facility (ug/m^3)	Percent of AAQS	Facility + Baseline (ug/m^3)	Percent of AAQS
CO 1-Hour	40,000	12,535	12.431	0.03%	12,547	31.37%
CO 8-Hour	10,000	6,440	4.234	0.04%	6,444	64.44%
NO_x Annual	100	19	0.436	0.44%	19.4	19.40%
SO_2 3-Hour	1,300	149	13.038	1.00%	162	12.46%
SO_2 24-Hour	260	50	3.112	1.20%	53	20.38%
SO_2 Annual	60	8	0.279	0.47%	8.3	13.83%
PM_{10} 24-Hour	150	28	0.814	0.54%	28.8	19.20%
PM_{10} Annual	50	19	0.161	0.32%	19.2	38.40%
Pb Quarter[c]	1.5	0.01	0.0075	0.50%	0.018	1.20%

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[a] The most restrictive AAQS between the Florida AAQS (Rule 62-204.240, F.A.C.) and National AAQS (40 CFR 50) are used.

[b] Based on high second-high short-term and maximum long-term impacts.

[c] The maximum 24-hour modeled concentrations were used to conservatively determine compliance with quarterly value.

TABLE 6-11
COMPARISON OF MAXIMUM INCREASES AND FACILITY IMPACTS TO AMBIENT REFERENCE CONCENTRATIONS

Pollutant	ARCs[a] (ug/m^3)	Max Increase[b] for Proposed Unit (ug/m^3)	Percent of ARC	Max Impact[b] for Facility (ug/m^3)	Percent of ARC
HCl 8-Hour	70	4.701	6.7%	5.530	7.9%
HCl 24-Hour	17	2.138	12.6%	2.419	14.2%
HCl Annual	7	0.142	2.0%	0.155	2.2%
Cd 8-Hour	0.02	4.97e-04	2.5%	1.59e-03	7.9%
Cd 24-Hour	0.005	2.26e-04	4.5%	6.95e-04	13.9%
Cd Annual	0.00056	1.50e-05	2.7%	4.45e-05	8.0%
Pb 8-Hour	0.5	4.97e-03	1.0%	1.72e-02	3.4%
Pb 24-Hour	0.1	2.26e-03	2.3%	7.55e-03	7.5%
Pb Annual	0.09	1.50e-04	0.2%	4.83e-04	0.5%
Hg 8-Hour	0.1	4.28e-03	4.3%	7.98e-03	8.0%
Hg 24-Hour	0.02	1.94e-03	9.7%	3.49e-03	17.5%
Hg Annual	0.3	1.30e-04	0.04%	2.24e-04	0.07%
TCDD[c] Annual	2.2e-08	1.96e-10	0.9%	6.52e-10	3.0%
HF 8-Hour	26	0.072	0.3%	0.178	0.7%
HF 24-Hour	6.2	0.033	0.5%	0.078	1.3%
Be 8-Hour	0.02	3.96e-06	0.02%	7.65e-06	0.04%
Be 24-Hour	0.005	1.80e-06	0.04%	3.35e-06	0.07%
Be Annual	0.00042	1.20e-07	0.03%	2.14e-07	0.05%
SAM 8-Hour	10	1.687	16.9%	2.458	24.6%
SAM 24-Hour	2.4	0.767	32.0%	1.075	44.8%
As 8-Hour	0.1	2.66e-04	0.3%	5.16e-04	0.5%
As 24-Hour	0.02	1.21e-04	0.6%	2.26e-04	1.1%
As Annual	0.00023	8.06e-06	3.5%	1.45e-05	6.3%
NH_3 8-Hour	170	0.877	0.5%	1.699	1.0%
NH_3 24-Hour	41	0.399	1.0%	0.743	1.8%
NH_3 Annual	100	0.027	0.03%	0.048	0.05%

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[a] From Version 4.0 Ambient Reference Concentration (ARCs) (FDEP, 1995b) list developed by the Florida Air Toxics Working Group. The ARC list is based on occupational exposure levels developed by ACGIH and OSHA with appropriate safety factors, BIF levels, and USEPA IRIS risk factors and reference concentrations.

[b] Maximum short-term and long-term impacts.

[c] 2378-TCDD Toxic Equivalent (TEQ) emissions estimated as 2% of total PCDD/PCDF emissions based on the average of available stack test data for the two existing LCERF units.

of the new and existing units would not be expected to significantly impact human health in the project vicinity. A more detailed human health risk assessment which considers additional modes of exposure and other parameters is contained in the Power Plant Siting Act (PPSA) application for Unit 3. An ecological risk assessment of the impact of the LCERF on wildlife and other ecological values is also contained in the PPSA application.

LEE COUNTY ENERGY RECOVERY FACILITY
PREVENTION OF SIGNIFICANT DETERIORATION
APPLICATION FOR MUNICIPAL WASTE COMBUSTOR UNIT 3

SECTION 7
ADDITIONAL IMPACT ANALYSES

Revised February 17, 2003

SECTION 7
ADDITIONAL IMPACT ANALYSES

In previous sections, the Lee County Energy Recovery Facility (LCERF) emissions increases and maximum impacts on local air quality concentrations were calculated in order to demonstrate that emissions from the proposed modification will comply with all applicable air quality and engineering standards (e.g., ambient air quality standards [AAQS], Prevention of Significant Deterioration [PSD] increments, Best Available Control Technology [BACT], etc.). The applicant is required to submit, as part of the PSD permit application, additional impact analyses for each PSD pollutant subject to preconstruction review. The additional analyses specified in 40 CFR 51.166(o) are to determine:

- An analysis of the impairment to visibility, soils, and vegetation having significant commercial or recreational value that would occur as a result of the modification and general commercial, residential, industrial, and other growth associated with the modification.
- An analysis of the air quality impact projected for the area as a result of general commercial, residential, industrial, and other growth associated with the modification.

These additional analyses of impacts from the proposed modification on air quality in the project vicinity are addressed in the next three sections. At the request of the Department, included is an assessment of minor source growth since August 7, 1977 as mentioned in 40 CFR 51.166(n)(3)(ii). In addition, an assessment of impacts during startup, shutdown, and malfunction conditions is addressed in Section 7.4. A summary of the ISCST3 modeling analyses of concentrations and deposition rates performed for the risk assessments in the Power Plant Siting Act (PPSA) application is given in Section 7.5.

Air Quality Related Values (AQRVs) for nearby Class I areas are addressed in Section 7.6 (PSD Class I Analysis). These include CALPUFF analyses to determine maximum impacts, deposition rates, and visibility impairment for comparison to Class I significance levels in the Everglades National Park.

7.1 LOCAL VISIBILITY IMPACTS

As discussed in Section 6 (Air Quality Impact Analyses), the proposed modification consists of adding Unit 3 to the two existing units. Pollutant emissions from the proposed unit will be exhausted from a third flue in the existing concrete stack shell which contains the two existing municipal waste combustor (MWC) flues. Particulate matter (PM) emissions from other existing Title V emission units at the LCERF (lime silo and ash building baghouse vent) are extremely small, as shown in Section 6, and would not be expected to cause visible emissions. Thus, local visibility issues are most likely to be due to MWC emissions and the associated 276-foot stack.

Pollutants have specific effects upon visibility within the atmosphere. The primary pollutants of concern for visibility are PM and nitrogen oxides (NO_X). PM can both scatter and absorb light, resulting in plumes which can be lighter or darker than the viewing background. Emissions of NO_X consist mostly of nitric oxide (NO) with smaller amounts (less than 10%) of nitrogen dioxide (NO_2) and other NO_X species. While NO is colorless, NO_2 can form a plume that is perceived of as yellow under certain viewing conditions. NO emissions eventually react to form NO_2 but at considerable distances. Thus, PM rather than NO_X is of primary concern when considering local visibility impacts.

In this case, visible PM emissions will not occur because Unit 3 will use a fabric filter (FF) baghouse and will comply with an emission limit of 0.009 gr/dscf corrected to 7% O_2. While bag failures can result in visible emissions, the air pollution control (APC) system is closely monitored and bag malfunctions are typically detected and corrected before visible emissions occur. Other emissions, such as acid gases, could possibly react with ammonia slip from the SNCR system and cause visible plumes in the immediate vicinity of the stack.

