Air Quality Permitting
Response to Public Comments

May 13, 2015

Tier II Operating Permit No. T2-2013.0062 PROJ 61305

Micron Technology, Inc.
Boise, Idaho

Facility ID No. 001-00044

Prepared by:
Morrie Lewis, Permit Writer
AIR QUALITY DIVISION

Final

BACKGROUND

Idaho Department of Environmental Quality (DEQ) provided for public comment on the proposed facility emissions cap (FEC) Tier II operating permit renewal, in accordance with IDAPA 58.01.01.404.01.c. During this period, comments were submitted in response to DEQ's proposed action. Each comment and DEQ's response is provided in the following section. All comments submitted in response to DEQ's proposed action are appended to this document (Appendix A).

PUBLIC COMMENTS AND RESPONSES

Public comments regarding the technical and regulatory analyses and the air quality aspects of the proposed permit are summarized below. Questions, comments, and/or suggestions received during the comment period that did not relate to the air quality aspects of the permit application, DEQ's technical analysis, or the proposed permit were not addressed.

Please note that while investigating the modeling parameters for 80BOI1 in response to public comments, DEQ discovered an inconsistency in model input data used in the MTI air impact analyses, and an inconsistency in the Chi/Q value included in the permit corresponding to the annual averaging period. Both inconsistencies were corrected.

Base elevations of emission sources were found to be up to several meters above base elevations of adjacent buildings. MTI and consultant CH2M Hill corrected this inconsistency and revised the supporting air impact analyses, resulting in minor changes in predicted air quality impacts. Compliance with standards was demonstrated and no permit conditions were changed as a result of the revised air impact analyses. Relevant discussion and details are provided in the appended Modeling Review Memorandum.[1]

Comment 1: **Determination of completeness and multiple submissions – supplemental information related to National Ambient Air Quality Standards (NAAQS) compliance was accepted without requiring a revised application package; DEQ should clearly define which existing sources were included or excluded in the modeling demonstrations.**

Response: DEQ agrees that multiple submissions can make review challenging, both for DEQ and for the public. In many permit applications, however, supplemental information is required during DEQ's technical review to obtain all of the information necessary to complete processing of an application in accordance with the procedures and requirements of IDAPA 58.01.01.400–410.[2]

Hardcopy application materials provided by Micron Technology, Inc. (MTI) were photocopied for posting to the DEQ website, and unfortunately image resolution and details were compromised in this process (most noticeably in the documents referenced). However, original hardcopy application materials were available at DEQ upon request for review and reproduction.

To simplify compliance modeling demonstrations, and to assist in establishing and determining compliance with facility-wide emission cap limits, the Tier II operating permit renewal relied upon a conservative approach of estimating and modeling facility-wide emissions in the emission inventories and compliance modeling analyses. The only exception to this approach was the exclusion of intermittent emission sources from the 1-hour NO_2 modeling demonstration, which

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[1] Appendix E to Statement of Basis to Tier II Operating Permit No. T2-2013.0062 Project 61305, DEQ, May 13, 2015. Intermittent sources that were excluded from 1-hour NO_2 modeling demonstrations were identified in Table 3.

[2] Rules for the Control of Air Pollution in Idaho. Retrieved from http://adminrules.idaho.gov/rules/current/58/0101.pdf.

complied with DEQ policy guidance.[3] Generators excluded from modeling demonstrations are identified, and further discussion is provided, in the appended Modeling Review Memorandum (Table 3).[1]

Result: no change to the proposed permit or statement of basis.

Comment 2: **Emission inventory calculations – no emission calculations appear to be included in the application; without documented calculations, assumptions, and emission factors, it is unclear how DEQ verified emission rates, and how these emission rates compare to modeled short-term and annual modeled emission rates.**

Response: DEQ guidance does request that sufficient information be provided in permit applications to document emission rate estimates.[4] Documentation should support the validity and verification of emission estimates.

Although many emission estimates in the application were provided in summary table format and without detailed or explicit sample calculations, supporting documentation was referenced from various sources, including AP-42[5] and manufacturer's data. Although not required nor reviewed as part of the application, the most recent annual emissions report from MTI has been appended for reference,[6] which includes equations that were used in estimating emissions. No deficiencies were found in DEQ's review and analysis of emission estimates provided in the application.

For the purposes of determining Prevention of Significant Deterioration (PSD) and Title V program regulatory applicability, the facility-wide greenhouse gas (GHG) emission inventory provides the necessary information to determine that the facility-wide potential to emit (PTE) exceeds 100,000 tons per year (T/yr) of carbon dioxide equivalent emissions (CO_2e). Because MTI does not qualify as an "anyway" source, the facility was not *subject to regulation* under the PSD and Title V regulatory programs.[7,8,9]

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3 "DEQ Guidance for Minor New Source Review Modeling of 1-Hour NO_2 from Intermittent Testing of Emergency Engines," DEQ, September 2013. This guidance was provided for public review and comment prior to finalization.

4 "Air Quality Permits Applicant and DEQ Responsibilities," DEQ, 2014.

5 Compilation of Air Pollutant Emission Factors, AP-42, Volume I, Fifth Edition (AP-42), Office of Air Quality Planning and Standards Office of Air and Radiation (OAQPS), EPA, January 1995.

6 As required by Permit Condition 4.10. Refer to Appendix B.

7 Following the recent court decision in Utility Air Regulatory Group (UARG) v. Environmental Protection Agency (EPA), EPA has indicated that it will no longer apply or enforce federal regulatory provisions of the EPA-approved Title V programs that require a stationary source to obtain a PSD or Title V permit solely because the source emits or has the potential to emit greenhouse gas (GHG) emissions above the major source thresholds ("Step 2" sources). The State of Idaho incorporates the T1 program definition of "major facility" at IDAPA 58.01.01.008.10.d, in accordance with 40 CFR 70.2. In order to act consistent with our understanding of EPA's memorandum and the Supreme Court's decision, DEQ will no longer require PSD or T1 permits for "Step 2" sources, and will not continue processing applications for such permits. DEQ and EPA recognize that Idaho's SIP-approved regulations may require revision to effectuate the Supreme Court's decision.

8 "Next Steps for Addressing EPA-Issued Step 2 Prevention of Significant Deterioration Greenhouse Gas Permits and Associated Requirements," EPA, December 19, 2014.

9 *Utility Air Regulatory Group (UARG) v. Environmental Protection Agency (EPA)*, 134 S. Ct. 2427, June 23, 2014.

Most FEC limits were established in Tier II Operating Permit No. T2-060033,[10] and were based upon baseline actual emissions, an operational variability component, and an optional growth component in accordance with IDAPA 58.01.01.175–181. After consideration of future business needs, MTI has not proposed a change to any established FEC limits, with the exception of a reduction in the lead emission limit, and establishing a $PM_{2.5}$ emission limit consistent with the existing PM_{10} emission limit and applicable NAAQS.

Result: no change to the proposed permit or statement of basis.

Comment 3: **Intermittent source modeling – it is not clearly communicated in the draft permit how many emergency generators are on site, and emergency generator modeled potential to emit is not consistent throughout the permitting package.**

Response: A FEC permit allows for flexibility in facility changes in accordance with IDAPA 58.01.01.181. Specifying the manufacturer, model, and number of engines within the permit could lead to regulatory compliance uncertainty when such changes are made. The boiler and emergency generator equipment lists included in the application were complete at the time of processing, and MTI is required to maintain a list of all such emission sources on site (Permit Condition 4.15). MTI has confirmed that the boiler and emergency generator equipment lists in the application and as appended to the statement of basis were complete and accurate at the time of submission.[11]

Modeled emission rates from emergency generators were based on 100 hours per year of potential operation, which accounts for testing, maintenance, and limited emergency operation. Based on a typical schedule of 30 minutes of testing every two weeks, and based on actual operation of these engines during the prior permit term – engines operated less than 9 hours per year on average, with no individual engine exceeding 30 hours of annual operation, [11] DEQ has determined that assuming 100 hours of annual operation per engine was reasonable and appropriate for estimating potential emissions.

Although EPA guidance does suggest that 500 hours is an appropriate default assumption for estimating the number of hours an emergency generator operates under worst-case conditions, it also supports alternative estimates when justified.[12] Based on historical operational data, a number above 100 hours is not supported.

Additional relevant discussion concerning intermittent emission sources is provided in the response to Comment 1.[1]

Result: Permit Condition 4.15 (as referenced by Permit Conditions 5.23, 7.4, 8.4, 8.5, and 8.6) has been revised to clarify that "all equipment subject to NSPS and NESHAP requirements" shall also be maintained as part of the required equipment list.

Comment 4: **Emergency engine heating – clarify whether constant heating of the engines is necessary to meet applicable opacity standards for these engines.**

Response: The application does provide that preheating of specific generator engines may reduce opacity emissions. However, it is not obvious that all emergency generator engines on-site will be configured at all times in this manner, nor that this work practice is necessary to comply with the conditions of the permit. For these reasons, DEQ has not included this work practice as a condition of the permit. Ultimately, the permittee is responsible for complying with all applicable emission limits and requirements, and for ensuring operation consistent with the information provided in the application.

Result: no change to the proposed permit or statement of basis.

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[10] Tier II Operating Permit No. T2-060033, issued February 26, 2008 (2011AAG2917).

[11] Email response, MTI, March 9, 2015 (2015AAG310).

[12] "Calculating Potential to Emit (PTE) for Emergency Generators," EPA, September 6, 1995.

Comment 5: **Boiler merged stack parameters – Table D-1.1 (p. 111 of 320 in the application) includes a statement that Boiler 80BOI1 was modeled using a 'composite stack' with diameter 1.64 ft. The actual exhaust configuration is described as being made up of six 8-inch diameter stacks in a frame. It is unclear why DEQ determined it was acceptable to model a merged stack using a single stack with an exhaust area equivalent to the total area for the six individual stacks. We believe EPA guidance to be inconsistent with this practice.**

Response: The methodology used was consistent with EPA guidance. EPA has clarified that multiple stacks may be modeled as a single source with combined flows provided the stacks are not separated from each other by a distance of more than the diameter of the individual stacks.[13] The MTI emission source 80BOI1 consists of six stacks, each with an 8-inch diameter. Stacks are separated by less than 8-inches, and are estimated to have similar flows and temperatures. Thus modeling the sources as a single source, with a flow equal to the combined flow and an effective diameter representing the total release area, was appropriate and consistent with EPA guidance.

Comment 6: **Boiler low NO_x burner stack parameters – Modeling for the low NO_x burners does not seem to account for the lower boiler exhaust temperatures that would be expected. The comment suggests that for modeling Scenario 2 (all boilers equipped with low NO_x burners), MTI used temperatures based on existing burners, rather than based on low NO_x burners.**

Response: MTI has confirmed that actual stack temperatures for the low NO_x boilers are expected to be higher than those used in the compliance modeling demonstrations, based on manufacturer's data. DEQ determined that this is a conservative approach and would be expected to overestimate modeled impacts.[11] In most instances, higher stack gas temperatures result in greater plume buoyancy, and consequently lower ground-level pollutant impacts.

Result: no change to the proposed permit or statement of basis.

Comment 7: **Permit conditions – clarifications recommended to various permit conditions.**

<u>Permit Conditions 4.6 and 6.1</u>

Permit Condition 4.6 provides guidance for monthly monitoring for hazardous air pollutants from combustion sources. However, the statement of basis does not clearly identify the equations and emissions factors to be used to calculate emissions from these sources. Permit Condition 6.1 requires that Micron document monthly average hourly process emissions of non-carcinogenic toxic air pollutants listed and yearly average hourly process emissions of carcinogenic toxic air pollutants. Non-carcinogens are subject to 24-hour ambient air quality standards as listed in Section 585 of the Idaho Air rules. Please explain why monthly monitoring is appropriate.

Response: The monthly monitoring regime for hazardous air pollutant (HAP) emissions and for Section 585 toxic air pollutant (TAP) emissions was established in initial FEC permitting action.[14]

Compliance with toxic air pollutant (TAP) standards was demonstrated by evaluating facility-wide emission increases of substances listed in IDAPA 58.01.01.585-586. Because the compliance demonstration under IDAPA 58.01.01.210 alternatively allows for evaluating project-specific emission increases resulting from modification, this approach was considered conservative. For the compliance demonstration, actual process-generated emissions of TAP substances listed in IDAPA 58.01.01.585-586 were averaged over calendar years 2001-2004, and potential emission increases were estimated at 80% above these emission rates. TAP emission limits were also established corresponding to 80% above these emission rates. The maximum predicted ambient air quality impact for all TAP emissions did not exceed 80% of any applicable AAC and AACC. The permit allows for emission increases beyond these limits only when a

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13 Record No. 91-II-01 from the Model Clearinghouse Information Storage and Retrieval System, EPA, August 1990.

14 Information for this response was referenced from the Statement of Basis to Tier II Operating Permit and Permit to Construct No. T2-060033, DEQ, February 21, 2008.

refined modeling analysis is completed, in keeping with the intent to establish emissions cap limits to accommodate growth and operational variability.

Although recordkeeping frequency intervals are usually matched to their standards, several factors were considered when determining that a monthly recordkeeping frequency was reasonable and appropriate for all TAP listed in IDAPA 58.01.01.585-586, including the conservative approach described, the operational schedule of the facility, the complexity and quantity of the chemical data tracked, and the time required for data quality assurance and emission calculations.

Result: no change to the proposed permit or statement of basis.

Building 4 Limited Boiler Operating Scenario Requirements

Permit Condition 7.3 provides monitoring guidance for the Building 4 boiler. Please clarify how the "duty" is to be calculated.

Response: The low NO_x boiler retrofit project has recently been completed, and the limited boiler operating scenario is no longer required. As a result, references to this operating scenario have been removed from the permit.[11]

Result: Requirements associated with the limited boiler heat input operating scenario have been removed from Section 7 of the permit.