The addition of a third flue to the stack shell would increase the amount of emissions by roughly 50% but not the pollutant concentration in the plume (because emission limits based on stack gas concentrations are similar for proposed and existing units). Thus, potential increases in plume visibility would be due only to a slightly greater plume depth and not increases in pollutant concentrations.

Operation of the current units shows that a visible plume due to pollutant emissions occurs very rarely. Continuous opacity measurements (COM) greater than 5% opacity (based on six-minute averages) occur about 0.0057% of the time, which translates to about 5 hours per year. Thus, the chance of observing a visible plume due to primary pollutant emissions of PM or NO_2 is small. The addition of a third MWC unit would not be expected to appreciably increase the severity or frequency of a visible plume in the project vicinity.

A visible plume due to condensed water vapor is seen more frequently, based on visual observations of the stack during the past eight years of operation. A vapor plume may appear 100 days per year, typically in the winter and on mornings between 6 and 9 a.m. The vapor plume appears within 50 feet of the stack and causes a short water vapor plume which extends from 100 to 500 feet downwind and then rapidly dissipates. The vapor plume is caused by the moisture content, or humidity, of the flue gas. The flue gas moisture is from three sources: 1) MSW, 2) combustion air, and 3) water evaporated from the spray dry absorber (SDA). The SDA is essential in controlling not only acid gases (e.g., 80% and 95% reduction of SO_2 and HCl, respectively), but the water in the slurry spray also rapidly cools the exhaust gases helping to minimize dioxin/furan formation and aiding in the capture and control of mercury. For these reasons, the use of water is an integral part of the APC system to significantly reduce pollutant emissions.

In the original PPSA application, field analyses were performed using a hovering helicopter (CDM, 1990a) which showed that a 400-foot stack would be visible for up to 2.5 miles from the LCERF, depending on the direction and in the absence of vegetation and other obstructions. When considering vegetation and other obstructions, the stack would not be visible in some directions past 1.5 miles. Given that the actual stack built is 276-feet high, the area where the stack and small water vapor plume would be visible is limited to the immediate facility vicinity (probably less than 1.5 miles). Impacts of the proposed modification on visibility in nearby Class I areas are described later.

7.2 MINOR SOURCE GROWTH

Minor source growth for the project was assessed in two ways. The secondary impacts of the proposed source on local air quality is assessed as required in 40 CFR 51.166(o). An analysis of population growth and other factors is also considered to qualitatively assess the amount of PSD increment consumption by minor sources since August 7, 1977 as mentioned in 40 CFR 51.166(n)(3)(ii).

Secondary impacts of the proposed source on local air quality are related to the increase in population due to facility employment and the attraction of support industries. The LCERF currently employs about 50 persons. An additional nine persons will be required when construction of the new unit is completed. This increase of nine persons represents only 0.002% of the current Lee County population of 440,888 (U.S. Census Bureau, 2002). Since many of the new workers will likely be hired from the surrounding community, any increase in local population would be insignificant to local air quality. Construction of the new unit will take approximately 24 months and require an additional 50 to 70 persons onsite on average with a maximum number of about 100 additional persons onsite at any one time (only 0.02% of Lee County's population). Any impacts on local population, if any, would be temporary.

Waste disposal rates for Lee and Hendry Counties currently exceed existing facility capacity on average. In addition, future increases in population are likely to increase the need for additional capacity. Therefore, a third unit is proposed to meet current and future capacity requirements in an environmentally sound manner. Given that Lee County has one of the highest recycling rates in Florida, it is unlikely that increases in recycling rates alone would eliminate the need for additional capacity. These issues are discussed in more detail in the LCERF Materials Separation Plan. Municipal solid waste (MSW) generation rates in the two counties will be unaffected by whether a new unit is built or not. Therefore, no significant expansion of industry or secondary support services is expected for operation of Unit 3.

Currently, approximately 250 trucks per day visit the LCERF to dispose of MSW. As noted above, MSW generation rates will be unaffected by the new unit. If a new MWC unit is not constructed, excess MSW will need to be transported to regional landfills. In that event, a transfer station would likely be constructed at the facility site. Thus, there would be no change in inbound trucks. However, there would be an increase in outbound trucks (MSW vs. ash). Therefore, the new unit will actually decrease truck traffic and truck-related emissions in the general project area. For these reasons, it is unlikely that the new unit will cause any appreciable deterioration of local air quality due to secondary sources or minor source growth and may actually improve local air quality.

At the request of the Florida Department of Environmental Protection (FDEP), a qualitative analysis has been performed of minor source growth and PSD increment consumption since the August 7, 1977 (effective date of PSD program and increments). The PSD minor source baseline dates in Florida are December 27, 1977 for PM and SO_2 and March 28, 1988 for NO_2 (Rule 62-204.360, F.A.C.). Since the baseline dates, any increases in ambient pollutant concentrations due to major or minor sources consume PSD increment. Conversely, any decreases in ambient pollutant concentrations would expand PSD increments. Since PSD increments are less than the AAQS, PSD increments typically restrict air quality deterioration in areas with baseline air quality considerably better (i.e., appreciably smaller) than the AAQS.

Lee County population[a] during 1977, 1988, and 2000 was 175251, 309144, and 440888 persons, respectively. Thus, there were large increases in Lee County's population of about 150% and 45% since the PM/SO_2 and NO_2 baseline dates, respectively. Lee County manufacturing employment[b] during the same years was 3207, 5771, and 7181 persons, respectively -- a 125% increase since the PM/SO_2 baseline dates and a 25% increase since the NO_2 baseline date. As a percentage of population, manufacturing employment has dropped from around 1.85% in 1977 and 1988 to 1.6% in 2000.

Based on population and manufacturing figures alone, it would appear that consumption of the Class II PSD increments by minor PSD sources is about 1.5 and 0.5 times the original baseline concentrations in 1977 for PM/SO_2 and in 1988 for NO_2. However, this does not consider other factors that affect emissions and air quality impacts. First, transportation emissions from automobiles and trucks have decreased sharply since 1977. These decreases in mobile source emissions generally offset any increases due to nationwide increases in vehicle-miles traveled. Also, manufacturing employment as a percentage of population has also decreased. Since industrial emissions are usually second overall to transportation emissions, this would suggest little Class II PSD increment consumption by major sources. Further, air quality regulations such as PSD, maximum achievable control technology (MACT), Title IV, and the Emission Guidelines have decreased permitted emission rates for many major PSD sources (both existing sources such as the LCERF and PSD modifications such as the Florida Power & Light Company's Fort Myers Repowering Project) and possibly expanded Class II PSD increments.

Ambient air quality monitoring data available since the baseline dates also support the conclusion that the Class II PSD increments has remained the same or expanded since the baseline dates. Due to the cost of monitoring, the length of time since the baseline dates, and the change in PM measurement methods from TSP to PM_{10}, it is difficult to obtain a complete record between 1977/1988 and 2000. However, some limited monitoring data

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[a] Linear interpolation of 1970, 1980, 1990, and 2000 census data.

[b] Florida Labor Market Statistics (Corbin, 2002b).

representative of Lee County are available for some period of time at the same location for the three PSD increment pollutants. Available historic monitoring data (high second-high short-term and maximum annual ambient concentrations in ug/m^3 over three calendar years, if available) are compared below:

TSP 24-Hour High Second-High Concentration (ug/m^3)

Charlotte County (3760-002)	48(94-96)-59(84-86) = -10 ug/m^3/10 yrs
Lee County (1300-005)	80(92-94)-70(84-86) = +10 ug/m^3/8 yrs

TSP Annual Maximum Geometric Mean Concentration (ug/m^3)

Charlotte County (3760-002)	20(94-96)-27(84-86) = -7 ug/m^3/10 yrs
Lee County (1300-005)	26(92-94)-30(84-86) = -4 ug/m^3/8 yrs

SO_2 3-Hour High Second-High Concentration (ug/m^3)

Sarasota County (4100-010)	242(90-92)-208(84-86) = +34 ug/m^3/6 yrs
Sarasota County (4100-012)	291(90-92)-278(84-86) = +13 ug/m^3/6 yrs

SO_2 24-Hour High Second-High Concentration (ug/m^3)

Sarasota County (4100-010)	101(90-92)-137(84-86) = -36 ug/m^3/6 yrs
Sarasota County (4100-012)	62(90-92)- 85(84-86) = -23 ug/m^3/6 yrs

SO_2 Annual Maximum Arithmetic Mean Concentration (ug/m^3)

Sarasota County (4100-010)	7(90-92)-11(84-86) = -4 ug/m^3/6 yrs
Sarasota County (4100-012)	8(90-92)- 5(84-86) = +3 ug/m^3/6 yrs

NO_2 Annual Maximum Arithmetic Mean Concentration (ug/m^3)

Pinellas County (3980-018)	30(98-00)-30(84-85) = +0 ug/m^3/14 yrs

Hence, while population and manufacturing employment increases would suggest that PSD increment consumption has occurred since the baseline date, trends in mobile and point source emissions and ambient air quality data suggest little PSD increment consumption since the baseline dates.

As shown in Section 6.9, maximum increases in facility impacts in the project vicinity due to the proposed modification are less than 2.5% of the PSD Class II increments for all pollutants and averaging times. Total facility impacts for both existing and proposed units are less than 3.5% of the PSD Class II increments. Since maximum increases in facility impacts were less than the significant impact levels (SILs) for all pollutants and averaging times, no additional multisource modeling analyses for major sources were required to show overall compliance with AAQS or PSD increments.

7.3 SOILS AND VEGETATION

PSD regulations require analysis of the impact to soils and vegetation having significant commercial or recreational value that would occur due to emissions from the proposed PSD modification. Atmospheric pollutants emitted in PSD significant emission rates from the proposed modification include NOx, sulfur dioxide (SO_2), PM, and carbon monoxide (CO). At extreme levels, these contaminants may cause direct damage to plant tissue and may result in deposition of chemicals into surrounding soils.

The significance of the impacts to soils and vegetation depends primarily on the atmospheric concentration levels of these pollutants as well as on the types of plants grown and the land use patterns in the surrounding area. Since maximum increases in facility impacts for the proposed modification occur in the immediate project vicinity, agricultural statistics and other information were summarized for Lee County (U.S. Department of Agriculture, 1997). Approximately 25% of the land in Lee County is devoted to agricultural production. Approximately 500 farms make up a total of 129,000 acres in the county, producing agricultural products with an annual market value in excess of $116 million.

There are approximately 25,000 acres of harvested cropland, 75,000 acres of pasture land for livestock, 13,000 acres of woodland, and 14,000 acres in orchards. Major crops grown in the county include vegetables, sweet corn, and melons (47% of the total market value of Lee County agricultural products sold, ranking as the eighth county in Florida); nursery and greenhouse crops (31% of the total Lee County market value, ranking tenth in the state); and fruits, nuts, and berries (16% of the total Lee County market value, for a county ranking of 18th in the state). Despite the number of acres devoted to pasture land, the market value of livestock is only 2% of the total market value of Lee County agricultural products sold (ranking 43rd in the state). Other uses of the land which could potentially experience significant impacts include parkland and other open areas within the County of recreational value that contain significant amounts of vegetation and exposed soils.

Historically, the majority of vegetative impacts due to air contaminants have resulted from elevated atmospheric concentrations of SO_2. At extreme levels, emissions of this contaminant can cause direct damage to plant tissue. The maximum 3-hour SO_2 impact due to facility emissions after the proposed modification is 15.4 ug/m^3 (Cases C through F on Table 6-5), well below the level at which plant damage has been observed. Therefore, no significant adverse impacts to vegetation due to SO_2 emissions from the modification are expected to occur.

Two additional pollutants which could potentially have harmful impacts on area vegetation include NO_X and CO. Neither of these gases is toxic to plants except in very high concentrations. The literature on NO_2 suggests the following injury threshold doses of NO_2 on plants (Dames & Moore, 1981):

- No effect for concentrations less than 10 ppm (18,800 ug/m^3) and exposures of 1 to 600 hours.
- Leaf symptoms for concentrations between 10 and 300 ppm (18,800 to 564,000 ug/m^3) and exposures of ½ to 600 hours.
- Death for concentrations between 300 and 500 ppm (564,000 to 940,000 ug/m^3) and exposures of 3/4 to 2 hours.

The threshold concentration for visible effects of NO_2 on vegetation is therefore about 335 times higher than the maximum 1-hour NO_X facility impact of 56 ug/m^3 predicted for the facility after the proposed modification (calculated for Cases C through F using the equation in Section 6.6, the NOx emission rates on Table 6-4, and the 1-hour maximum "unitized" impacts on the top of Table 6-5).

CO requires even higher concentrations to elicit injury in plants. According to Dames & Moore (1981), the following injury threshold levels apply:

- No effect for concentrations less than 100 ppm (115,000 ug/m^3) and exposures for 1 to 3 weeks.
- Epinasty at levels greater than 500 ppm (575,000 ug/m^3).
- Chlorosis and leaf abscission occur at 10,000 ppm (11,500,000 ug/m^3) in sensitive plants, but tolerant plants require more than 10 times this concentration to produce the same symptoms.

Thus, the threshold concentration for visible effects is 5,500 times greater than the maximum 1-hour CO impact of 20.8 ug/m^3 predicted for the facility after the proposed modifications (Cases C through F on Table 6-5).

The impact of emission levels on soils is also not expected to cause any harmful effects. The potential for changes in rainfall pH due to the formation of sulfuric and nitric acid in the atmosphere from facility emissions of SO_2 and NO_X is minor given the expected maximum annual ambient air concentrations of SO_2 and NO_x due to facility emissions of 0.3 and 0.4 ug/m^3, respectively. According to the literature, there is no evidence of any significant impacts of gaseous NO_X on soil microorganisms. Negative impacts of CO on soil microorganisms have only been observed at levels significantly greater than those being emitted by this facility. These effects include inhibition of nitrogen fixation by soil microorganisms and increased utilization of CO by soil microorganisms (Dames & Moore, 1981). Inhibition of nitrogen fixation has been observed only when CO concentrations are in excess of 2,000,000 ug/m^3, a level more than 96,000 times the maximum 1-hour facility impact of 20.8 ug/m^3 (Cases C through F on Table 6-5). Soils function as a major sink for atmospheric CO, primarily due to uptake and metabolism of CO by soil fungi. At the levels expected, facility emissions of CO are not expected to result in any significant changes to local soils or the productivity of these microorganisms. Therefore, no significant impacts from the modification are anticipated on soils.

The impacts of PM and heavy metals including lead (Pb) on soils and vegetation are also expected to be insignificant due to the low predicted concentrations of these air contaminants. Studies have shown that urban areas with higher Pb soil concentrations than those likely to occur in Lee County have observed no detectable effect on produce or on human consumers of these foods (RTP Environmental Associates, Inc., 1986).

Potential impacts on soils and vegetation have been evaluated due to facility emissions of both criteria and non-criteria (trace element) pollutants. Proposed emissions for the new unit as well as combined (proposed + existing) emissions for the entire future facility have been shown in Section 6.10 of this permit application not to interfere with the maintenance of AAQS. Since one of the factors used in developing the secondary AAQS was the prevention of significant adverse impacts on soils and vegetation, facility compliance with the AAQS also indicates that no significant adverse impact on soils and vegetation will occur. A more detailed ecological risk assessment of the proposed modification is also contained in the PPSA application.

7.4 STARTUP, SHUTDOWN, AND MALFUNCTION CONDITIONS

The U.S. Environmental Protection Agency (USEPA) has recognized that the New Source Performance Standard (NSPS) emission standards for MWCs can only be met under steady state conditions and by employing "Good Combustion Practices (GCP)." During periods of startup, shutdown, and malfunction (S/S/M) conditions, the NSPS emission limits do not apply as follows (40 CFR Part 60.58b(a) and November 16, 2001 Federal Register at 66 FR 57824):

- The NSPS emission "standards under this subpart apply at all times except during periods of startup, shutdown, or malfunction. Duration of startup, shutdown, or malfunction periods are limited to 3 hours per occurrence, except as provided" next.

- "For the purpose of compliance with the [NSPS] CO emission limits, if a loss of boiler water level control (e.g., boiler waterwall tube failure) or a loss of combustion air control (e.g., loss of combustion air fan, induced draft fan, combustion grate bar failure) is determined to be a malfunction, the duration of the malfunction period is limited to 15 hours per occurrence."