Permit Condition 8.3

Permit Condition 8.3 addresses monitoring emergency standby IC engine hours of operations. This permit condition allows up to or more than 200 operational hours per year for each generator. The modeling of annual emergency engine generator emissions in the July 14 analyses were based on operating each engine no more than 100 hours per year. Further confusing this assumption is Section 4.2.4 of the application (p. 16 of 320) which addresses the maximum operation of each engine during any calendar year and modeled emissions rates calculated by dividing these maximums by 24. Please clarify and revise this condition to be consistent with the 500 hour per year modeling guidance on emergency engine generator discussed above.

Emission estimates for emergency generators were conservatively estimated assuming 100 hours per year of annual operation. These estimates were used in evaluating facility-wide potential to emit, in accounting for maintenance and testing operation, and in modeling compliance demonstrations. Additional relevant discussion concerning this assumption is provided in the response to Comment 3.[1]

DEQ agrees that for consistency with the emission estimates and compliance demonstrations, the default value used in the FEC recordkeeping permit condition should be updated to reference 100 hours per year.

Result: Permit Condition 8.3 was revised to include a default value of 100 hours per year for estimating emissions from each emergency generator.

Comment 8: **$PM_{2.5}$ background concentrations – $PM_{2.5}$ background concentrations should have been updated for the air impact analyses performed in support of permit issuance. Background concentrations used in the impact analyses were generally based on monitoring data from 2008-2010. $PM_{2.5}$ concentrations associated with 2010-2012 monitoring data show significantly higher $PM_{2.5}$ concentrations, and when 2013 data are considered, the most recent background 24-hour $PM_{2.5}$ value (based on the regulatory design value of the three-year mean of the upper 98th percentile of 24-hour averaged concentrations for each year) is 53 $\mu g/m^3$, well over the 35 $\mu g/m^3$ standard.**

Response: It is DEQ standard procedure to use the best readily available data for background concentrations at the time a modeling protocol is submitted to the agency. Only the 2010-2012 data were readily available at the time DEQ received a modeling protocol from MTI, and background concentrations were based on those data. DEQ determined it was not reasonable or appropriate to require an applicant to revisit analyses, using data not previously available, after DEQ issued a protocol approval notice, unless use of the previously approved data or method would clearly result in a violation of applicable rules or regulations. Also, since the design value is used for a background concentration (the three-year average of the upper 98^{th} percentile of maximum 24-hour averaged $PM_{2.5}$ concentrations), it is unlikely that this value would occur simultaneously with maximum modeled concentrations.

DEQ's current practice for establishing $PM_{2.5}$ background concentrations for use in air permitting impact analyses is to use the Northwest International Air Quality Environmental Science and Technology Consortium (NW AIRQUEST) lookup design values.[15] This tool provides site-specific design value concentrations (the statistical value to be compared against National Ambient Air Quality Standards) that are based on available monitoring data in combination with regional-scale modeled simulations. This tool was not available at the time when DEQ reviewed MTI's modeling protocol. However, the 24-hour background $PM_{2.5}$ concentration given by the lookup tool for the MTI site is 18 $\mu g/m^3$. This compares to a value of 19.3 $\mu g/m^3$ that was used in the modeling analyses provided with the permit application.

Result: no change to the proposed permit or statement of basis.

Comment 9: **Excluding emergency engines from 1-hour NO_2 analyses – provide a technical justification for omitting all engines from 1-hour NO_2 modeling, and for not requiring conditions stating when these engines should be appropriately tested (i.e. during the day- or night-time hours).**

Response: DEQ's modeling guidance provides the recommended approach on modeling emissions associated with the testing and operation of emergency engines.[16] In this guidance, DEQ has determined that emissions of nitrogen oxides (NO_x) from the intermittent operational testing of emergency engines may be excluded from project-specific significant impact level (SIL) analyses and cumulative NAAQS analyses for 1-hour NO_2, provided that annual hours of operation from testing and maintenance are less than or equal to 100 hours per engine. This guidance was developed after a review of approaches taken in other states, and with input from the public and the regulated industry.

Because the potential for elevated short-term NO_2 impacts to the public is minimized based on the limited and intermittent operation of the emergency engines, DEQ determined inclusion of these sources within the ambient air quality standard compliance demonstrations would not be required. Additional relevant discussion concerning this assumption is provided in the response to Comment 1.[1]

Result: no change to the proposed permit or statement of basis.

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15 "Lookup 2009-2011 design values of criteria pollutants" available through the Washington State University Laboratory for Atmospheric Research. Retrieved from http://lar.wsu.edu/nw-airquest/lookup.html.

16 State of Idaho Guideline for Performing Air Quality Impact Analyses, Doc ID AQ-011, DEQ, September 2013.

APPENDIX A – PUBLIC COMMENTS

www.idahoconservation.org
Idaho Conservation League
PO Box 844, Boise, ID 83701
208.345.6933

Morrie Lewis
Air Quality Division
DEQ State Office
1410 N. Hilton
Boise, ID 83706

February 20, 2015

RE: Idaho Conservation League Comments on the Draft Tier II air quality permit renewal for Micron

Dear Mr. Lewis:

Thank you for the opportunity to comment on the proposed Tier II air quality permit renewal for Micron. Since 1973, the Idaho Conservation League (ICL) has been Idaho's voice for clean water, clean air, and wilderness—values that are the foundation to Idaho's extraordinary quality of life. The ICL works to protect these values through public education, outreach, advocacy and policy development. As Idaho's largest state-based conservation organization, we represent over 25,000 supporters, many of whom have a deep personal interest in air quality.

Determination of Completeness and Multiple Submissions

The Idaho Department of Environmental Quality (the Department) provides clear guidance on permitting package submission and defines a "complete" application. If an application is lacking necessary information it is the policy of the Department to deem the package incomplete or deny the submission until a complete package can be assembled. Micron's permit application was determined "complete" in February of 2014. However, important supplemental information related to National Ambient Air Quality Standards (NAAQS) compliance was accepted in April and July of 2014. Please explain why the Department did not require Micron to submit a revised application package that included all the necessary information prior to determining "completeness".

Allowing multiple submissions makes public review very difficult. Inevitably, information is scattered throughout the permitting package and within supplemental submissions. For example, the plot plan, Form PP (p. 100 of 320 in the application) refers the reader to "Appendix A and Figures B.1 and B.2 (Appendix B) in the Tier II Application." The figure included in Appendix A (p. 36 of 320) and Figure A-1 (p. 58 of 320) show the building layout and stack locations, except that the text identifying the building and stack locations is not legible in either figure. Figure B.2 (p. 41 of 320) shows the building layout with each building identified only by a letter-and-number code, with no clear tie to the building name or identification of the processes housed in each building.

Clarity is particularly important given the unique nature of the Facility Emissions Cap (FEC) permit. For example, it is difficult to follow how the Department determined baseline facility configuration information – with regards to specific equipment, stack release parameters, emission rates, emission factors, operational assumptions used in modeling analysis, etc. Because this information is the starting point for any ambient impact analysis and guides the applicant in any changes allowed under the FEC, the Department must clearly define which existing sources were included or excluded for this FEC renewal.

Emissions Inventory Calculations

Permitting guidance posted on the Department's website clearly states that emission inventories must include documented calculations, assumptions, and emissions factors used. No emission inventory calculations appear to be included in the permit application package. For example, the January 24th, 2014 submission regarding greenhouse gas emissions for the LED Ramp and RDL B1X Expansion projects shows CO_2 equivalent (CO_{2e}) emissions in tons per year for each of these projects, but includes no information about how these values were calculated. Additionally, the July 2013 submission does not included detailed calculations or an emission rate summary for the two new operations scenarios for the Building 4 boilers.

Without these calculations, it is unclear how the Department verified statements in the application and supplemental submissions. In particular, it is unclear how modeled short-term and annual emission rates for criteria pollutants and toxic air pollutants (TAPs) and other modeled emissions compare with the requested ton per year FEC limits.

The statement of basis should be revised to include legible copies of emission calculations, clearly showing which emission factors were used in the calculations and any assumptions incorporated into the calculations, for all pollutants and operating scenarios. The statement of basis should also be revised to clearly demonstrate how the modeled emission rates and operational assumptions compare with the FEC limits.

Intermittent Source Modeling

Micron's emergency engine generator modeled potential to emit (PTE) is not consistent throughout the permitting package. It is not clear whether the Department is assuming 100 or 200 hours of operation per year for each emergency engine generator.

In February 2013, Micron's modeling protocol states annual emissions from emergency engine generators were based on 200 hours of operation per year. Then, in the December 2013 application, Micron stated that annual engine generator emissions were based on 100 hours of operation per year, which is consistent with NESHAP guidance for emergency diesel engines (Subpart ZZZZ and NSPS Subpart IIII). It is unclear on what standard the modeled PTE is based. In addition, it is not clear how many emergency generators are onsite. Looking through the statement of basis, one can infer there are 19 emergency engines, but this is not clearly communicated in the draft permit. Please clarify the number of hours per year with which Micron should model potential ambient air impacts for the emergency generators. Without a clear understanding of how emergency generators will be tested and operated, the Department cannot adequately predict if intermittent sources will impact NAAQS standards and ambient air quality.

Additionally, the Department must provide an explanation as to why the PTE for each emergency engine generator was not calculated based on 500 hours per year operation for routine testing, maintenance, and emergency operations, in accordance with EPA guidance[1] and normal DEQ practice for other facilities. Please show the revised criteria pollutant PTE calculations for all emergency engine generators in your response. Please describe the impact on annual NAAQS dispersion modeling results if the engines are presumed to operate 500 hours per year for routine maintenance, testing, and emergency response, particularly for $PM_{2.5}$.

Emergency Engine Heating

Section 5.4.6 of the application should be revised to require continuous heating of each emergency engine generator. Electrically heating emergency engine generators can result in substantial reductions of smoke/opacity from the stacks compared to "cold start" emissions. Please explain or clarify whether constant heating of the engine generators is necessary in order to meet the applicable opacity standards for these engines.

Boiler Exhaust Parameters

- Table D-1.1 (p. 111 of 320 in the application) includes a statement that Boiler 80BOI1 was modeled using a "composite stack" with diameter 1.64 ft. The actual exhaust configuration is described as being made up of six 8-inch diameter stacks in a frame.

  It is unclear why the Department determined it was acceptable to model a merged stack by simply using a single stack with an exhaust area equivalent to the total area for the six individual stacks. We believe EPA guidance to be inconsistent with this practice.

- Modeling for the low NOx burners does not seem to account for the lower boiler exhaust temperatures that would be expected. Such low exhaust temperatures would result in less thermal buoyancy and therefore reduced dispersion of NOx. The Department used higher boiler exhaust temperatures for modeling the low-NOx emissions from Building 4 and Building 25. This is likely not representative of actual ambient air impacts. Please revise the modeling to include the lower boiler exhaust temperatures that would be expected with a low NOx burner.

Permit Conditions

- Permit Condition 4.6 provides guidance for monthly monitoring for hazardous air pollutants from combustion sources. However, the statement of basis does not clearly identify the equations and emissions factors to be used to calculate

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[1]http://www.epa.gov/region7/air/title5/t5memos/emgen.pdf, http://www.epa.gov/region07/air/nsr/nsrmemos/generator.pdf

emissions from these sources. Please revise the statement of basis to include these emission factors and relevant equations.

- Permit Condition 6.1 requires that Micron document monthly average hourly process emissions of noncarcenogenic toxic air pollutants listed and yearly average hourly process emissions of carcinogenic toxic air pollutants. Noncarcinogens are subject to 24-hour ambient air quality standards as listed in Section 585 of the Idaho Air rules. Please explain why monthly monitoring is appropriate.

- Permit Condition 7.3 provides monitoring guidance for the Building 4 boiler. Please clarify how the "duty" is to be calculated.

- Permit Condition 8.3 addresses monitoring emergency standby IC engine hours of operations. This permit condition allows up to or more than 200 operational hours per year for each generator. The modeling of annual emergency engine generator emissions in the July 14 analyses were based on operating each engine no more than 100 hours per year. Further confusing this assumption is Section 4.2.4 of the application (p. 16 of 320) which addresses the maximum operation of each engine during any calendar year and modeled emissions rates calculated by dividing these maximums by 24. Please clarify and revise this condition to be consistent with the 500 hour per year modeling guidance on emergency engine generator discussed above.

PM2.5 Background Concentrations

The March 15, 2013 modeling protocol approval issued by the Department provided background concentrations for all criteria pollutants and averaging periods based on 2008-2010 data collected at the St. Luke's Meridian monitor [(19.3 $\mu g/m^3$ (24-hr average) and 6.3 $\mu g/m^3$ (annual average)]. More recent data was available to the Department and should have been used to model ambient air impacts.

For example, $PM_{2.5}$ background values based on 2010-2012 data collected at the St. Luke's Meridian monitor had increased to 29 $\mu g/m^3$ (24-hr average) and approximately 6.8 $\mu g/m^3$ (annual average). These data were available to the Department by late spring 2013. In addition, $PM_{2.5}$ background values based on 2011-2013 data collected at the St. Luke's Meridian monitor were 53 $\mu g/m^3$ (24-hr average) and 11.95 $\mu g/m^3$ (annual average). These data were available to the Department by late spring 2014 and show that the $PM_{2.5}$ background concentrations in the Boise area now exceed the 24-hr NAAQS (35 $\mu g/m^3$) and very nearly exceed the 12 $\mu g/m^3$ annual $PM_{2.5}$ NAAQS.

Please explain why the Department determined it was acceptable for this Micron project to demonstrate compliance with the 24-hour $PM_{2.5}$ NAAQS using background values based on data collected during 2008-2010 for modeling analyses submitted as recently as July 2014. New data was available and arguably more representative of actual ambient air quality conditions. ICL urges the Department of revise the permitting package to include the use of more recent and relevant data.

The Department's Guidance on Intermittent Source Modeling

The Department has been inconsistent in its approach to modeling intermittent sources and appears to let Micron exclude these sources while requiring modeling from other permit applicants, even within the same airshed (BYU Idaho P-2013.0057, Project 61299, issued November 6, 2014; and St. Luke's Meridian Hospital, P-2012.0057, Project 61323).