- "The startup period commences when the affected facility begins the continuous burning of municipal solid waste and does not include any warm-up period when the affected facility is combusting fossil fuel or other non-municipal solid waste fuel, and no municipal solid waste is being fed to the combustor."

- "Continuous burning is the continuous, semicontinuous, or batch feeding of municipal solid waste for purposes of waste disposal, energy production, or providing heat to the combustion system in preparation for waste disposal or energy production. The use of municipal solid waste solely to provide thermal protection of the grate or hearth during the startup period when municipal solid waste is being fed to the grate is not considered to be continuous burning."

These exclusionary periods were included in the MWC standards and guidelines since operation during these periods is unstable, transitory in nature, and outside the normal control range of the equipment. However, the NSPS language does not relieve the owner or operator from the requirement at 40 CFR 60.11(d) of the NSPS general provisions which require:

- "At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the maximum extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions."

The NSPS language also does not alter the definition of malfunction included in 40 CFR 60.2 (Definitions) of the NSPS general provisions which is:

- "...any sudden, infrequent, and not reasonably preventable failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner. Failures that are caused in part by poor maintenance or careless operation are not malfunctions."

While malfunctions do occur at MWCs due to the complexity of the MWC and air pollution control (APC) equipment (i.e., spray dry absorber, fabric filter baghouse, selective non-catalytic reduction (SNCR), and activated carbon injection), every precaution must be taken to minimize the frequency and severity of malfunctions. The LCERF has standard procedures to maintain the integrity and reliability of capital equipment and processes including: 1) a preventative maintenance program; 2) inspections of key components on each shift; and 3) scheduled outages for internal inspection of equipment. Each of these tasks are designed to maintain the integrity of the LCERF and thereby avoid unnecessary S/S/M.

The following analyses are provided to document that the facility will continue to comply with the AAQS even during S/S/M periods. Short-term AAQS would be of concern, which requires that CO, SO_2, and PM be addressed (NO_2 has an annual standard only).

Specific startup practices for Unit 3 will vary depending whether it is initiated from a "cold" start (i.e., the furnace and associated equipment are at ambient temperature) or a "hot" start, better defined as a "restart." All startup procedures, however, include the use of MSW and residue to cover the grates to prevent the grates from overheating whenever auxiliary fuel firing is necessary. During startup, auxiliary fuel is initially combusted to preheat the furnace if necessary. After proper conditions are achieved, continuous MSW feeding is initiated and MSW throughput is ramped until full load is reached. The shutdown sequence basically involves halting the MSW feed and then firing natural or propane gas when necessary until the grates are clear (i.e., the same sequence as startup except in reverse). The auxiliary burners aid in reducing shutdown CO and VOC emissions.

During combustion of natural or propane gas only, emissions are very much less than when firing MSW due to the clean nature of these fuels and the significantly smaller size of the auxiliary burners as compared to the gross heat input capacity of the MWCs. Therefore, impacts would be less during initial startup and final shutdown conditions than the maximum normal facility impacts shown in Section 6 (Air Quality Impact Analyses). Operating conditions during startup or shutdown operations when a combination of auxiliary fuel and MSW is combusted would be similar to conditions of reduced load. These reduced load operating conditions were modeled in Section 6 as part of the screening analyses and impacts were found to be less than under conditions of maximum load. Emissions monitored during the startup and shutdown of the Marion County, Oregon facility indicated no significant increase in flue gas concentrations of dioxins and furans (a measure of organics in general) or of metals. There was an approximate 40% increase in emissions of acid gases above average (i.e., considerably less than the 400% increase analyzed below when considering malfunctions) (USEPA, 1987b, 1987c).

While emissions and impacts during startups and scheduled shutdowns will be the same or less than for normal operations, emissions and impacts during some types of malfunctions can be greater than for normal conditions. Malfunctions can be grouped into three general categories - boiler malfunctions, miscellaneous malfunctions, and APC equipment malfunctions. These malfunctions are considered routine and are the reason for the USEPA exclusionary policy regarding malfunctions. Except for excess CO emissions associated with loss of boiler water level control as noted earlier, excess emissions during malfunctions are limited to three hours, consistent with the NSPS exemption rules. Catastrophic failure of the APC system which cannot be repaired in three hours would require the combustion unit to be taken into a shutdown sequence.

Boiler malfunctions include boiler tube ruptures (typically the single largest contributor to lost boiler availability due to repair times) and ash discharger pluggages (more frequent than tube failures but only require the temporary cessation of MSW feed until the discharger is drained and cleared). Miscellaneous malfunctions consist of site power losses, control system malfunctions, and auxiliary burner failures. Loss of the electrical connection would cause combustion instabilities resulting in shutdown. Auxiliary burner failures (mis-starts) can cause short-duration low temperatures and elevated CO and VOC concentrations. All of these malfunctions can result in elevated CO and VOC emissions until the unit is returned to normal operation or shutdown is complete. Malfunction CO emissions of 600 ppmdv corrected to 7% O_2 for all three units (i.e., a facility malfunction and shutdown including all three units) were assumed for a 15-hour period allowed for in the NSPS for certain malfunctions. This would result in high second-high 1-hour and 8-hour facility concentrations during malfunction conditions of 75 and 25 ug/m^3, respectively. Added to maximum representative background concentrations of 12535 and 6440 ug/m^3, respectively, gives total concentrations that are 32% and 65% of the respective AAQS (almost totally due to background). Thus, excess CO emissions would not be expected to cause or contribute to exceedances of the CO AAQS in the extremely unlikely event of simultaneous malfunction of all three units and emissions six times greater than NSPS limits. Again, most malfunction conditions do not result in emissions greater than permit limits.

APC equipment malfunctions consist of scrubber or carbon injection malfunctions (i.e., pluggage of the lime or carbon slurry systems and atomizer failures), baghouse failures, and SNCR system failures. Short-term impacts for SNCR failures were not considered since NO_2 has no short-term AAQS. For annual emissions and impacts as described later, SNCR failures were assumed to yield uncontrolled NO_X emissions of 350 ppmdv corrected to 7% O_2.

Scrubber malfunctions may be accompanied by normal flue gas temperatures (loss of lime feed only) or elevated flue gas temperatures (loss of both lime feed and water slurry). Acid gas emissions for either scenario would be similar. Since elevated temperatures result in higher plume rise and decreased impacts, impacts for normal stack gas temperatures were considered. Uncontrolled emissions during the malfunction would be five times greater than the proposed permit limits for normal conditions since the NSPS requires SO_2 control of 80%. Assuming a single 3-hour malfunction of all three units simultaneously in one 24-hour period would give 3-hour and 24-hour high second-high facility impacts of 65 and 4.7 ug/m^3, respectively. Added to maximum representative background concentrations of 149 and 50 ug/m^3, respectively, gives total concentrations that are 16% and 21% of the respective AAQS (mostly due to background). Thus, excess SO_2 emissions greater than the proposed permit levels as allowed in the NSPS would not be expected to cause or contribute to exceedances of the SO_2 AAQS even in the extremely unlikely event of simultaneous malfunction of all three units during periods when inlet SO2 concentrations are at the maximum expected levels. Again, emissions during most malfunction events will comply with the proposed permit levels.

Baghouse failures may occur periodically but to a lesser extent than other APC system problems. Bag ruptures, a potential failure mode, can be detected as elevated opacity readings at the stack. In most cases, bag ruptures do not cause an opacity exceedance and can be repaired without a combustion unit shutdown. Baghouse failures resulting in emissions greater than the proposed permit limit are infrequent. The duration of excess emissions resulting from a bag failure would be expected to be limited to less than 30 minutes as the offending baghouse module would be quickly isolated. However, assuming excess emissions twice the proposed permit limits (0.018 gr/dscf) averaged over 24-hours and a complete failure of the baghouse system for all three MWC units simultaneously for a 3-hour period allowed in the NSPS would result in a high second-high 24-hour facility impact of 0.588 ug/m^3. Adding the maximum 24-hour representative background value of 28 ug/m^3 gives a total PM_{10} impact that is 19% of the AAQS (again, mostly due to background). Therefore, excess PM_{10} emissions greater than the proposed permit levels as allowed in the NSPS would not be expected to cause or contribute to exceedances of the PM_{10} AAQS. Again, emissions during most malfunction events will comply with the proposed permit levels.