The EPA 2011 guidance[2] for Intermittent Source Modeling lines out a very reasonable approach to modeling sources that could easily dominate modeled scenarios. In this guidance, EPA suggests that intermittent sources be included in dispersion modeling for 1-hr NO_2 impacts for sources with emission scenarios that are continuous enough or frequent enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations; and that it would be appropriate to restrict planned testing to certain hours of the day (for example, during daylight hours only), which might mitigate that source's contribution to ambient NO_2 levels. The EPA guidance also stresses that the reviewing authority (the Department) must be consulted and will make the final decisions with regard to modeling intermittent sources, and that a key criterion is the protection of public health.

The Department's March 15, 2013 modeling protocol approval required Micron to use the approach developed by the Department's modeling coordinator, Kevin Schilling, to model emergency engine generator emissions using three random hourly emission input files that would reflect the proposed testing schedule for each of the engines. It appears that Micron pushed the Department omit all emergency generator testing emissions from 1-hr NO_2 dispersion modeling analyses[3]. These interactions appear to have resulted in DEQ issuing "guidance" that allows applicants to do exactly that, providing the annual hours of operation for each engine generator do not exceed 100 hours per year. However, there appears to be no technical justification for this guidance. Based on sample cases run by the Department[4], impacts from these 19 engines would not be negligible regardless of whether testing protocol occurs one hour every two weeks or one hour each month. Please provide technical justification for omitting all engine generators from 1-hour NO2 modeling and for not requiring conditions stating when these engines should be appropriately tested (i.e. during the day or nighttime hours).

In addition, modeled emissions for short-term averaging periods do not include projected emergency operation of those engines. Please provide justifiable projections for the operations of these emergency engines, both in testing periods and during period of emergency use, and use these projections to model ambient air impacts.

There are significant issues with the proposed permit package and we would urge the Department to require Micron to submit an updated, comprehensive, and complete permit package that addresses the breadth of issues we have raised. Again, thank you for the opportunity to comment on the Micron Tier II air quality permit renewal. Please feel free to contact me with any questions or comments at (208) 345-6933 ex 23 or sarkle@idahoconservation.org.

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[2] http://www.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf

[3] Multiple emails between the Department and Micron where obtained through a Public Records Request. These interactions indicate serious disagreement between the Department and Micron about how intermittent sources should be treated.

[4] Table 13-1. DEQ Sample Case Results for 1-Hr NO2 Impacts

Sara Arkle

Community Conservation Associate
Idaho Conservation League

APPENDIX B – 2014 FEC ANNUAL RECORDKEEPING

Micron

RECEIVED

SEP 26 2014

DEPARTMENT OF ENVIRONMENTAL QUALITY BOISE REGIONAL OFFICE

September 26, 2014

HAND DELIVERED

Air Quality Permit Compliance
Department of Environmental Quality
Boise Regional Office
1445 N. Orchard
Boise, ID 83706-2239

Reference: **Micron Technology, Inc. – T2-2009.0078 Annual Report**

Dear Madame or Sir:

Enclosed is Micron Technology, Inc.'s annual air emissions report for the Boise facility, which operates under Tier II Operating Permit and Permit to Construct No. T2-2009.0078. In accordance with Permit Condition 3.5.1, this report includes the estimated total criteria pollutant and hazardous air pollutant (HAP) emissions as recorded from July 1, 2013 through June 30, 2014, the rolling 12-month emissions totals, and changes to the equipment log.

Calculations were performed using records of material usage for manufacturing and support processes, fuel use for boilers and other natural gas combustion sources, and hours of operation for emergency generators as directed by the permit. Calculations and supporting data are enclosed as the following:

- Appendix A – Criteria Pollutant Emissions
- Appendix B – HAP Emissions
- Appendix C – Equipment Log Updates

Based on information and belief formed after reasonable inquiry, the statements and information contained in this report are true, accurate, and complete.

Elizabeth N. Elroy — 9-26-14

Elizabeth Elroy — Date
Facilities Manager

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September 26, 2014

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Air Quality Permit Compliance
Department of Environmental Quality
Boise Regional Office
1445 N. Orchard
Boise, ID 83706-2239

Reference: Micron Technology, Inc. – T2-2009.0078 Annual Report

Dear Madame or Sir:

Enclosed is Micron Technology, Inc.'s annual air emissions report for the Boise facility, which operates under Tier II Operating Permit and Permit to Construct No. T2-2009.0078. In accordance with Permit Condition 3.5.1, this report includes the estimated total criteria pollutant and hazardous air pollutant (HAP) emissions as recorded from July 1, 2013 through June 30, 2014, the rolling 12-month emissions totals, and changes to the equipment log.

Calculations were performed using records of material usage for manufacturing and support processes, fuel use for boilers and other natural gas combustion sources, and hours of operation for emergency generators as directed by the permit. Calculations and supporting data are enclosed as the following:

Appendix A – Criteria Pollutant Emissions
Appendix B – HAP Emissions
Appendix C – Equipment Log Updates

Based on information and belief formed after reasonable inquiry, the statements and information contained in this report are true, accurate, and complete.

Elizabeth N. Elroy
Elizabeth Elroy
Facilities Manager

9-26-14
Date

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Elizabeth N. Elroy
Elizabeth Elroy
Facilities Manager

9-26-14
Date

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If you have any questions or require additional information, please contact Jane Anderson at (208)368-1508.

Sincerely,

Elizabeth N. Elroy

Elizabeth Elroy
Facilities Manager

Enclosures

cc: Air Quality Stationary Source Division
Department of Environmental Quality
1410 N. Hilton
Boise, ID 83706

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Apendix A - Criteria Pollutants and HAPs

Facility Wide Emissions

	Estimated Emissions (T/yr)[1]							
July 1, 2013 - June 30, 2014 Totals by Source	**PM10**	**SO2**	**NOx**	**CO**	**VOC**	**Lead**	**Individual HAP[2]**	**Aggregate HAPS**
Boilers (Bldg 4, 25, 32, 80)	2.0	0.6	15.7	15.5	1.5	0.0001	0.0	0.6
Natural Gas Combustion (Site Wide, Non-Boiler)	0.6	0.2	7.4	6.2	0.4	0.00004		
Emergency Generators (Site Wide)	0.03	0.02	1.4	0.3	0.04	--	0.0	0.0009
Cooling Towers (Site Wide)	13.0	--	--	--	--	--	--	--
Manufacturing Emissions (Site Wide)	8.4	0.4	3.6	--	42.9	0.00003	2.9	3.9
2013-2014 Total Emissions:	**24.0**	**1.2**	**28.0**	**22.0**	**44.8**	**0.0002**	**2.9**	**4.6**

Monthly Rolling 12-Month Emissions	**PM10**	**SO2**	**NOx**	**CO**	**VOC**	**Lead**	**Individual HAPS[2]**	**Aggregate HAPS**
as of July 31, 3013	23.9	0.9	28.6	22.0	46.7	0.0002	2.9	4.5
as of August 31, 3013	23.8	1.0	28.7	22.0	45.1	0.0002	2.9	4.8
as of September 30, 3013	23.9	1.0	28.7	21.9	45.4	0.0002	2.8	4.5
as of October 31, 3013	23.9	1.0	28.4	21.9	45.2	0.0002	2.8	4.4
as of November 30, 3013	24.0	1.0	28.7	22.1	45.4	0.0002	2.8	4.4
as of December 31, 3013	23.9	1.1	29.3	22.8	45.0	0.0002	2.7	4.6
as of January 31, 2014	23.7	1.1	28.9	22.4	45.0	0.0002	2.8	4.5
as of February 28, 2014	23.8	1.1	28.3	22.0	45.2	0.0002	2.8	4.6
as of March 31, 2014	23.7	1.1	28.1	21.9	44.5	0.0002	2.8	4.6
as of April 30, 2014	23.8	1.2	28.0	21.9	44.2	0.0002	2.9	4.6
as of May 31, 2014	23.8	1.2	27.9	22.0	44.7	0.0002	2.8	3.6
as of June 30, 2014	24.0	1.2	28.0	22.0	44.8	0.0002	2.9	4.6

FEC Limits	62	17	92	75	96	0.060	<10	<25

1. Emissions estimated using the equations and methods identified in June 1, 2009 application.
Not all materials used in manufacturing process have emissions to the air. Usage of those materials is not included in this report.
2. Emissions estimates for highest individal HAP (Hydrofluoric Acid (HF)).

Appendix A - Criteria Pollutants
Emission Estimates

2013-2014 Criteria Pollutant Emissions
Boilers

Equations:

a.) [PM_{10}, SO_2, VOC, lead] *Estimated Emissions (T/yr) = EF (lb/ft³) x Fuel Usage (ft³/yr) x 1 T/2000 lb.*

b.) [CO and NO_x] *Estimated Emissions (T/yr) = EF (lb/MMBTU) x Fuel Usage (MMBTU/yr) x 1 T/2000 lb.*

	Fuel Usage [1,2] ft³/yr	Fuel Usage [1,2] MMBTU/yr	Estimated Criteria Emissions Lead T/yr	PM_{10} T/yr	SO_2 T/yr	VOC T/yr	CO T/yr	NO_x T/yr
Bldg 4 [3]								
Boiler 1	0	0	0.E+00	0.00	0.00	0.00	0.00	0.00
Boiler 2	20,720,110	21,471	5.E-06	0.08	0.02	0.06	0.82	0.77
Boiler 3	0	0	0.E+00	0.00	0.00	0.00	0.00	0.00
Boiler 4	0	0	0.E+00	0.00	0.00	0.00	0.00	0.00
Boiler 5	0	0	0.E+00	0.00	0.00	0.00	0.00	0.00
Boiler 6	23,934,778	24,798	6.E-06	0.09	0.03	0.07	0.94	0.89
Bldg 25 [3,4,5]								
Boiler 1	61,584,731	63,599	2.E-05	0.24	0.07	0.17	2.42	2.29
Boiler 2	40,538,048	41,888	1.E-05	0.16	0.05	0.11	1.59	1.51
Boiler 3	39,762,284	41,077	1.E-05	0.15	0.05	0.11	1.56	1.48
Boiler 4	61,987,550	63,992	2.E-05	0.24	0.07	0.17	2.43	2.30
Boiler 5	50,324,732	51,968	1.E-05	0.19	0.06	0.14	1.97	1.87
Boiler 6 [5]	46,718,542	48,229	1.E-05	0.18	0.05	0.13	0.72	0.87
Boiler 7 [5]	57,572,152	59,421	1.E-05	0.22	0.07	0.16	0.89	1.07
Boiler 8 [5]	44,735,841	46,220	1.E-05	0.17	0.05	0.12	0.69	0.83
Boiler 9 [5]	52,666,867	54,348	1.E-05	0.20	0.06	0.15	0.82	0.98
Bldg 80 [2,3,7,8]								
Boiler 1 [8]	4,646,417	4,798	1.E-06	0.02	0.00	0.01	0.09	0.12
Boiler 2 [7]	4,646,417	4,798	1.E-06	0.02	0.00	0.01	0.09	0.12
Boiler 3 [7]	4,646,417	4,798	1.E-06	0.02	0.00	0.01	0.09	0.12
Boiler 4 [8]	4,646,417	4,798	1.E-06	0.02	0.00	0.01	0.09	0.12
Boiler 5 [8]	4,646,417	4,798	1.E-06	0.02	0.00	0.01	0.09	0.12
Boiler 6 [8]	4,646,417	4,798	1.E-06	0.02	0.00	0.01	0.09	0.12
Bldg 32 [1,3,6]								
Boiler 1	2,029,930	2,099	5.E-07	0.01	0.00	0.01	0.09	0.10
Total (T/yr):			**1.E-04**	**2.0**	**0.6**	**1.5**	**15.5**	**15.7**

	Lead	PM_{10}	SO_2	VOC	CO	NOx
Emission Factors (EF)[3]	5.00E-10	7.60E-06	0.0000023	5.50E-06		
Emission Factors (EF)[4]					7.60E-02	7.20E-02
Emission Factors (EF)[5]					8.40E-05	1.00E-04
Emission Factors (EF)[6]					3.00E-02	3.60E-02
Emission Factors (EF)[7]					4.06E-02	6.68E-02
Emission Factors (EF)[8]					3.69E-02	3.64E-02

1. Fuel usage is based on actual monitored values except for Bldg 32 where all gas usage for the building is assumed to be used in the boiler.
2. There is only one meter measuring all gas used in Bldg 80 boilers. The total usage was averaged over all 6 boilers.
3. EF for all boilers:
   Lead, PM_{10} and VOC EF are from AP-42, Section 1.4, for Small Boilers (<100 MMBTU/hr) in units lb/ft³.
   SO_2 EF is based on Idaho DEQ recommendations for Idaho's natural gas supply. See MTI's Tier II Operating Permit Statement of Basis.
4. NOx and CO EF for Bldg 4 boilers and Bldg 25 boilers 1-5 are from Sellers Engineering Co. in units of lb/MMBTU.
5. NOx and CO EF for Bldg 25 boilers 6, 7, 8, and 9 low-NOx boilers from Sellers Engineering Co. in units of lb/MMBTU.
6. NOx and CO EF for Bldg 32 are from AP-42 Section 1.4 for Small Boilers (<100 MMBTU/hr) In units of lb/ft³.
7. NOx and CO EF for Bldg 80 boilers 2 and 3 from Fulton in units lb/MMBTU.
8. NOx and CO emission factors for Bldg 80 low-emission boilers 1 and 4-6 from Fulton in lb/MMBTU.

Appendix A - Criteria Pollutants
Emission Estimates

2013-2014 Criteria Pollutant Emissions
Natural Gas Combustion (Site Wide, Non-Boiler)

Equations:

a.) *Estimated Emissions (T/yr) = EF (lb/ft ^{3}) x Fuel Usage (ft ^{3} /yr) x 1 T/2000 lb.*

	Fuel Usage [1]	Estimated Criteria Emissions					
		PM_{10}	SO_2	NOx	CO	VOC	Lead
	ft^3/yr	T/yr	T/yr	T/yr	T/yr	T/yr	T/yr
Total:	145,557,942	**0.6**	**0.2**	**7.4**	**6.2**	**0.4**	**4.E-05**

	PM_{10}	SO_2	NOx	CO	VOC	Lead
Emission Factors (EF) [2]	7.6E-06	2.3E-06	1.0E-04	8.4E-05	5.5E-06	5E-10

1. Fuel usage is based on fuel billing records less actual monitored values used in site boilers.
2. EF are from AP-42, Section 1.4, units are (lb/ft ^{3}).
   NO_x and CO EF are from Table 1.4-1 for Small Boilers (<100 MMBTU/hr).
   SO_2 EF is based on Idaho DEQ recommendations for Idaho's natural gas supply. See MTI's Tier II Operating Permit Statement of Basis.

Appendix A - Criteria Pollutants

Emission Estimates

2013-2014 Criteria Pollutant Emissions
Emergency Generators

Equations:

a.) *Estimated Emissions (T/yr) = EF (g/hp-hr) x Rated Capacity (hp) x Hours Operated (hr/yr) ÷ 453.6 (g/lb) ÷ 2000 (lb/T).*

Emission Unit ID	Rated Capacity (hp)	Hours Operated [1] (hr/yr)	Estimated Criteria Emissions				
			PM_{10} (T/yr)	**SO_2 (T/yr)**	**NO_X (T/yr)**	**CO (T/yr)**	**VOC (T/yr)**
01-GEN-01	1818	4.0	0.00	0.00	0.07	0.01	0.00
1X-GEN-01	1818	4.7	0.00	0.00	0.08	0.01	0.00
04-GEN-01	1817	4.5	0.00	0.00	0.07	0.02	0.00
06-GEN-01	1817	4.6	0.00	0.00	0.07	0.02	0.00
10-GEN-01	345	4.5	0.00	0.00	0.02	0.01	0.00
15-GEN-01	1482	4.3	0.00	0.00	0.06	0.01	0.00
17-GEN-01	1817	4.1	0.00	0.00	0.06	0.02	0.00
17C-GEN-01	1817	5.2	0.00	0.00	0.08	0.03	0.00
24-GEN-01	1850	4.4	0.00	0.00	0.11	0.01	0.00
24D-GEN-02	1817	3.7	0.00	0.00	0.05	0.02	0.00
24D-GEN-03	1817	4.1	0.00	0.00	0.06	0.02	0.00
25-GEN-01	1817	4.7	0.00	0.00	0.07	0.03	0.00
26-GEN-01	1850	3.7	0.00	0.00	0.10	0.00	0.00
36-GEN-01	1850	4.1	0.00	0.00	0.11	0.00	0.00
36-GEN-02	1850	3.9	0.00	0.00	0.10	0.00	0.00
38-GEN-01	449	4.0	0.00	0.00	0.02	0.01	0.00
50-GEN-01	2220	7.5	0.00	0.00	0.10	0.01	0.00
80-GEN-01	1818	4.7	0.00	0.00	0.08	0.01	0.00
22C-FWP-02	481	24.4	0.01	0.01	0.11	0.03	0.01
Total (T/yr):			**0.03**	**0.02**	**1.4**	**0.3**	**0.04**

Emission Factors for > 600 horse power units in (g/hp-hr)	**PM_{10}**	**SO_2**	**NO_X**	**CO**	**VOC**
AP-42 Factors [2]	0.3	0.0055	11	2.5	0.32
Factors for 24-GEN-01, 26-01, 36-01 AND 36-02	0.07		12.6	0.58	0.13
Factors for 01-GEN-01, 1X-01, 15-01, AND 80-01	0.2887		8.899	1.59	0.12
Factors for 04-GEN-01, 06-01, 17-01, 17C-01, 24D-02, 24D-03, & 25-01	0.19		7.29	2.67	0.365
Factors for 50-GEN-01	0.03		5.4	0.44	0.1

Emission Factors for < 600 horse power units in (g/hp-hr)

AP-42 Factors [3]	1	0.930	14	3.03	1.35
Factors for 38-GEN-01	0.842		9.085	2.9	0.156
Factors for 22C-FWP-02	0.49		8.26	2.02	0.405

1. Hours of operation are monitored with a non-resettable meter on each engine.
2. Emission factors from AP-42, Section 3.4, Large Stationary Diesel and All Stationary Duel Fuel Engines.
   AP-42 factors used where manufacturer's emission factor data is not available and for SO_2 emissions.
   For SO_2 emissions, sulfur content of the ultra-low sulfur fuel is assumed to be 15 ppm or 0.0015%.
3. Emission factors from AP-42, Section 3.3, Gasoline and Diesel Industrial Engines.
   AP-42 factors used where manufacturer's emission factor data is not available.
   For SO_2 emissions, sulfur content of the ultra-low sulfur fuel is assumed to be 15 ppm or 0.0015%.

Appendix A - Criteria Pollutants
Emissions Estimates

2013-2014 PM10 Emissions
Cooling Tower Emissions

Equations:

a.) Estimated Emissions (lb/yr) = Flow Rate (gal/min) x TDS (mg/L) x Drift Loss (%) x Operating Time (hr/yr) x 3.785 L/gal x 1 lb/453,600 mg x 60 min/hr

TDS = Total Dissolved Solids

Variables:

Operating Time (OT) 8760 hr/yr[1]

Manufacturer	Flow Rate (gal/min)	TDS (mg/L)	Drift Loss (%)	Estimated Emissions (lb/yr)
Marley	5,470	750	0.02%	3,599
PSI	76,000	750	0.008%	19,999
CCT	15,000	750	0.005%	2,467

Total:	**26,065 (lb/yr)**
	13 (T/yr)

1. This estimate conservatively assumes that all of the cooling towers are operating continuously all year.

Appendix A - Criteria Pollutants
Emission Estimates

2013-2014 PM_{10} Emissions
PM_{10} Formation - Manufacturing

Component Material Name	Component Usage[1] (lb/yr)	Gas Left in Returned Cylinder[2] (lb/yr)	Stoichiometric Conversion[3]	Chemical Conversions[4]	Percent Emitted[5]	Exhaust Conditioner Conversion[6]	Abatement Efficiency[7] (%)	Scrubber Downtime Correction Factor (%)[8]	PM_{10} (lb/yr)
EMISSION FORMULA:	(USAGE	- HEEL) X	STOICHIOMETRY	X	PERCENT EMITTED	X CONVERSION	X (1-CONTROL EFF)	X CORRECTION FACTOR	
DIBORANE	18	1	2.52	B_2H_6 -> B_2O_3	100%	0.9999	90%	112%	4.7
DICHLOROSILANE	1,694	85	0.60	H_2SiCl_2 -> SiO_2	100%	0.9999	50%	102%	489
DICHLOROSILANE	1,694	85	0.72	H_2SiCl_2 -> HCl	100%	0.9999	92%	114%	106
DISILANE	523	26	1.94	H_6Si_2 -> $2(SiO_2)$	100%	0.9999	50%	101%	488
GERMANIUM TETRAHYDRIDE	1.5	0.08	1.37	GeH_4 -> GeO_2	100%	0.9999	50%	102%	1.0
PHOSPHINE	24	1	2.09	PH_3 -> P_2O_5	100%	0.9999	50%	101%	24
SILANE	5,027	251	1.87	SiH_4 -> SiO_2	100%	0.9999	50%	101%	4,519
TETRAETHYL SILICATE	10,476	524	0.29	$C_8H_{20}O_4Si$ -> SiO_2	100%	0.9999	50%	103%	1,460
TRISILYLAMINE	11	1	1.68	Si_3H_9N -> $3(SiO_2)$	100%	0.9999	50%	101%	8.9
TUNGSTEN HEXAFLUORIDE	8,580	429	0.78	WF_6 -> WO_3	100%	0.9999	50%	101%	3,217
EMISSION FORMULA:	(USAGE	- HEEL) X	STOICHIOMETRY	X	PERCENT EMITTED	X	(1-CONTROL EFF)	X CORRECTION FACTOR	
BORON TRIFLUORIDE	28	1	0.88	BF_3 -> 3(HF)	100%		91%	100%	2.1
CHLORINE TRIFLUORIDE	524	26	0.39	ClF_3 -> HCl	100%		92%	113%	17.7
CHLORINE TRIFLUORIDE	524	26	0.65	ClF_3 -> 3(HF)	100%		91%	112%	33
IODOTRIFLUOROMETHANE	0.1	0.005	0.27	CF_3I -> 3(HF)	100%		91%	100%	0.002
METHYL FLUORIDE	57	3	0.59	CH_3F -> HF	100%		91%	112%	3.2
NITROGEN TRIFLUORIDE	27,456	1,373	0.85	NF_3 -> 3(HF)	100%		91%	124%	2,458
TITANIUM TETRACHLORIDE	1,058	53	0.42	$TiCl_4$ -> TiO_2	100%		50%	101%	214
TITANIUM TETRACHLORIDE	1,058	53	0.77	$TiCl_4$ -> 4(HCl)	100%		92%	114%	71
TRIMETHYLALUMINIUM	30	1	0.71	$C_6H_{18}Al_2$ -> Al_2O_3	100%		0%	100%	20
TUNGSTEN HEXAFLUORIDE	8,580	429	0.40	WF_6 -> HF	100%		91%	112%	330
EMISSION FORMULA:	(USAGE	- HEEL) X	STOICHIOMETRY	X	PERCENT EMITTED	X	(1-CONTROL EFF)	X CORRECTION FACTOR	
ANHYDROUS HYDROCHLORIC ACID[9]	420	21	1	HCl	100%		92%	114%	36
ANHYDROUS HYDROFLUORIC ACID[9]	48	2	1	HF	100%		91%	112%	4.6
EMISSION FORMULA:	USAGE	X	STOICHIOMETRY	X	PERCENT EMITTED	X	(1-CONTROL EFF)	X CORRECTION FACTOR	
HYDROCHLORIC ACID[10]	14,794		1	HCl	10%		92%	123%	145
HYDROFLUORIC ACID[10]	257,575		1	HF	10%		91%	117%	2,717
AMMONIUM FLUORIDE	56,156		0.54	NH_4F -> HF	10%		91%	119%	325
AMMONIUM BIFLUORIDE	122		0.70	NH_5F_2 -> 2(HF)	10%		91%	112%	0.9
1,3-DICHLORO-1,1,2,2,3-PENTAFLUOROPROPANE (H	0.7		0.49	$C_3HCl_2F_5$ -> 5(HF)	100%		91%	100%	0.03
1,3-DICHLORO-1,1,2,2,3-PENTAFLUOROPROPANE (H	0.7		0.36	$C_3HCl_2F_5$ -> 2(HCl)	100%		92%	100%	0.02
3,3-DICHLORO-1,1,1,2,2-PENTAFLUOROPROPANE (H	12		0.49	$C_3HCl_2F_5$ -> 5(HF)	100%		91%	100%	0.5
3,3-DICHLORO-1,1,1,2,2-PENTAFLUOROPROPANE (H	12		0.36	$C_3HCl_2F_5$ -> 2(HCl)	100%		92%	100%	0.3
DIIODODIFLUOROMETHANE	0.2		0.13	CF_2I_2 -> 2(HF)	100%		91%	100%	0.003
DIISOPROPYLAMINOSILANE	7.7		0.46	$C_6H_{17}NSi$ -> SiO_2	100%		50%	100%	1.8
HAFNIUM, TETRAKIS(DIMETHYLAMINO)-	22		0.59	$Hf(N(CH_3)_2)_4$ -> HfO_2	100%		50%	101%	6.5
PENTAMETHYLCYCLOPENTADIENYL TITANIUM TRIMETHOXIDE	7.7		0.29	$C_{13}H_{24}O_3Ti$ -> TiO_2	100%		50%	100%	1.1
GALLIUM, TRIETHYL-	2.2		0.60	$(CH_3CH_2)_3Ga$ -> Ga_2O_3	100%		50%	100%	0.7
PERFLUOROBUTANESULFONIC ACID	0.01		0.60	$C_4HF_9O_3S$ -> 9(HF)	100%		91%	100%	0.0005
SILANE, TRIETHOXY(3,3,4,4,5,5,6,6,7,7,8,8,8-TRIDECAFLUOROOCTYL)-	4.02		0.12	$C_{14}H_{19}F_{13}O_3Si$ -> SiO_2	100%		50%	100%	0.2
SILANE, TRIETHOXY(3,3,4,4,5,5,6,6,7,7,8,8,8-TRIDECAFLUOROOCTYL)-	4.02		0.51	$C_{14}H_{19}F_{13}O_3Si$ -> 13(HF)	100%		91%	100%	0.2
TETRAKISDIMETHYLAMINO TITANIUM	41		0.36	$C_8H_{24}N_4Ti$ -> TiO_2	100%		50%	100%	7.3
TRIS(DIMETHYLAMINO)CYCLOPENTADIENYL ZIRCONIUM	138		0.43	$C_{11}H_{23}N_3Zr$ -> ZrO_2	100%		50%	102%	30
TRIS(DIMETHYLAMINO)SILANE	49		0.37	$(N(CH_3)_2)_3SiH$ -> SiO_2	100%		50%	100%	9.1
XENON DIFLUORIDE	0.06		0.24	XeF_2 -> 2(HF)	100%		91%	100%	0.001
Total Manufacturing PM_{10} Emissions									**16,752 (lb/yr)** **8.4 (T/yr)**

1. This is the amount of each component purchased based on 2013-2014 purchasing records.
2. Gas cylinders are not depleted completely due to contamination issues and potential operational shortage issues. Estimate assumes 5% heel left in cylinder.
3. Based on stoichiometry, these are the conversions factors of raw material into regulated pollutants.
4. Raw material to regulated pollutant conversions.
5. Based on engineering judgment see justification in Section 3.1 of the narrative section of MTI's Tier II Permit Application March 2003.
6. Based on manufacturer's specifications, this is the conversion efficiency from the exhaust conditioners.
7. Based on manufacturer's specifications and engineering data this is the pollution abatement efficiency. See letter from MTI to IDEQ, dated January 7, 2011 for documentation and justification.
8. Scrubber Downtime Correction Factor based on hours per year scrubber control could not be credited and is determined by chemical usage in specific areas and specific scrubbers attributed to that area. See page A20 for a table of monthly scrubber downtimes by area.
9. Based on purchasing records this is the amount of Hydrofluoric Acid and Hydrochloric Acid purchased in gaseous form.
10. Based on purchasing records this is the amount of Hydrofluoric Acid and Hydrochloric Acid purchased in liquid form.