Maximum facility impacts for short-term averaging times (i.e., 24-hours or less) during S/S/M periods were shown to comply with AAQS for all criteria pollutants above. The effect of S/S/M periods on annual emissions and impacts was also considered. Recent facility operations indicate 14 scheduled startups, nine scheduled shutdown periods, and five unscheduled malfunction shutdowns per unit during a 12-month period. The number of S/S/M events presented above is provided to allow an assessment of the impact from these type of operations, based on prior operations. These values should not be included as a permit condition as the actual number of S/S/M events will vary year to year. Startup/scheduled shutdown emissions before and after normal operations would be less than normal facility emissions as noted above due to the size and fuel used in the auxiliary burners and the reduced amount of MSW combusted. Therefore, these periods (about 0.8% of the year at three hours per occurrence) were not considered since they are expected to decrease rather than increase annual impacts. While excess emissions would not be expected to occur for all of the malfunction periods, five malfunction shutdowns (15 hours) only equals 0.17% of the year. During 1998-2000, excess emissions stated in the quarterly reports averaged 8 hours/year/unit for CO and 1 min/yr/unit for opacity (no excess emissions were reported for SO_2 or NO_X). Even if excess emissions occurred 1% of the year (88 hours), annual emissions increases would only be 5% for CO, 4% for SO_2, and 1% for NO_X and PM_{10} (with the maximum proposed or permitted emission rates during the remaining 99% of the year).

None of the increases in annual emissions due to S/S/M conditions would appreciably change the air quality modeling results or the fact that annual impacts are less than all regulatory-defined significant impact levels, de minimis monitoring levels, AAQS, PSD increments, etc. Since the units will operate on average at less than 100% availability and less than 110% of nominal load, average annual emissions will be less than the permit limits (i.e., maximum annual emissions for the proposed MWC unit and the existing MWC units are already considerably overstated). Further, if reduced emissions during shutdown periods and periods of unit downtime for repairs associated with the malfunctions were considered, annual emissions would also likely be less than those conservatively presented in this permit application for normal operations.

7.5 RISK ASSESSMENT ANALYSES

In Section 6.10 (Ambient Air Quality Standards), maximum facility impacts were compared to AAQS and background pollutant levels. It was shown that facility emissions would not cause or significantly contribute to ambient concentrations greater than the USEPA and Florida AAQS, which are designed to protect human health or public welfare for the PSD criteria pollutants (CO, SO_2, NO_2, PM_{10}, and Pb). In Section 6.11, a comparison of maximum non-criteria pollutant concentrations to Florida Ambient Reference Concentrations (ARCs) was provided. Maximum concentration impacts less than the ARCs are generally assumed to demonstrate that facility emissions would not cause conditions injurious to human health.

While these analyses are generally considered to conservatively estimate facility impacts on public health, they do not consider non-inhalation routes of exposure and other factors which are considered in more detailed risk assessments. Therefore, a human health risk assessment is contained in the PPSA application. An ecological risk assessment of the impact of the facility emissions on wildlife and other ecological values is also included in the PPSA application.

Since additional routes of exposure are considered in the risk assessments, modeling analyses of wet and dry deposition rates are required. Also averages of concentrations and deposition rates across particular land features are also needed (the PSD analyses focus on maximum impact locations). A summary of the ISCST3 modeling analyses performed for the risk assessments is included here.

ISCST3 was used with the same receptor grids as described in Section 6 -- the 100-meter spaced "fine" receptor grid within two kilometers of the main facility stack, the 500-meter spaced "coarse" receptor grids from two to ten kilometers from the main facility stack, and an additional 100-meter spaced "fine" receptor grid west-southwest of the source (to determine overall maximum annual concentrations). These modeled receptors are collectively referred to as the "modeling domain." In the PSD modeling analyses, the area inside the fence immediately surrounding the LCERF was excluded from the modeling domain. However, in the risk assessment modeling analyses, the area inside the property boundary, which is also fenced, was excluded from the long-term analyses. Public access is deterred by the property boundary fence, so activities related to indirect exposure pathways, such as livestock grazing and vegetable gardening, would not occur within the property boundary.

The modeling domain was sufficient in size to determine maximum impact locations. Area-averaged long-term impacts in the modeling domain were calculated for the Caloosahatchee River, and the associated watershed, and in the area of typical ponds found south of the facility (defined as that portion of the modeling domain area bounded by Interstate 75 on the west and State Route 82 on the north). Area-averaged long-term impacts were also determined for the right-of-way area used to graze cattle along the western property boundary.

All five years of Fort Myers (1990 through 1994 from Page Field) meteorological data as described in Section 6 were used. Average 5-year concentrations and deposition rates were determined (both anywhere in the modeling domain outside the property boundary and in the areas described above). Maximum 1-hour concentrations were also calculated for the overall modeling domain outside the LCERF fenceline.

Maximum 1-hour and 5-year gaseous concentrations were modeled by assuming no deposition, depletion, or gravitational settling. Since no firm guidance yet exists for using ISCST3 algorithms to estimate wet deposition rates for gaseous pollutants, 5-year wet gaseous deposition was estimated by modeling gases as 0.01 micron (um) particles with liquid and ice wet scavenging coefficients of 1.65E-4 (considering the effects of wet depletion but not gravitational settling on modeling impacts) based on the procedures in the USEPA Region VI Risk Assessment Protocols for Hazardous Waste Combustion Facilities (USEPA, 1998b and 1999d). Dry gaseous deposition rates were estimated later in the risk assessments by multiplying the modeled annual gaseous concentrations by an appropriate deposition velocity.

Concentrations and deposition rates were also modeled assuming the pollutants were evenly distributed across the surfaces of the particulate matter emissions. The effects of plume depletion (due to wet and dry deposition) and gravitational settling were also considered. The modeled particulate distribution was based on data from the Wurzburg, Germany facility (Hahn and Sussman, 1986). The mean diameter and surface area percentages, based on the USEPA Region VI Risk Assessment Protocols for Hazardous Waste Combustion Facilities (USEPA, 1998b and 1999d), are:

Particle Class	Mean Diameter	% By Mass	% By Surface Area
< 0.6 um	0.38 um	53%	90.0%
0.6 - 1.0 um	0.82 um	4%	3.1%
1.0 - 1.6 um	1.32 um	3%	1.5%
1.6 - 3.2 um	2.49 um	10%	2.6%
3.2 - 5.0 um	4.16 um	8%	1.2%
5.0 - 7.3 um	6.22 um	8%	0.8%
7.3 - 10.8 um	9.16 um	6%	0.4%
10.8 - 17.4 um	14.35 um	8%	0.4%

A mean particle density of 1.0 g/cm^3 was assumed in the ISCST3 modeling since the PM distribution data were likely derived from Cascade impactor data. Wet scavenging coefficients are the ISCST3 recommended values (i.e., 0.6E-4, 0.4E-4, 0.8E-4, 1.8E-4, 3.2E-4, 4.2E-4, 5.8E-4, and 6.6E-4 calculated for the mean particle class diameters from 0.38 um to 14.35 um, respectively, and assuming identical values for liquid and ice precipitation).

Facility impacts were modeled for the new MWC unit operating with the two existing MWCs (i.e., future combined facility impacts for both proposed and existing MWCs). Impacts were predicted for both gaseous and particulate pollutants using a "unitized" facility emission rate of 1.0 grams/second for all conditions. The worst-case 1-hour and 5-year source configurations determined by the screening analyses in Section 6 were considered. For the combined facility, worst-case impacts occur under Case 6 conditions for the proposed facility as shown in Table 6-5. Maximum long-term impacts occur for three operating units (Case F). Maximum 1-hour impacts occur surprisingly for two operating units (Case E), probably due to the interaction between plume height and mixing height. Therefore, for the risk assessments, these cases were remodeled with an emission rate of 1 g/s and these results are shown on Table 7-1.

Because of depletion, 5-year particulate pollutant concentrations are slightly less than gaseous pollutant concentrations. Maximum 5-year wet deposition rates for both gaseous and particulate emissions decrease rapidly with increasing distance from the facility. Maximum 5-year dry deposition rates for particulate pollutants are less than maximum wet deposition rates. Finally, area-averaged maximum 5-year concentrations and deposition rates are similar for the areas considered. The locations of the maximum concentrations and deposition rates in the modeling domain are shown in Figure 7-1 for three operating units. Maximum wet and total deposition rates and 1-hour concentrations occur in the facility vicinity. Maximum 5-year concentrations and dry deposition rates occur 2.5 kilometers west-southwest of the stack.

TABLE 7-1
MODELING RESULTS FOR LEE COUNTY ENERGY RECOVERY FACILITY RISK ASSESSMENT FOR COMBINED (PROPOSED AND EXISTING) MWC UNITS

ENTIRE FUTURE FACILITY	**Overall Maximum for Modeling Domain**		**Modeling Domain Area-Average**			
Pollutant Type and Modeled Parameter	**Maximum Modeled Impact**	**Location UTM (km)**	**Watershed for Typical Ponds**	**Caloosahatchee River**	**Caloosahatchee River Watershed**	**Right-of-Way Grazing Area**
Average Long-Term[a] Gaseous Pollutant Impacts for Case F (1 g/s emissions)						
Concentration (ug/m^3)	0.01289	422.0, 2944.6	0.00412	0.00340	0.00385	0.00284
Wet Deposition (g/m^2/yr)	0.08295	424.402,2945.8	0.00092	0.00038	0.00111	0.02848
Average Long-Term[a] Particulate Surface-Area Pollutant Impacts for Case F (1 g/s emissions)						
Concentration (ug/m^3)	0.01278	422.0, 2944.6	0.00406	0.00332	0.00378	0.00283
Total Deposition (g/m^2/yr)	0.03811	424.402, 2945.8	0.00072	0.00039	0.00082	0.01431
Dry Deposition (g/m^2/yr)	0.00027	421.9, 2944.6	0.000086	0.000058	0.000079	0.000048
Wet Deposition (g/m^2/yr)	0.03811	424.402,2945.8	0.00063	0.00033	0.00074	0.01426
Maximum Short-Term[b] Gaseous Pollutant Impacts for Case E (1 g/s emissions)						
1-Hour Concentration (ug/m^3)	2.97061	424.0, 2945.0	N/A	N/A	N/A	N/A

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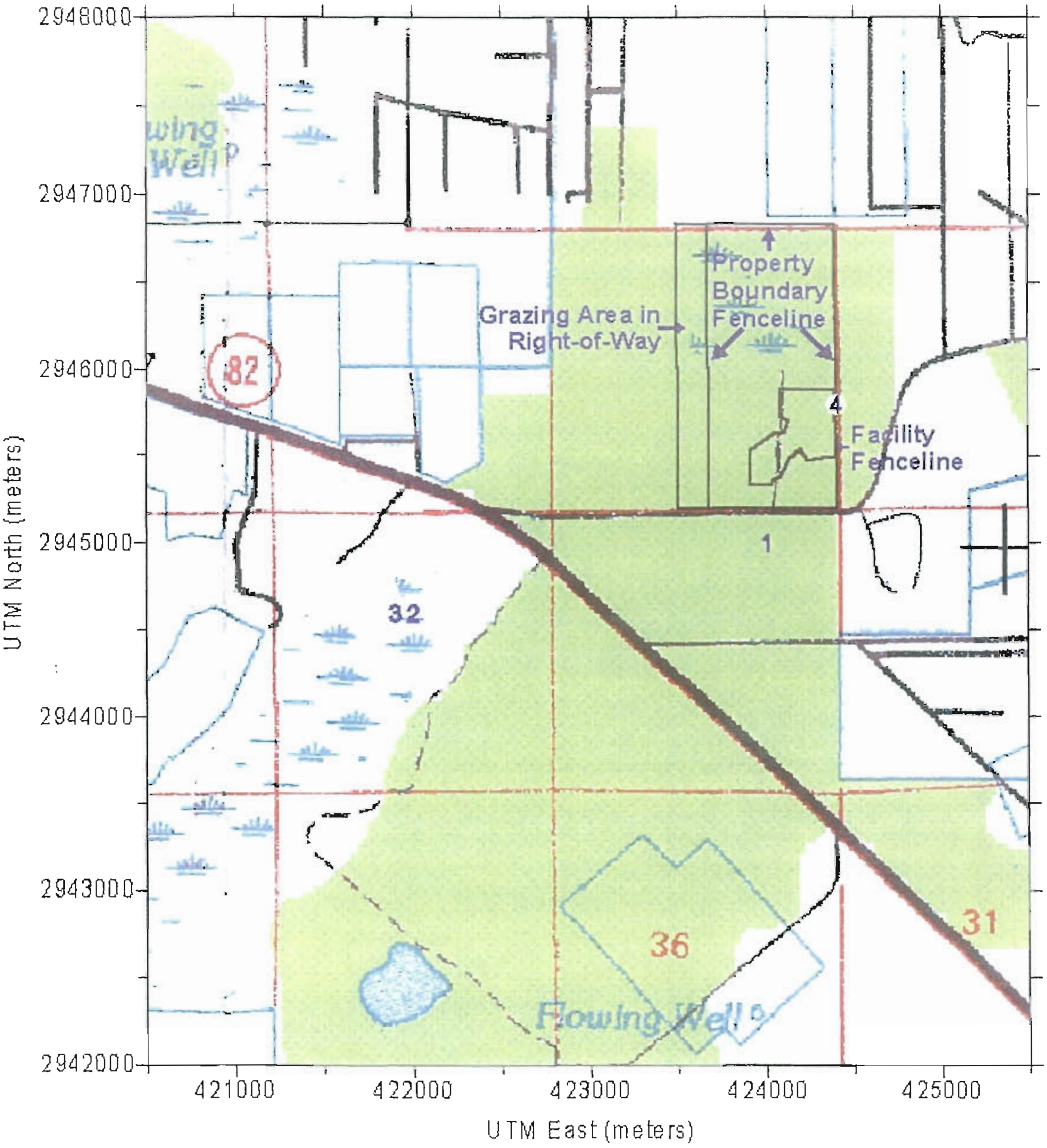
[a] Long-term impacts averaged over the five years of meteorological data modeled (1990-94 for Fort Myers Airport) for all areas outside the property boundary.

[b] Maximum 1-hour impact from all five years of meteorological data modeled (1990-94 for Fort Myers Airport) for all areas outside the facility fenceline.

FIGURE 7-1
MAXIMUM IMPACT LOCATIONS FOR RISK ASSESSMENTS



1 = Maximum 1-Hour Concentration
2 = Maximum Long-term Concentrations (Gases & Particulates)
3 = Maximum Long-term Dry Deposition Rate (Particulates)
4 = Maximum Long-term Wet Deposition Rates (Gases & Particulates)
and Maximum Long-term Total Deposition Rate (Particulates)

Property Boundary and Facility Fencelines Shown
Source: USGS Ft. Myers 1:100,000 Scale Metric Map
Scale: 1" = 1000 meters

7.6 PSD CLASS I ANALYSIS

As part of the PSD permit application, air quality modeling analyses of increment consumption and impacts of PSD significant increases in pollutant emissions to other AQRVs in nearby Class I areas are required. The nearest PSD Class I area to the LCERF is Everglades National Park, located approximately 90 kilometers (km) south to southeast of the LCERF. The next closest Class I area, Chassahowitzka National Wildlife Refuge, is located nearly 250 km north of the LCERF. Impacts and AQRVs were therefore evaluated for the Everglades National Park only. Impacts in Everglades National Park were quantified using the CALPUFF Modeling System operated in a screening mode.

The modeling followed guidance provided by the Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I report (U.S. Forest Service et al., 2000), the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report, and the Guidance on Nitrogen Deposition Analysis Thresholds criteria document. Details of the modeling approach were submitted to the National Park Service (NPS) in a modeling protocol, which was approved with some changes and additional guidance by Mr. John Notar of the NPS on November 8, 2001 (Graw, 2001).

CALPUFF was used to assess the potential impacts of the proposed modification on PSD Class I increments, regional haze, and deposition rates for nitrogen- and sulfur-containing species in the Everglades National Park. When CALPUFF is operated in a screening mode, a homogeneous wind-field is assumed for the entire modeling domain. Three receptor rings centered on the LCERF (424.2 km East and 2945.7 km North in UTM Zone 17) were created to quantify impacts: one ring representing the nearest Class I area boundary (88 km), another ring for the middle of the Class I area (146 km), and the third ring at the distance to the furthest Class I area boundary (205 km). Each receptor ring consists of 360 receptors equally spaced 1 degree apart. Due to the flat nature of southern Florida, no receptor elevations were considered. Reported concentrations are the maximum model-predicted impacts anywhere within the modeling domain, regardless if pollutants are predicted to be transported in a direction away from the Class I area.