Appendix A - Criteria Pollutants
Emissions Estimates

2013-2014 SO_2 Emissions
Sodium Metabisulfite - Wastewater Treatment

Equation:

a.) *Estimated Emissions (lb/mo) = SO_2 formed (lb/mo)[1] ÷ hours per month (hr) x [(scrubber uptime (hr) x (1 - scrubber efficiency (96.4%)) + scrubber downtime (hr)]*

Date	Tank 660 SO_2 Generation[1] (lb)	Tank 662 SO_2 Generation[1] (lb)	Total Monthly SO_2 Emissions (lb)
Jul-13	2.9	0.8	3.7
Aug-13	4.6	0.5	5.1
Sep-13	1.7	0.4	2.1
Oct-13	2.4	0.4	2.8
Nov-13	2.5	0.3	2.8
Dec-13	3.2	0.4	3.7
Jan-14	1.2	0.2	1.4
Feb-14	0.9	0.1	1.0
Mar-14	0.7	1.1	1.8
Apr-14	1.8	1.4	3.2
May-14	0.5	0.2	0.7
Jun-14	1.8	1.6	3.4
		Total =	**32 lb/yr**

2013-2014 SO_2 Emissions
Sulfur Dioxide - Manufacturing

Equation:

b.) *Estimated Emissions (lb/mo) = Usage (lb/mo) - heel (lb/mo)[2]*

Date	Total Monthly SO_2 Emitted[2] (lb)
Jul-13	219
Aug-13	109
Sep-13	109
Oct-13	0
Nov-13	0
Dec-13	219
Jan-14	0
Feb-14	0
Mar-14	0
Apr-14	0
May-14	109
Jun-14	0
Total =	**765 lb/yr**

Total SO_2 Emissions Estimates:	**796 (lb/yr)**
	0.4 (T/yr)

1. Calculated based on sodium metabisulfite usage and wastewater pH for each tank.
2. Calculated based on sulfur dioxide usage less a 5% heel and the remaining emitted.

Appendix A - Criteria Pollutants
Emission Estimates

2013-2014 NOx Emissions
Manufacturing

Equation:
a.) *Estimated Emissions (lb/yr) = Usage (lb/yr) x Formation Ratio*

Component Material Name	Usage (lb/yr)	Formation Ratio	Estimated NOx Emissions (lb/yr)
NITRIC ACID[1]	601	0.73	439

Equation:
b.) *Estimated Emissions (lb/yr) = Usage (lb/yr) X (1- Heel) X Formation Ratio*

Component Material Name	Usage (lb/yr)	Heel	Formation Ratio	Estimated NOx Emissions (lb/yr)
NITROGEN TRIFLUORIDE[2]	32,076	5%	0.05	1,524
NITROUS OXIDE[3]	40,105	5%	0.135	5,143

Equation:
c.) *Estimated Emissions (lb/yr) = Usage (lb/yr)*

Component Material Name	Usage (lb/yr)	Estimated NOx Emissions (lb/yr)
NITRIC OXIDE	62	62

Total NOx Estimated Emissions	
	7,167 (lb/yr)
	3.6 (T/yr)

1. Usage in Fab 4 quartz clean process.
   Formation ratio for Nitric Acid to NOx is based on stoichiometric conversion.
2. Conversion of Nitrogen Trifluoride to NOx during CVD, diffusion and dry etch tool chamber cleans.
   Formation ratio based on tool vendor test data.
3. Conversion of Nitrous Oxide to NOx during tool exhaust thermal (oxidizing) abatement.
   Formation ratio based on tool vendor test data.

Appendix A - Criteria Pollutants
Emission Estimates

2013-2014 Uncontrolled VOC Emissions (MTI and MP Mask)
Manufacturing - No Solvent Drain

Equations:
a.) *Estimated Emissions (lb/yr) = Usage (lb/yr)*

Uncontrolled VOC Emissions (MTI and MP Mask) - No Solvent Drain	
Component Material Name	**Usage (lb/yr)**[1]
ISOPROPANOL	22,412
1-BROMO-3-CHLORO-5,5-DIMETHYLHYDANTOIN	5,300
MORPHOLINE	4,416
OCTYL PHENOXYPOLYETHOXYETHANOL	3,605
1-METHOXY-2-PROPANOL ACETATE	2,527
TETRAHYDROFURAN	804
ALKYBENZENE	798
2-PROPANOL, 1-METHOXY-	587
TRANS-1,2 DICHLOROETHYLENE	580
METHANOL	308
METHYL ETHYL KETONE	296
2-METHYLPENTANE	294
ISOPROPYLAMINE SALT OF GLYPHOSATE	201
1,2,3-PROPANETRIOL	183
CYCLOHEXANONE	177
1,2-PROPYLENE GLYCOL	161
ETHYLENE GLYCOL	145
PROPANE	145
POLYDIMETHYLSILOXANE FLUIDS	139
ACETYLENE	129
POLY(OXY-1,2-ETHANEDIYL), A-HYDRO-W-HYDROXY-	123
ETHANOL	107
ETHYL LACTATE	86
ETHANOL, 2-(2-ETHOXYETHOXY)-, ACETATE	68
2-PROPENOIC ACID, 2-METHYL-, MONOESTER WITH 1,2-PROPANEDIOL	67
REACTION PRODUCT OF EPICHLOROHYDRIN/BISPHENOL	64
PHOSPHONIC ACID, (1-HYDROXYEHTYLIDENE)BIS-	57
SOLVENT NAPHTHA (PETROLEUM), MEDIUM ALIPH.	54
OTHER - VOC	53
3-METHYLPENTANE	50
1,3-CYCLOHEXADIENE, 2-METHYL-5-(1-METHYLETHYL)-	48
2,2-DIMETHYLBUTANE	47
2,3-DIMETHYLBUTANE	47
DISTILLATES (PETROLEUM), HYDROTREATED LIGHT	44
1,2-ETHANEDIAMINE	43
2-(DIMETHYLAMINOETHANOL)	43
BENZENEMETHANOL	40
NAPHTHA (PETROLEUM), HYDROTREATED HEAVY	37
2-(2-BUTOXYETHOXY)ETHANOL	37
AROMATIC ADDITIVES	36
GRADE WW ROSIN	31
ACETIC ACID, BUTYL ESTER	30
HEXANE	28
XYLENE	28
TOLUENE	27
STYRENE	27
2-BUTOXY ETHANOL	27
5-CHLORO-2-METHYL-4-ISOTHIAZOLIN-3-ONE	25
METHYLTRIACELOXYSILANE	24
1-PROPOXY-2-PROPANOL	21

Appendix A - Criteria Pollutants
Emission Estimates

Uncontrolled VOC Emissions (MTI and MP Mask) - No Solvent Drain (continued)	
Component Material Name	**Usage (lb/yr)[1]**
PETROLEUM SPIRITS	18
REFINED PETROLEUM OIL	17
OXYDIAZON	16
ETHANOL, 2,2,2``-NITRILOTRIS-	15
ETHYL ACETATE	15
ACETIC ACID	14
PERFLUOROALKYLETHER	13
METHANE, OXYBIS-	13
N-METHYL-2-PYRROLIDONE	13
N-BUTANE	12
VM&P NAPHTHA	11
2-PROPENOIC ACID, 2-METHYL-, 2-HYDROXYETHYL ESTER	9.4
POLYALKYLENE GLYCOL	8.3
BUTYROLACTONE	8.1
ETHYL ETHER	7.8
BUTANE, 1,1-OXYBIS-	7.5
HEPTANE	6.4
POLYBUTENE	6.0
DIETHANOLAMINE	5.8
BENZENE, METHOXY-	5.8
N-OCTANE	5.8
SODIUM DODECYLBENZENE SULFONATE	5.3
2-AMINOETHANOL	4.9
PENTANE	4.5
2,2,4 TRIMETHYL PETANE DIOL-1,3 MONOISOBUTYR	4.5
CYCLOHEXANE	4.0
RESIDUAL OILS (PETROLEUM), HYDROTREATED	4.0
NEODECANOIC ACID, OXIRANYLMETHYL ESTER	4.0
2,4-PENTANEDIOL, 2-METHYL-	3.5
BUTYL BENZYL PHTHALATE	3.5
SUBSTITUTED SILANE/SILICA REACTION PRODUCT	3.5
ETHANOL, 2-(2-ETHOXYETHOXY)-	3.3
DIETHYLENE GLYCOL N-HEXYL ETHER	3.2
ACETIC ACID, 2,2-OXYBIS-	3.1
1,2-PROPADIENE, MIXT. WITH 1-PROPYNE (9CI)	3.1
ETHYL CYANOACRYLATE	2.9
AMMONIUM METAVANADATE	2.8
CYCLOPENTANONE	2.8
VINYL ACETATE	2.5
NAPHTHENIC DISTILLATE OIL MIST	2.4
AMMONIUM CITRATE DIBASIC	2.1
PYRIDINE, 2-METHYL-	2.1
NAPHTHA (PETROLEUM), LIGHT ALKYLATE	2.0
SEC-BUTYL ALCOHOL	1.9
CHLORINATED POLYVINYL CHLORIDE	1.8
1,2-ETHANEDIAMINE, N-(2-AMINOETHYL)-	1.7
4,4-ISOPROPYLIDENEDIPHENOL	1.7
FORMIC ACID	1.6
STODDARD SOLVENT	1.6
ACETIC ACID, 2-METHYLPROPYL ESTER	1.6
TRIETHANOLAMINE DODECYLBENZENE SULFONATE	1.6
SODIUM DODECYL SULFATE	1.3
BUTANOIC ACID, 3-OXO-, ETHYL ESTER	1.3
ETHYLBENZENE	1.2
NAPHTHA	1.1
BENZENE	1.1
2,2-OXYBISETHANOL	1.1

Appendix A - Criteria Pollutants
Emission Estimates

Uncontrolled VOC Emissions (MTI and MP Mask) - No Solvent Drain (continued)	
Component Material Name	**Usage (lb/yr)[1]**
PROPYLENE CARBONATE	1.1
1,1,1,3,3,3 HEXAFLUOROPROPANE	1.0
POLYGLYCOL DIMETHACRYLATE	0.9
ACETIC ACID, PENTYL ESTER	0.9
BUTANEDIOIC ACID, MONO[2-[(2-METHYL-1-OXO-2-PROPENYL)OXY]ETHYL] ESTER	0.8
ISOBUTANE	0.8
1,3-ISOBENZOFURANDIONE, TETRAH	0.7
LUBRICATING OILS (PETROLEUM), C20-50, HYDROTREATED NEUTRAL OIL-BASED, HIGH-VISCOSITY	0.7
NAPTHENIC DISTILLATE	0.7
BIFENTHRIN	0.7
SODIUM PENTACHLOROPHENATE	0.7
2-PROPENOIC ACID, 2-METHYL-, BUTYL ESTER	0.7
CUMENE HYDROPEROXIDE	0.7
PROPANOIC ACID, 3-ETHOXY-, ETHYL ESTER	0.7
TETRAMETHOXYGERMANE	0.6
1,4-DIOXANE	0.5
ETHYLENE OXIDE	0.5
3-METHOXY METHYL PROPIONATE	0.5
PIPERONYL BUTOXIDE TECHNICAL	0.5
LIGROINE	0.5
2-METHYL BUTYL ACETATE	0.4
4-METHYLPYRIDINE	0.4
ACETALDEHYDE	0.4
FORMALDEHYDE	0.4
DIACETONE ALCOHOL	0.3
METHYL ISOBUTYL KETONE	0.3
ACETONITRILE	0.3
ACRYLIC ACID	0.3
TRIETHYLENE GLYCOL DIMETHACRYLATE	0.3
ISOAMYL ETHER	0.2
3(DIETHYLAMINO)PROPYLAMINE	0.2
DIIODODIFLUOROMETHANE	0.2
PARAFFIN WAXES AND HYDROCARBON WAXES, CHLORO	0.2
POLYVINYLPYRROLIDONE	0.2
PROPYLENE OXIDE	0.2
L-GLUTAMIC ACID	0.2
SUBSTITUTED TRIAZINE	0.2
TRIMETHYLOLPROPANE	0.2
CYCLO. EPOXY RESIN ERL-4221E	0.2
STRAIGHT RUN MIDDLE DISTILLATES	0.2
OCTAMETHYLCYCLOTETRASILOXANE	0.1
M-XYLENE	0.1
POLYGLYCOL LAURATE	0.1
TETRABUTYLAMMONIUM HYDROXIDE	0.1
NITROCELLULOSE	0.1

Total:	**44,971 (lb/yr)** **22.5 (T/yr)**

Notes: See page A19

Appendix A - Criteria Pollutants
Emission Estimates

2013 -2014 Uncontrolled VOC Emissions (MTI)
Manufacturing - With Solvent Drain

Equations:
a.) *Estimated Emissions (lb/yr) = Usage (lb/yr) - Solvent Waste (lb/yr)*

Component Material Name	Usage (lb/yr)[1]	Waste Allocation (lb/yr)[3]	Estimated Emissions (lb/yr)[8]
1-DODECENE	11,592	7,948	3,644

Total:	**3,644 (lb/yr)** **1.8 (T/yr)**

Notes: See page A19

Appendix A - Criteria Pollutants
Emission Estimates

2013-2014 Controlled VOC Emissions (MTI)
Manufacturing - With Solvent Drain
Fab 4

Equation Inputs	Value	Variable
VOC Downtime (hr/yr)[4]	167.4	DT
VOC Uptime (hr/yr)	8,592.6	UT
Operating Time (hr/yr)	8,760.0	OT
VOC Efficiency[2]	0.948	VOC Efficiency