CALPUFF was used in screening mode with five years of single station meteorology. The surface data required by CALPUFF for screening analyses includes pressure, relative humidity, precipitation, and horizontal global radiation data. The latest readily available five year period with horizontal global radiation data is 1986 through 1990 from the National Climatic Data Center (NCDC) Solar and Meteorological Surface Observation Network (SAMSON) CD. The nearest National Weather Service (NWS) surface station to the LCERF, Fort Myers Airport (Page Field), is not available on the SAMSON CD. The nearest SAMSON stations with solar radiation data are West Palm Beach (164 km from LCERF), Tampa (167 km), Miami (173 km), and Vero Beach (175 km). Based on conversations between Richard Graw of RTP Environmental Associates, Inc. (RTP) and Mr. John Notar of the NPS on September 26, 2001 (Graw, 2001), the Tampa surface station located at 27° 58' North latitude and 82° 32' West longitude in Time Zone 5 (EST) was selected for the Class I area screening analyses based on its similar exposure along Florida's Gulf Coast and expected sea breeze influences. The nearest NWS upper air stations are West Palm Beach (164 km from LCERF) and Tampa (167 km). Due to its similar exposure along Florida's Gulf Coast, the Tampa upper air station was selected to determine representative mixing heights for the modeling analyses. PCRAMMET was used to generate the extended ISCST3 meteorological dataset using wet deposition and precipitation data options. Other PCRAMMET options were based on summer values for open agricultural and cultivated areas and are the same as those used to generate the Fort Myers ISCST3 modeling dataset as described in Section 6. The Tampa anemometer height is 22 feet.

CALPUFF is capable of simulating the chemical transformation of pollutants which contribute to regional haze and atmospheric deposition such as the transformation of sulfur dioxide to ammonium sulfate – a fine particle which effectively scatters light, thereby increasing haze. CALPUFF requires the user to provide background concentrations of other pollutants (e.g., ozone and ammonia) which participate in the chemical reactions in order to accurately quantify the impacts. For ozone (O_3), an average concentration of 24 ppb (based on nearby 7 am to 7 pm ozone season measurements) was used and, for ammonia (NH_3), a domain average value of 10.0 ppb was used (grassland regions) as suggested by Mr. John Notar of NPS on September 26, 2001 (Graw, 2001).

A CALPUFF control file was used which included IWAQM recommended defaults for the model options. This included rural dispersion coefficients, default wind speed profile exponents, default vertical potential temperature gradient and default surface characteristics for irrigated agricultural land. A brief summary of the options used in the modeling analysis are listed below:

- Number of X grid cells = 2
- Number of Y grid cells = 2
- Number of vertical layers = 1
- Grid Origin = 169.2 km East and 2690.7 km North in UTM Zone 17
- Grid spacing = 255 km
- Cell face heights = 0 and 5000 meters
- Minimum mixing height = 20 meters
- Maximum mixing height = 5000 meters (based on observational data)
- Minimum windspeed for non-calm conditions = 0.5 m/s
- Vertical distribution used in the near field = Gaussian
- Terrain adjustment method = partial plume path adjustment
- No puff splitting allowed
- Chemical mechanism = MESOPUFF-II
- Wet and dry removal modeled
- Dispersion coefficients = PG dispersion coefficients
- PG sigma-y and sigma-z not adjusted for roughness
- Partial plume penetration of elevated inversion allowed
- Lateral turbulence not used

The computational grid used extended 50 kilometers beyond the furthest receptor point. The maximum concentration for each pollutant averaging time modeled was compared with the appropriate AQRV. CALPOST options include the formation of hygroscopic species based on seasonal relative humidity [f(rh)] values and background concentrations of hygroscopic and non-hygroscopic species as presented for Everglades National Park in the FLAG Phase I report (U.S. Forest Service et al., 2000). Maximum hourly relative humidity was limited to 98%. CALPUFF values of light extinction were calculated for a 24-hour averaging period while CALPUFF predicted values of deposition were calculated for annual periods (8760 hours). CALPUFF predicted concentrations of PSD criteria pollutants SO_2, NO_2, and PM_{10} were calculated using the applicable averaging time (SO_2 = 3, 24, and 8760 hours; NO_2 = 8760 hours; and PM_{10} = 24 and 8760 hours). Other options used in the POSTUTIL and CALPOST post-processing programs are described below for the appropriate AQRV.

Maximum emission rates for the proposed modification (i.e., the new MWC unit) and the associated stack parameters used in the Class I analysis are shown on Tables 6-1 and 6-2 for Case 5. Sulfuric acid (H_2SO_4) emissions were modeled as sulfate (SO_4) by multiplying the sulfuric acid emission rate by the ratio of molecular weights (96/98).

7.6.1 PSD CLASS I INCREMENT ANALYSIS

Maximum concentrations predicted by CALPUFF for Unit 3 are shown on Table 7-2 for the PSD increment pollutants. USEPA has established PSD Class I increments for three pollutants: PM_{10}, SO_2, and NO_2. In addition, USEPA proposed Class I significant impact levels (SILs; 61 FR 38292, July 23, 1996) for these same pollutants. The maximum predicted concentrations are less than 3% of the PSD Class I increments for all pollutants. Since the maximum impacts are less than the proposed USEPA Class I SILs, no additional multisource modeling analyses (i.e., including other PSD sources) are typically required to demonstrate compliance with the PSD Class I increments.

7.6.2 PSD CLASS I AIR QUALITY RELATED VALUES

In addition to an analysis of PSD Class I increments, the applicant must also demonstrate that AQRVs in PSD Class I areas such as scenic vistas (i.e., based on CALPUFF modeled visibility impairment) and sensitive plants and ecosystems (i.e., based on CALPUFF modeled deposition rates of nitrogen- and sulfur-containing species) will not be threatened as a result of the proposed modification. The Federal Land Managers have established AQRV screening thresholds. If the applicant demonstrates that the maximum impacts are less than these screening thresholds, than further analyses would typically not be required. However, should the impacts exceed the screening thresholds, then more refined analysis may be required, depending upon the magnitude and frequency of occurrence, as evaluated on a case-by-case basis by the Federal Land Manager.

The CALPUFF-predicted change in light extinction is compared with the FLAG threshold of 5%, below which the proposed change is considered insignificant. Additionally, model-predicted nitrogen- and sulfur-containing species deposition rates

TABLE 7-2
COMPARISON OF MAXIMUM CLASS I IMPACTS TO USEPA PROPOSED SIGNIFICANT IMPACT LEVELS AND CLASS I INCREMENTS

Pollutant Name	Averaging Time	Maximum Unit 3 Impacts (ug/m^3)	Proposed Class I SILs (ug/m^3)[a]	Percent of Proposed Class I SILs	PSD Class I Increments (ug/m^3)	Percent of PSD Class I Increments
PM_{10}	24-Hour	0.01404	0.3	4.68%	8	0.18%
PM_{10}	Annual	0.00110	0.2	0.55%	4	0.03%
SO_2	3-Hour	0.48556	1.0	48.56%	25	1.94%
SO_2	24-Hour	0.14901	0.2	74.51%	5	2.98%
SO_2	Annual	0.01294	0.1	12.94%	2	0.65%
NO_x	Annual	0.01171	0.1	11.71%	2.5	0.47%

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[a] 61 Federal Register 38250, 1996 (specifically 61 FR 38292).

are compared with the FLAG threshold of 0.01 kilograms per hectare per year (kg/ha-yr), below which the proposed change is considered insignificant.

Model-predicted impacts on air quality related values were quantified using the same model, input data, and model options, as in the PSD Class I increment analysis. Two post-processing utilities, POSTUTIL and CALPOST, were also used as discussed below.

7.6.2.1 ACID DEPOSITION ANALYSES

Acid deposition is quantified by modeling the deposition rates of nitrogen- and sulfur-containing species. Emission rates of NO_X, SO_2, and SO_4 were input into CALPUFF, which in turn calculates the deposition rates of secondary species. Table 7-3 presents the species modeled in the CALPUFF program. Dry and wet flux output files created by CALPUFF were processed in POSTUTIL to obtain a combined total flux output file. In POSTUTIL, nitrogen and sulfur deposition fluxes were computed using a weighted sum of the deposition fluxes of all of the species computed and stored from the CALPUFF model run. Table 7-3 includes the weight of nitrogen or sulfur contained in each species modeled in the POSTUTIL program. All of the following contribute to the total nitrogen mass: SO_4 in the form of ammonium sulfate [$(NH_4)_2SO_4$]; NO_X as NO_2; HNO_3; and NO_3 in the form of ammonium nitrate [$(NH_4)NO_3$]. Only SO_2 and SO_4 contribute to the total sulfur mass. The total amount of nitrogen or sulfur contained in one gram of each of the species modeled was calculated using molecular weight ratios.

The resulting output file from the POSTUTIL program was processed in the CALPOST program to obtain total nitrogen and total sulfur deposition rates. A scaling factor was employed which converted the deposition rates from grams per square meter per second (g/m^2-sec) to kg/ha-yr. Table 7-4 presents the maximum model-predicted nitrogen and sulfur flux for Everglades National Park. The model-predicted nitrogen and sulfur deposition rates were lower than the FLAG thresholds of 0.01 kg/ha-yr for each compound, applicable in the Eastern United States. Therefore, the deposition impacts from the proposed modification are not considered significant and additional refined analyses are unnecessary.

7.6.2.2 REGIONAL HAZE ANALYSIS

The CALPOST post-processor was used to quantify the percent change in light extinction from the proposed modification. Since ammonium nitrate and ammonium sulfate particles form as a function of relative humidity (rh), seasonal values of this factor (f(rh)) are provided into CALPOST to account for this phenomenon. Seasonal f(rh) values documented in the FLAG report for Everglades National Park were used as input. Background concentrations of light scattering and absorbing species must also be provided in order for CALPOST to calculate the change in light extinction. The FLAG document provides seasonal values of hygroscopic and non-hygroscopic species for Everglades National Park, which were also used as input into CALPOST. Light extinction is calculated as a 24-hour averaged value.

TABLE 7-3
MODELING INPUTS FOR CALPUFF DEPOSITION ANALYSES

CHEMICAL SPECIES MODELED FOR DEPOSITION

Nitrogen Containing Species	**Deposition Mechanism**
HNO_3	Dry and Wet
NO_3	Dry and Wet
NO_x	Dry
Sulfur Containing Species	**Deposition Mechanism**
SO_2	Dry and Wet
SO_4	Dry and Wet

WEIGHT OF CHEMICAL SPECIES MODELED FOR DEPOSITION IN POSTUTIL

Species Contributing to Total Nitrogen	**Weight**[a]
$(NH_4)_2(SO_4)$ as SO_4	(2 x 14) / (32 + 4 x 16) = 0.291667
NO_x as NO_2	14 / (14 + 2 x 16) = 0.304348
HNO_3	14 / (1 + 14 + 3 x 16) = 0.222222
$(NH_4)NO_3$ as NO_3	(2 x 14) / (14 + 3 x 16) = 0.451623
Species Contributing to Total Sulfur	**Weight**[a]
SO_2	32 / (32 + 2 x 16) = 0.500000
SO_4	32 / (32 + 4 x 16) = 0.333333

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[a] Number of grams of nitrogen or sulfur in one gram of species modeled, calculated from the molecular weights for nitrogen (14), sulfur (32), oxygen (16) and hydrogen (1) as shown above.

TABLE 7-4
MAXIMUM MODEL-PREDICTED NITROGEN AND SULFUR DEPOSITION RATES

Chemical Species	**Deposition Rate (kg/ha-yr)**	**Screening Threshold (kg/ha-yr)**	**Percent of Screening Threshold**
Total Nitrogen	0.00358	0.010	35.8%
Total Sulfur	0.00669	0.010	66.9%

The maximum model-predicted light extinction (B_{ext}), background light extinction, and percent change in light extinction are presented in Table 7-5. The maximum predicted change in light extinction is slightly greater than 5%, which is predicted to occur for one day out of the five years (1826 days) modeled at five of the 1080 receptors. The results are based upon the maximum 3-hour emission rates for SO_2 and sulfuric acid (H_2SO_4) and the 24-hour averaged concentration of light scattering and absorbing species.

The analysis was refined by using the 24-hour SO_2 and sulfuric acid emission rates to be consistent with the averaging period of the light scattering and absorbing species calculated in CALPUFF. The maximum 24-hour emission rate of these species (SO_2 and sulfuric acid) is 66% of the 3-hour emission rates reported on Table 6-2 for Case 5 (i.e., outlet SO_2 concentrations of 100 and 66 ppmdv corrected to 7% O_2 for 3-hour and 24-hour averaging times, respectively, with H_2SO_4 equal to 24% of SO_2 emission rate on a lb/hr or g/s basis). The results from the revised analysis with 24-hour emission rates are included on Table 7-5. For the 24-hour emission rates of SO_2 and H_2SO_4, the model-predicted change in light extinction is 4.01%, which is less than the 5% screening threshold. This is nevertheless a very conservative assessment. Therefore, the proposed modification does not pose a threat to regional haze at Everglades National Park.

TABLE 7-5
MODEL-PREDICTED CHANGE IN LIGHT EXTINCTION IN EVERGLADES NATIONAL PARK

Emission Source	**Model-Predicted B_{ext} (Mm^{-1})**	**Background B_{ext} (Mm^{-1})**	**Percent Change in B_{ext}**
Unit 3 With 3-Hour Emission Rates	1.168	21.83	5.35%
Unit 3 With 24-Hour Emission Rates	0.875	21.83	4.01%

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SECTION 8
REFERENCES

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SECTION 8
REFERENCES

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LEE COUNTY ENERGY RECOVERY FACILITY PREVENTION OF SIGNIFICANT DETERIORATION APPLICATION FOR MUNICIPAL WASTE COMBUSTOR UNIT 3

SECTION 9
ATTACHMENTS

Revised February 17, 2003

ATTACHMENT 7

EPA United States Environmental Protection Agency
REGION 2 New Jersey, New York, Puerto Rico & U.S. Virgin Islands

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EPA INTENDS TO MAKE CHANGES TO DRAFT PREPA RE-POWERING PERMIT

FOR RELEASE: Thursday, January 20, 2000

(#00015) **San Juan, Puerto Rico** – In response to public concerns and new information about the best way to control nitrogen oxide emissions from oil-fired power plants, the **U.S. Environmental Protection Agency (EPA) intends to make changes to a proposed permit for the Puerto Rico Electric Power Authority's (PREPA) re-powering project in San Juan. The draft permit, released in March** 1999, would allow PREPA to increase the electric generating capacity at its San Juan Power Plant and lower total emissions by replacing two, decades-old, 44 megawatt boilers with two 232-megawatt combined cycle turbines. **The intended changes to the draft permit will require PREPA to replace one of the two nitrogen control technologies proposed for installation on the new turbines with special burners to be installed on four old boilers that will remain in service.** While this change will increase nitrogen oxide emissions over the levels under the original draft permit, the emissions will still be at lower levels than those from the old plant.

"An additional benefit of making this change in the control technology requirement is that there will be a decrease, from the original proposed permit, in two pollutants of particular concern in the San Juan area – sulfuric acid mist and fine particles," said Jeanne M. Fox, EPA Region 2 Administrator.

In its draft permit, proposed in March 1999, EPA included Selective Catalytic Reduction (SCR), which uses an ammonia injection system to reduce nitrogen oxide emissions, and steam injection. However, new data indicate that, on oil-fired turbines, SCR cannot consistently achieve the expected reductions in nitrogen oxide emissions. As a result, EPA is removing the SCR requirement and will instead require PREPA to install special burners, called "low NOx burners," on the four old boilers at its facility. PREPA would still use steam injection on its turbines.

"After carefully considering the feasibility of using SCR on an oil-fired plant and reviewing public comments, the choice was clear," said Jeanne M. Fox, EPA Regional Administrator. "We want to ensure that PREPA uses the most reliable pollution controls. Steam injection systems and low NOx burners are both tried and true nitrogen oxide controls."

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