Equations:

a.) *To VOC (lb/yr) = Usage (lb/yr) - Solvent Waste (lb/yr)*

b.) *Estimated Emissions (lb/yr) = [To VOC x DT/OT] + [To VOC x UT/OT x (1-VOC Efficiency)]*

Controlled VOC Emissions (MTI) - With Solvent Drain				
Component Material Name	**Usage (lb/yr)[1]**	**Waste Allocation (lb/yr)[3]**	**To VOC (lb/yr)[8]**	**Estimated Emissions (lb/yr)[8]**
ISOPROPANOL	521,913	307,893	214,019	15,007
1-METHOXY-2-PROPANOL ACETATE	178,907	129,148	49,759	3,489
ACETIC ACID, BUTYL ESTER	32,575	20,818	11,756	824
4-METHYL-2-PENTANOL	10,406	6,421	3,985	279
1,3-PROPANEDIOL	5,990	2,135	3,855	270
DIPROPYLENE GLYCOL METHYL ETHER	5,990	2,135	3,855	270
ETHYL LACTATE	4,322	3,578	744	52
HEXAMETHYLDISILIZANE	1,895		1,895	133
2-PROPANOL, 1-METHOXY-	1,378	3,371	0	0
2-METHOXY-1-PROPANOL ACETATE	820		820	57
CYCLOHEXANONE	711	317	394	28
N-METHYL-2-PYRROLIDONE	641	1,228	0	0
PROPYLENE GLYCOL MONOETHYL ETHER	607		607	43
BUTYROLACTONE	450	419	31	2.2
BENZENE, METHOXY-	371	117	254	18
2-HEPTANONE	304		304	21
OTHER - VOC	300		300	21
ETHANOL, 2,2,2``-NITRILOTRIS-	274		274	19
ISOBUTYL ALCOHOL	264		264	19
2-(2-BUTOXYETHOXY)ETHANOL	216		216	15
BENZALDEHYDE, 2-HYDROXY-, POLYMER WITH 1,4-BIS[(ETHENYLOXY)METHYL]CYCLOHEXANE, FORMALDEHYDE, 3-METHY	206		206	14
METHYL-2-HYDROXYISOBUTYRATE	147		147	10
ACETIC ACID, PENTYL ESTER	127		127	8.9
ETHYLENE GLYCOL	119	347	0	0
2-AMINOETHANOL	77		77	5.4
2-METHYL BUTYL ACETATE	76		76	5.4
PROPANOIC ACID, BUTYL ESTER	57		57	4.0
CRESOL (MIXED ISOMERS)	57		57	4.0
2-METHYL-4-ISOTHIAZOLIN-3-ONE	48		48	3.3
PROPANOL, OXYBIS-	40		40	2.8
PROPANOIC ACID, 2-HYDROXY-, ETHYL ESTER, (2S)-	23		23	1.6
1,2-ETHANEDIAMINE	20		20	1.4
GLYCINE	18		18	1.2
ISOAMYL ETHER	12		12	0.9
TRIS(DIMETHYLAMINO)SILANE	9.9		9.9	0.7
CYCLOPENTANONE	9.1		9.1	0.6
DIACETONE ALCOHOL	5.5	10	0	0

Appendix A - Criteria Pollutants
Emission Estimates

Controlled VOC Emissions (MTI) - With Solvent Drain (continued)				
Component Material Name	Usage (lb/yr)[1]	Waste Allocation (lb/yr)[3]	To VOC (lb/yr)[8]	Estimated Emissions (lb/yr)[8]
1,3-BENZENEDIACETONITRILE, A,A-BIS[[(BUTYLSULFONYL)OXY]IMINO]-	4.6		4.6	0.3
BENZENE, ETHENYL-, HOMOPOLYMER	1.9		1.9	0.1
TETRAETHYLENEPENTAMINE	1.1		1.1	0.1
1,4-DIOXANE	0.7		0.7	0.05
TERT-BUTYL ALCOHOL	0.6		0.6	0.04
METHANOL	0.5		0.5	0.04
1,2-PROPYLENE GLYCOL	0.4		0.4	0.03
2-HEXANONE	0.4		0.4	0.03
ETHYL ACETATE	0.4		0.4	0.03
TRIETHYLAMINE	0.4		0.4	0.03
1,8-NAPHTHALIMIDYL TRIFLATE	0.3		0.3	0.02
1-BUTANOL, 2-METHYL-	0.3		0.3	0.02
PROPANOIC ACID, 3-ETHOXY-, ETHYL ESTER	0.3		0.3	0.02
PROPANOIC ACID, 2-METHYL-, 2-METHYLPROPYL ESTE	0.2		0.2	0.02
1,1,3,3-TETRAMETHYLDISILAZANE	0.2		0.2	0.02
BENZENEMETHANOL	0.2		0.2	0.01
POLYDIMETHYLSILOXANE FLUIDS	0.2		0.2	0.01
TRIMETHYLSILYL ISOCYANATE	0.2		0.2	0.01
HEPTANE	0.1		0.1	0.01
METHYL ISOBUTYL KETONE	0	2.8	0	0

Total:	20,634 (lb/yr) 10.3 (T/yr)

Notes: See page A19

Appendix A - Criteria Pollutants
Emission Estimates

2013-2014 Scrubber Controlled VOC Emissions (MTI)
Manufacturing

Equation Inputs	Value	Variable
Scrubber Downtime (hr/yr)[4]	180.4	DT
Scrubber Uptime (hr/yr)	8,579.6	UT
Operating Time (hr/yr)	8,760.0	OT

Equations:

a.) *Estimated Emissions (lb/yr) = Usage (lb/yr) x % Emitted ÷ Operating Time (hr/yr) x [Scrubber Downtime (hr/yr) + Scrubber Uptime (hr/yr) x (1-Scrubber Efficiency)]*

Component Material Name	Usage (lb/yr)[1]	% Emitted	Scrubber Efficiency[2]	Estimated Emissions (lb/yr)
ACETIC ACID	25,782	10%	90%	306
ACETYLENE	1,201	100%	0%	1,201
PROPYLENE	760	100%	0%	760
GLYCINE	696	100%	90%	82
ETHYLENE	420	100%	0%	420
1-BROMO-2-METHYLPROPANE	378	100%	0%	378
ETHANEDIOIC ACID	148	100%	0%	148
ISOPROPANOL	112	100%	0%	112
FORMIC ACID	79	100%	0%	79
METHYL FLUORIDE	57	100%	90%	6.8
TRIS(DIMETHYLAMINO)SILANE	39	100%	0%	39
ETHYLENE GLYCOL	38	100%	0%	38
HAFNIUM, TETRAKIS(DIMETHYLAMINO)-	22	100%	0%	22
METHANAMINE, N-METHYL-	17	100%	0%	17
DIISOPROPYLAMINOSILANE	7.7	100%	0%	7.7
1-PIPERAZINEETHANAMINE	6.6	100%	0%	6.6
2-AMINOETHANOL	4.4	100%	90%	0.5
DIIODODIFLUOROMETHANE	0.2	100%	0%	0.2
GLUTARALDEHYDE	0.1	100%	0%	0.1

Total:	**3,624 (lb/yr)** **1.8 (T/yr)**

Notes: See page A19

Appendix A - Criteria Pollutants
Emission Estimates

2013-2014 Uncontrolled VOC Emissions (RDL)
Manufacturing - With Solvent Drain
Before Bldg 15 (RDL) VOC abatement was installed (July-Oct 2013)[10]

Equations:
a.) *Estimated Emissions (lb/yr) = Usage (lb/yr) - Waste Allocation (lb/yr)*

Component Material Name	Usage (lb/yr)[1]	Waste Allocation (lb/yr)[3]	Estimated Emissions (lb/yr)[8]
ISOPROPANOL	30,920	27,195	3,725
N-METHYL-2-PYRROLIDONE	4,081	4,325	0
1-METHOXY-2-PROPANOL ACETATE	11,620	6,883	4,737
ETHYLENE GLYCOL	1,785	1,068	717
ETHYL LACTATE	351	192	159
BUTYROLACTONE	143	151	0
BENZENE, METHOXY-	114	42	72
2-METHYL BUTYL ACETATE	57	4.4	53
ACETIC ACID, PENTYL ESTER	57	8.6	49
STODDARD SOLVENT	51		51
2-METHOXY-1-PROPANOL ACETATE	37		37
3-METHOXY-1-BUTANOL ACETATE	11	0.2	11
HEXAMETHYLDISILIZANE	8.8		8.8
CRESOL (MIXED ISOMERS)	5.7		5.7
1,2-PROPYLENE GLYCOL	3.1		3.1
DIETHANOLAMINE	2.0		2.0
ETHANOL, 2,2,2``-NITRILOTRIS-	2.0		2.0
1,4-DIOXANE	1.1		1.1
2-BUTOXY ETHANOL	1.1		1.1
2-PROPANOL, 1-METHOXY-	0	217	0
ACETIC ACID, BUTYL ESTER	0	7.3	0
DIACETONE ALCOHOL	0	51	0

Total:	**9,634 (lb/yr)** **4.8 (T/yr)**

Notes: See page A19

Appendix A - Criteria Pollutants
Emission Estimates

2013-2014 Controlled VOC Emissions (RDL)
Manufacturing - With Solvent Drain
After Bldg 15 (RDL) VOC abatement was installed (Nov 2013-June 2014)[10]

Equation Inputs	Value	Variable
VOC Downtime (hr/yr)[4]	552.6	DT
VOC Uptime (hr/yr)	5,255.4	UT
Operating Time (hr/yr)	5,808.0	OT
VOC Efficiency[2]	0.948	VOC Efficiency

Equations:

a.) *To VOC (lb/yr) = Usage (lb/yr) - Waste Allocation (lb/yr)*

b.) *Estimated Emissions (lb/yr) = [To VOC x DT/OT] + [To VOC x UT/OT x (1-VOC Efficiency)]*

Component Material Name	Usage (lb/yr)[1]	Waste Allocation (lb/yr)[3]	To VOC (lb/yr)[8]	Estimated Emissions (lb/yr)[8]
ISOPROPANOL	44,369	34,082	10,287	1,463
1-METHOXY-2-PROPANOL ACETATE	23,241	16,453	6,787	965
N-METHYL-2-PYRROLIDONE	0	202	0	0
ETHYLENE GLYCOL	0	27	0	0
BUTYROLACTONE	832	792	40	5.7
ETHYL LACTATE	690	697	0	0
BENZENE, METHOXY-	197	32	164	23
2-METHOXY-1-PROPANOL ACETATE	123		123	18
ACETIC ACID, PENTYL ESTER	98	6.3	92	13
2-METHYL BUTYL ACETATE	98	1.6	96	14
1,4-DIOXANE	41		41	5.8
CRESOL (MIXED ISOMERS)	9.7		9.7	1.4
HEXAMETHYLDISILIZANE	8.8		8.8	1.3
1,2-PROPYLENE GLYCOL	8.8		8.8	1.3
2-PROPANOL, 1-METHOXY-	5.4	3.4	2.1	0.3
DIETHANOLAMINE	4.9		4.9	0.7
ETHANOL, 2,2,2``-NITRILOTRIS-	4.9		4.9	0.7
3-METHOXY-1-BUTANOL ACETATE	3.3		3.3	0.5
1-DODECENE	0	6,528.4	0	0
ACETIC ACID, BUTYL ESTER	0	136.3	0	0
DIACETONE ALCOHOL	0	6.7	0	0

Total:	**2,513 (lb/yr)** **1.3 (T/yr)**

Notes: See page A19

2013-2014 Controlled VOC Emissions (3DI)
Manufacturing - With Solvent Drain

Equation Inputs	Value	Variable
VOC Downtime (hr/yr)[4]	158.3	DT
VOC Uptime (hr/yr)	8,601.7	UT
Operating Time (hr/yr)	8,760.0	OT
VOC Efficiency[2]	0.948	VOC Efficiency

Equations:

a.) *To VOC (lb/yr) = Usage (lb/yr) - Waste Allocation (lb/yr)*

b.) *Estimated Emissions (lb/yr) = [To VOC x DT/OT] + [To VOC x UT/OT x (1-VOC Efficiency)]*

Component Material Name	Usage (lb/yr)[1]	Waste Allocation (lb/yr)[3]	To VOC (lb/yr)[8]	Estimated Emissions (lb/yr)[8]
ISOPROPANOL	29,073	32,847	0	0
N-METHYL-2-PYRROLIDONE	23,169	27,701	0	0
1-METHOXY-2-PROPANOL ACETATE	10,646	3,389	7,256	502
ETHYLENE GLYCOL	8,092	5,462	2,630	182
ETHYL LACTATE	84	1.9	83	5.7
2-METHOXY-1-PROPANOL ACETATE	52		52	3.6
OCTYL PHENOXYPOLYETHOXYETHANOL	34		34	2.4
BENZENE, METHOXY-	13	0.03	13	0.9
1,2-PROPYLENE GLYCOL	6.6		6.6	0.5
ACETIC ACID, PENTYL ESTER	6.2		6.2	0.4
2-METHYL BUTYL ACETATE	5.8		5.8	0.4
3-METHOXY-1-BUTANOL ACETATE	2.9	0.2	2.7	0.2
BUTYROLACTONE	2.5	19	0	0
POLY(OXY-1,2-ETHANEDIYL), A-HYDRO-W-HYDROX	1.1		1.1	0.1
CRESOL (MIXED ISOMERS)	0.4		0.4	0.03
2-PROPANOL, 1-METHOXY-	0	2,876	0	0
DIACETONE ALCOHOL	0	79	0	0
METHYL ISOBUTYL KETONE	0	5.8	0	0
PROPANOIC ACID, 3-ETHOXY-, ETHYL ESTER	0	2.0	0	0

Total:	
	698 (lb/yr) 0.3 (T/yr)

Notes: See page A19

VOC Emission Estimate Notes:

1. This is the amount of each constituent purchased by area based on 2013-2014 purchasing records.
   VOCs purchased in amounts <0.1 lbs in a single month are assigned to "Other-VOC" No Drain No Control.
   Total weight of these VOCs <45 lbs for the reporting period.
2. Based on manufacturer's specifications and engineering data this is the pollution abatement efficiency.
3. Based on bulk hazardous waste shipments and allocated by usage.
4. Annual average downtime per manufacturing area is a weighted average based on the exhaust-flow capacities
   of each unit that service that area.
5. Based on stoichiometry, these are the conversions factors of raw material gases into regulated pollutants.
6. Gas cylinders are not depleted completely due to contamination issues and potential operational shortage issues.
   Estimate assumes 5% left in cylinder.
7. Based on manufacturer's specifications, this is the conversion efficiency from the exhaust conditioners.
8. As described in permit application dated June 1, 2009, the facility uses a mass balance approach to VOC emissions calculations.
   The mass balance subtracts bulk solvent shipments, which occur every three to twelve weeks.
   Based on this approach, annual usage may be less than waste allocation.
   Over time, this approach results in an accurate emissions calculation.
   In the event that the solvent waste shipped exceeds the purchased amounts, negative emissions are conservatively set to zero.
9. No waste credit taken from "Other-VOC" emissions since the source of this constituent in the waste has not been fully identified.
10. New VOC unit installed on Bldg 15/16 (RDL area) on 11/19/2013.

2013-2014 Abatement Downtime Summary

VOC Equipment Group	Downtime (hr/yr)		
VOC - Fab 1X (Bldg 1X)	158.3		
VOC - Fab 2 (Bldg 2)	8760		
VOC - Fab 3 (Bldg 15) Nov 2013-June 2014	552.6		
VOC - Fab C (Bldg 24a - 02)	8760		
VOC - Fab 4B-01 (Bldg 24D)	8760		
VOC - Fab 4B-02	218.9		
VOC - Fab 4B-03	85.2	167.4	Fab 4 VOC Capacity-Weighted Downtime Average.[4]
VOC - Bldg 50	168.2		
VOC - Mask Shop	8760		

Scrubber Equipment Group	Downtime (hr/yr)
Fab 1 (01-FS-01 through 01-FS-03)	8760.0
Fab 1X NH3 (01X-AMS-105)	0
Fab 1X (01X-FS-101 through 01X-FS-104)	0.1
Bldg. 4 (04-FS-01 and 04-FS-02)	0
Bldg. 5 (05-FS-01 through 05-FS-03)	0.03
Bldg. 15 NH3 (15-AMS-05 and 15-AMS-06)	3.8
Bldg. 15 (15-FS-02 and 15-FS-03)	0.3
Bldg. 16 (16-FS-01 and 16-FS-02)	53.1
Bldg. 22 (22-FS-02)	47.4
CMP (24-FS-01 through 24-FS-03)	0.4
CMP NH3 (24-AMS-08)	0.2
Fab 4 NH3 (24-AMS-12)	2.2
Fab 4 (24-FS-6, 24-FS-7, 24-FS-9, and 24-FS-10)	15
Implant (24-FS4, 24-FS5, and 24-FS-11)	0
Fab 4B (24D-FS-01 through 24D-FS-04)	107.1
Fab 4B MPS (24D-PMS-01)	0
Fab 4B NH3 (24D-AMS-01)	105
Assembly (26-FS-01 and 26-FS-02)	0.02
Bldg. 50 NH3 (50-AMS-01 and 50-AMS-02)	22.0
Bldg. 50 (50-FS-01 through 50-FS-03)	58.2
Mask (80-FS-01 and 80-FS-02)	0

Notes: See page A19

Appendix A - Criteria Pollutants

Emission Estimates

2013- 2014 Solvent Waste Shipment Allocation [8]

Component Material Name	B16 (RDL) Solvent Drain - Uncontrolled Solvent Waste (lb/yr)	B16 (RDL) Solvent Drain - Controlled Solvent Waste (lb/yr)	Fab 4 Solvent Drain - Controlled Solvent Waste (lb/yr)	B1X (3DI) Solvent Drain - Controlled Solvent Waste (lb/yr)
1,3-PROPANEDIOL	0	0	2,135	0
1-DODECENE	1,420	6,528	0	0
1-METHOXY-2-PROPANOL ACETATE	6,883	16,453	129,148	3,389
2-PROPANOL, 1-METHOXY-	217	3	3,371	2,876
4-METHYL-2-PENTANOL	0	0	6,421	0
ACETIC ACID, BUTYL ESTER	7	136	20,818	1
ACETONE (Not a VOC)	12,174	24,447	1,134	724
BENZENE, METHOXY-	42	32	117	0
BUTYROLACTONE	151	792	419	19
CYCLOHEXANONE	0	0	317	0
DIACETONE ALCOHOL	51	7	10	79
DIPROPYLENE GLYCOL METHYL ETHER	0	0	2,135	0
ETHYL LACTATE	192	697	3,578	2
ETHYLENE GLYCOL	1,068	27	347	5,462
ISOPROPANOL	27,195	34,082	307,893	32,847
METHYL ISOBUTYL KETONE	0	0	3	6
N-METHYL-2-PYRROLIDONE	4,325	202	1,228	27,701
OTHER - VOC [10]	282	160	1,489	2,511
PROPANOIC ACID, 3-ETHOXY-, ETHYL ESTER	0	0	0	2
TOLUENE	0	0	0	0

Notes: See page A19

Appendix A - Criteria Pollutants
Emissions Estimates

2013-2014 Lead Emissions
Manufacturing Emissions

Equations:

a.) *Estimated Emissions (lb/yr) = Concentration (ug/m ^{3}) x Exhaust Flowrate (ft ^{3} /min) x Operating Time (hr/yr) x 1 m ^{3} /35.3 ft ^{3} x 1 lb/453,600,000 ug x 60 min/1 hr*

SIG Wave Solder Exhaust - Bldg. 32

Dross Skims

Concentration [1] =	4	ug/m^3
Wave solder exhaust flow rate =	475	ft^3/min
Operating Time [2] =	487	hr/yr
Dross Skim Estimated Emission =	**0.0001**	**lb/yr**

Solder Pot

Concentration [1] =	11.25	ug/m^3
Exhaust flow rate at solder pot =	140	ft^3/min
Operating Time =	8760	hr/yr
Solder Pot Estimated Emission =	**0.05**	**lb/yr**

Total:	**0.05**	**(lb/yr)**
	0.00003	**(T/yr)**

1. As tested by site Industrial Hygenist.
2. Dross skims every 6 hours and last for 20 minutes (max).

Appendix B - HAPs
Facility Wide HAP Emissions

	Combustion (lb/yr)		Manufacturing (lb/yr)	Estimated Emissions (lb/yr)
Component Material Name	Natural Gas	Generator		
1,3-BUTADIENE		0.004	0	0.004
1,4-DIOXANE			0.6	0.6
ACETALDEHYDE		0.1	0.4	0.5
ACETONITRILE			0.3	0.3
ACROLEIN		0.02	0	0.02
ACRYLIC ACID			0.3	0.3
ANTIMONY COMPOUNDS			0.9	0.9
ARSENIC COMPOUNDS	0.1		0.2	0.3
BENZENE	1.4	0.8	1.1	3.3
BERYLLIUM COMPOUNDS	0.008		0	0.008
CADMIUM COMPOUNDS	0.8		0	0.8
CHLORINE			846	846
CHROMIUM COMPOUNDS	1.0		0.1	1.0
COBALT COMPOUNDS	0.1		0	0.1
CRESOL (MIXED ISOMERS)			4.0	4.0
DICHLOROBENZENE	0.8		0	0.8
DIETHANOLAMINE			5.8	5.8
ETHYLBENZENE			1.2	1.2
ETHYLENE GLYCOL			141	141
ETHYLENE OXIDE			0.5	0.5
FORMALDEHYDE	51	0.2	0.4	52
GLYCOL ETHERS			122	122
HEXANE	1,232		28	1,260
HYDROCHLORIC ACID			376	376
HYDROFLUORIC ACID			5,875	5,875
LEAD COMPOUNDS			0.1	0.1
MANGANESE COMPOUNDS	0.3		1.26	1.5
MERCURY COMPOUNDS	0.2		2.4	2.6
METHANOL			308	308
METHYLENE CHLORIDE			2.9	2.9
METHYL ISOBUTYL KETONE			0.3	0.3
NAPHTHALENE	0.4		0	0.4
NICKEL COMPOUNDS	1.4		0.01	1.4
PAH	0.1	0.2	0	0.3
PHOSPHINE			0.002	0.002
PHTHALIC ANHYDRIDE			17	17
PROPYLENE OXIDE			0.2	0.2
PYROCATECHOL			32	32
SELENIUM COMPOUNDS	0.02		1.5	1.6
STYRENE			27	27
TOLUENE	2.3	0.3	27	30
TRIETHYLAMINE			0	0.03
VINYL ACETATE			2.5	2.5
XYLENE		0.2	28	28

Total:	9,148 (lb/yr) 4.6 (T/yr)

Appendix B - HAPs
Emission Estimates

2013-2014 HAP Emissions
Natural Gas Combustion

Equations

a.) *Estimated Emissions (lb/yr) = Emission Factor (lb/10^6 ft^3) x Fuel Usage (10^6 ft^3/yr).*

Component Material Name	Emission Factor[1,4] (lb/10^6 ft^3)	Adusted Emission Factor[3] (lb/10^6 ft^3)	Fuel Usage[2] (10^6 ft^3/yr)	Emissions (lb/yr)
PAH	8.8E-05	8.9E-05	676.01	0.1
BENZENE	2.1E-03	2.1E-03	676.01	1.4
DICHLOROBENZENE	1.2E-03	1.2E-03	676.01	0.8
FORMALDEHYDE	7.5E-02	7.6E-02	676.01	51
HEXANE	1.8E+00	1.8E+00	676.01	1,232
NAPHTHALENE	6.1E-04	6.2E-04	676.01	0.4
TOLUENE	3.4E-03	3.4E-03	676.01	2.3
ARSENIC COMPOUNDS	2.0E-04	2.0E-04	676.01	0.1
BERYLLIUM COMPOUNDS	1.2E-05	1.2E-05	676.01	0.0
CADMIUM COMPOUNDS	1.1E-03	1.1E-03	676.01	0.8
CHROMIUM COMPOUNDS	1.4E-03	1.4E-03	676.01	1.0
COBALT COMPOUNDS	8.4E-05	8.5E-05	676.01	0.1
MANGANESE COMPOUNDS	3.8E-04	3.8E-04	676.01	0.3
MERCURY COMPOUNDS	2.6E-04	2.6E-04	676.01	0.2
NICKEL COMPOUNDS	2.1E-03	2.1E-03	676.01	1.4
SELENIUM COMPOUNDS	2.4E-05	2.4E-05	676.01	0.02
Total:				**1,292 lb/yr** **0.6 T/yr**

1. Emission Factors from AP-42 Section 1.4, units are lb/10^6 ft^3.
2. Fuel usage is based on site wide fuel billing records.
3. EPA AP-42 emission factors assume 1020 BTU/ft^3, but MTI's natural gas averaged 1032.6 BTU/ft^3 during this period. Adjusted factor = Original factor * 1032.6 / 1020.
4. Average emission factor of Polycyclic Aromatic Hydrocarbons (PAH) listed in AP-42, Section 1.4.

Appendix B - HAPs
Emission Estimates

2013-2014 HAP Emissions
Emergency Generator Emissions

Equations:
a.) *Estimated Emissions (lb/yr)= EF (lb/MMBTU) x Heat Capacity of diesel (MMBTU/gal) x Fuel Use Rate (gal/hr) x Hours of Operation (hr/yr).*

Emission Unit ID	Rated Capacity (HP)	Fuel Use Rate (gal/hr)	Hours of Operation [1] (hr/yr)	Estimated Emissions: Acetaldehyde (lb/yr)	Acrolein (lb/yr)	Benzene (lb/yr)	1,3-Butadiene (lb/yr)	Formaldehyde (lb/yr)	PAH (lb/yr)	Toluene (lb/yr)	Xylenes (lb/yr)	Total HAPS (lb/yr)	
01-GEN-01	1818	89.7	4.0	1.2E-03	3.9E-04	3.8E-02	0.0E+00	3.9E-03	1.0E-02	1.4E-02	9.6E-03	7.8E-02	
1X-GEN-01	1818	89.7	4.7	1.5E-03	4.6E-04	4.5E-02	0.0E+00	4.6E-03	1.2E-02	1.6E-02	1.1E-02	9.2E-02	
04-GEN-01	1817	94.3	4.5	1.5E-03	4.6E-04	4.5E-02	0.0E+00	4.6E-03	1.2E-02	1.6E-02	1.1E-02	9.2E-02	
06-GEN-01	1817	94.3	4.6	1.5E-03	4.7E-04	4.6E-02	0.0E+00	4.7E-03	1.3E-02	1.7E-02	1.2E-02	9.4E-02	
10-GEN-01	345	17.6	4.5	8.4E-03	1.0E-03	1.0E-02	4.3E-04	1.3E-02	1.8E-03	4.5E-03	3.1E-03	4.2E-02	
15-GEN-01	1482	74.0	4.3	1.1E-03	3.5E-04	3.4E-02	0.0E+00	3.5E-03	9.3E-03	1.2E-02	8.5E-03	6.9E-02	
17-GEN-01	1817	94.3	4.1	1.3E-03	4.2E-04	4.1E-02	0.0E+00	4.2E-03	1.1E-02	1.5E-02	1.0E-02	8.4E-02	
17C-GEN-01	1817	94.3	5.2	1.7E-03	5.3E-04	5.3E-02	0.0E+00	5.3E-03	1.4E-02	1.9E-02	1.3E-02	1.1E-01	
24-GEN-01	1850	84.0	4.4	1.3E-03	4.0E-04	4.0E-02	0.0E+00	4.0E-03	1.1E-02	1.4E-02	9.8E-03	8.0E-02	
24D-GEN-02	1817	94.3	3.7	1.2E-03	3.8E-04	3.7E-02	0.0E+00	3.8E-03	1.0E-02	1.4E-02	9.3E-03	7.6E-02	
24D-GEN-03	1817	94.3	4.1	1.3E-03	4.2E-04	4.1E-02	0.0E+00	4.2E-03	1.1E-02	1.5E-02	1.0E-02	8.4E-02	
25-GEN-01	1817	94.3	4.7	1.5E-03	4.8E-04	4.7E-02	0.0E+00	4.8E-03	1.3E-02	1.7E-02	1.2E-02	9.6E-02	
26-GEN-01	1850	84.0	3.7	1.1E-03	3.4E-04	3.3E-02	0.0E+00	3.4E-03	9.1E-03	1.2E-02	8.3E-03	6.8E-02	
36-GEN-01	1850	84.0	4.1	1.2E-03	3.7E-04	3.7E-02	0.0E+00	3.7E-03	1.0E-02	1.3E-02	9.2E-03	7.5E-02	
36-GEN-02	1850	84.0	3.9	1.1E-03	3.6E-04	3.5E-02	0.0E+00	3.6E-03	9.6E-03	1.3E-02	8.7E-03	7.1E-02	
38-GEN-01	449	22.1	4.0	9.4E-03	1.1E-03	1.1E-02	4.8E-04	1.4E-02	2.0E-03	5.0E-03	3.5E-03	4.7E-02	
50-GEN-01	2220	92.7	7.5	2.4E-03	7.6E-04	7.4E-02	0.0E+00	7.6E-03	2.0E-02	2.7E-02	1.9E-02	1.5E-01	
80-GEN-01	1818	89.7	4.7	1.5E-03	4.6E-04	4.5E-02	0.0E+00	4.6E-03	1.2E-02	1.6E-02	1.1E-02	9.2E-02	
22C-FWP-02	481	24.7	24.4	6.4E-02	7.7E-03	7.8E-02	3.3E-03	9.8E-02	1.4E-02	3.4E-02	2.4E-02	3.2E-01	
Total :				**0.1**	**0.0**	**0.8**	**0.004**	**0.2**	**0.2**	**0.3**	**0.2**	**1.8**	
											Total:	**0.0009**	**T/yr**

	AP- 42 Emission Factors for < 600 horsepower (HP) units in (lb/MMBTU) [2]	AP- 42 Emission Factors for > 600 horsepower (HP) units in (lb/MMBtu) [3]
Acetaldehyde	7.67E-04	2.52E-05
Acrolein	9.25E-05	7.88E-06
Benzene	9.33E-04	7.76E-04
1,3-Butadiene	3.91E-05	0
Formaldehyde	1.18E-03	7.89E-05
PAH	1.68E-04	2.12E-04
Toluene	4.09E-04	2.81E-04
Xylenes	2.85E-04	1.93E-04

Heat Capacity of #2 Diesel [4] 0.138 MMBTU/gal

1. Hours of operation are monitored with a non-resettable meter on each engine.
2. Emission factors from AP-42, Section 3.3, Gasoline and Diesel Industrial Engines. AP-42 factors used where manufacturer's emission factor data is not available.
3. Emission factors from AP-42, Section 3.4, Large Stationary Diesel and All Stationary Duel Fuel Engines. AP-42 factors used where manufacturer's emission factor data is not available.
4. From 40 CFR 98, Subpart C.

Appendix B - HAPs
Emission Estimates

2013-2014 Emissions of VOC-HAPs
Manufacturing

Calculations with VOC Estimates [1]	VOC Table Reference (page)							
Component Material Name	No Drain - No Control (A9-11)	Drain - No Control (A12)	Drain - Control (A13-14)	Scrubber (A15)	RDL - No Control (A16)	RDL - Control (A17)	3DI (A18)	Total
	Emissions (lb/yr)							
1,4-DIOXANE	0.5	0	0.05	0	1.1	5.8	0	**7.6**
4,4-ISOPROPYLIDENEDIPHENOL	1.7	0	0	0	0	0	0	**1.7**
ACETALDEHYDE	0.4	0	0	0	0	0	0	**0.4**
ACETONITRILE	0.3	0	0	0	0	0	0	**0.3**
ACRYLIC ACID	0.3	0	0	0	0	0	0	**0.3**
BENZENE	1.1	0	0	0	0	0	0	**1.1**
CRESOL (MIXED ISOMERS)	0	0	4.0	0	5.7	1.4	0.03	**11**
DIETHANOLAMINE	5.8	0	0	0	2.0	0.7	0	**8.5**
ETHYLBENZENE	1.2	0	0	0	0	0	0	**1.2**
ETHYLENE GLYCOL	145	0	0	38	717	0	182	**1,083**
ETHYLENE OXIDE	0.5	0	0	0	0	0	0	**0.5**
FORMALDEHYDE	0.4	0	0	0	0	0	0	**0.4**
GLYCOL ETHERS	108	0	15	0	0	0	0	**123**
HEXANE	28	0	0	0	0	0	0	**28**
METHANOL	308	0	0.04	0	0	0	0	**308**
METHYL ISOBUTYL KETONE	0.3	0	0	0	0	0	0	**0.3**
PROPYLENE OXIDE	0.2	0	0	0	0	0	0	**0.2**
STYRENE	27	0	0	0	0	0	0	**27**
TOLUENE	27	0	0	0	0	0	0	**27**
TRIETHYLAMINE	0	0	0.03	0	0	0	0	**0.03**
VINYL ACETATE	2.5	0	0	0	0	0	0	**2.5**
XYLENE	28	0	0	0	0	0	0	**28**

Total:	
	1,784 (lb/yr)
	0.9 (T/yr)

1. HAP emissions estimates from VOC estimation sheets (A9-A18).
2. Glycol ethers include:
   2-(2-BUTOXYETHOXY)ETHANOL, 2-(2-METHOXYETHOXY)-ETHANOL, DIETHYLENE GLYCOL N-HEXYL ETHER, ETHANOL, 2-(2-ETHOXYETHOXY)-, ACETATE AND GLYCOL ETHER ACETATE EB

Appendix B - HAPs
Emission Estimates

2013 - 2014 Manufacturing Non-VOC HAPs Uncontrolled Manufacturing Emissions

Equations:

a.) *Usage (lb/yr) = Estimated Emissions(lb/yr)*

Component Material Name	Usage (lb/yr)	Estimated Emissions (lb/yr)
ANTIMONY COMPOUNDS	0.9	0.9
CHROMIUM COMPOUNDS	0.01	0.01
DIBUTYL PHTHALATE	2.2	2.2
MERCURY COMPOUNDS	2.4	2.4
METHYLENE CHLORIDE	2.9	2.9
NICKEL COMPOUNDS	0.002	0.002
PHENANTHRENE	0.06	0.1
PHTHALIC ANHYDRIDE	17	17
PHOSPHORUS	0.1	0.1
PYROCATECHOL	32	32
SELENIUM COMPOUNDS	1.5	1.5
	Total	59

2013 - 2014 Manufacturing Non-VOC HAPs Controlled Manufacturing Emissions

Equations:

b.) *Estimated Emissions (lb/yr) = [(Usage (lb/yr) x Downtime (hr/yr)/Operating Time (hr/yr)) + (Usage (lb/yr) x Uptime (hr/yr)/Operating Time (hr/yr) x (1-Scrubber Efficiency))]*

Component Material Name	Usage (lb/yr)	Downtime (hr/yr)	Uptime (hr/yr)	Operating Time (hr/yr)	Scrubber Effiencency	Estimated Emissions (lb/yr)
CARBONYL SULFIDE	65.11	107	8,653	8,760	50%	33

Total:	**92 (lb/yr)** **0.05 (T/yr)**

Appendix B - HAPs
Emission Estimates

2013-2014 Controlled Arsine Emissions (MTI)
Manufacturing

Equations:
a.) *Estimated Emissions (lb/yr) = Usage (lb/yr) X (1- Heel) X (1 - Scrubber Efficiency)*

Component Material Name	Usage (lb/yr)	Heel	Scrubber Efficiency	Estimated Emissions (lb/yr)
ARSINE	7.36	5%	98.5%	0.1

2013-2014 Controlled Arsenic Oxide Emissions (MTI)
Manufacturing

Equations:
a.) *Estimated Emissions (lb/yr) = Usage (lb/yr) X Stoichiometric Conversion to Arsenic Oxide X (1-ScrubberEfficiency)*

Component Material Name	Usage (lb/yr)	Stoichiometric Conversion	Scrubber Efficiency	Estimated Emissions (lb/yr)
TRIETHYL ARSENITE	0.88	0.47	90%	0.04
TRIS(DIMETHYLAMINO)ARSINE	0.44	0.48	90%	0.02

Total:	0.2 (lb/yr) 0.0001 (T/yr)

Appendix B - HAPs
Emission Estimates

2013-2014 Chlorine Emissions (MTI)
Manufacturing

Equations:

a.) *Estimated Emissions (lb/yr) = Usage (lb/yr) X (1 - Heel)*

Component Material Name	Usage (lb/yr)	Heel	Estimated Emissions (lb/yr)
CHLORINE	890	5%	846

Total:	846 (lb/yr) 0.4 (T/yr)

2013-2014 HAP Emission Estimates
Manufacturing - HAP Emissions from PM_{10} Emissions

Component Material Name	Estimated Emissions (lb/yr)
PHOSPHINE	0.002
HYDROCHLORIC ACID	376
HYDROFLUORIC ACID	5,875

Total:	**6,251**	**(lb/yr)**
	3.1	**(T/yr)**
Total Hydrofluoric Acid (Highest Individual HAP):	**5,875**	**(lb/yr)**
	2.9	**(T/yr)**

Appendix B - HAPs
Emission Estimates

2013-2014 Other HAPs
Manufacturing - Welding Emissions

Equation:
Emissions (lb/yr) = Usage (lb/yr) x EF x 0.0001 lb/lb electrode used

Material	Usage (lb electrode)	Cr		Cr(VI)		Mn		Ni	
		EF [1]	Emissions (lb/yr)	EF [1]	Emissions (lb/yr)	EF [1]	Emissions (lb/yr)	EF [1]	Emissions (lb/yr)
AWS WELDING ELECTRODE ER70S-6	50	0.01	0.00005	ND	NA	3.18	0.02	0.01	0.00005
UTP 6824 (E309-16)	180	3.93	0.07	3.59	0.06	2.52	0.05	0.43	0.008
ATOM ARC 7018 ESAB	200	0.06	0.001	ND	NA	10.3	0.2	0.02	0.0004
FLEETWELD 5P+ (E6010)	1,000	0.03	0.003	0.01	0.001	9.91	1.0	0.04	0.004
	Total =		**0.07**		**0.07**		**1.3**		**0.01**
								Total:	**0.0007 T/yr**

Note:
1. Emission Factor (EF) from AP-42 Chapter 12.19 Electric Arc Welding, Table 12.19-2. Units of 0.1 lb/1000 lb electrode consumed.

Appendix C - Equipment Log Updates

2013-2014 Equipment Changes

Included in 2009 Permit Application	Source ID	Location	Location Type	Equipment Type	In Service as of Permit Issuance?	Equipment Startup Date	Equipment Shutdown Date	Comments
No	50-FS-03	Building 50	Manufacturing	Acid Scrubber	No	8/7/2013		New Unit Installed
No	15-VOC-01	Building 15	Manufacturing	VOC Abatement Unit	No	11/11/2013		New Unit installed

APPENDIX C – BOILER TEST RESULTS

TEST RECORD

Sellers ENGINEERING COMPANY

received 1/13/98

SO & Model Number	101321 600 HP-SH-LN390, 150#S	Tested By	D.H. & E.T.
Job Name	Micron Technology	Date	9/19/97
Job Location	Boise ID	MS Number	10389

COMBUSTION TEST RECORD

Input (MBTU/HR)		
Supply Pressure	10#	
ft. at		sec.
min.	32	sec. at 100 ft.
Pilot Gas Press (High)	10	" WC
Pilot Gas Press (Low)	4.8	" WC
Primary Voltage	220	
Control Voltage	120	
Blower Motor AMPS L1	58	
L2	58	
L3	60	
Blower-Impeller	#3000	
Housing	#3000	
Air Jet Diameter	8-13/16	"
Throat Diameter	9-1/2	"
Burner Port Dia.	9/16	"
Pilot Header on	Right	Side
Shutter on Blower	1-1/4	Bolt

FLUE GAS ANALYSIS

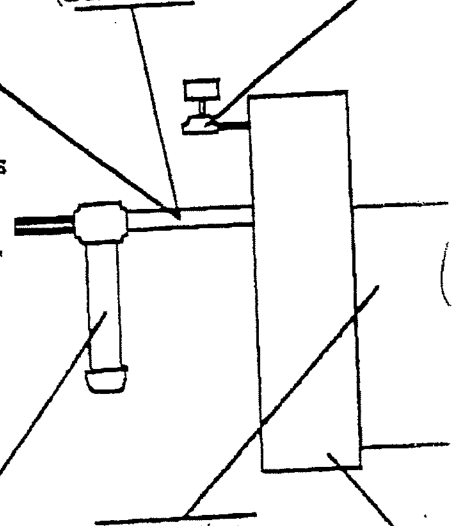
O^2	6.0	%
CO^2	8.4	%
CO	1	PPM
NOx	20	PPM
Stack Temp	634	Deg
Pilot Flame Signal	38	Volts D.C.
Main Flame Signal	39	Volts D.C.
Pilot Cold Flash	6	Sec
Pilot Flame Signal		Volts
Main Flame Signal		Volts
PRI LWC-Set Pt	19-3/4	Check G.I. 9/19/97
2nd LWC-Set Pt	18-3/4	Check

Pressure (Burners Off)	Pressure (Burners On)	Blower Pressure
1.8	5.2	12

NOTE:

all measurments are in

"INCHES OF WATER COLUMN"



Gas Pressure	Combustion Chamber Pressure	Manifold Pressure
12.2 13	1.8 1.8	6

CONTROL TEST RECORD

	Set Pt	Check
Operating Control		
High Limit Control		
Nox Start Control		
Air Switch		
Hi Gas Press Switch		
Lo Gas Press Switch		
Proof of Closure		
Pilot Flame Failure		
Main Flame Signal		
Dielectric Test		
Gas Leak Test		

APPENDIX D – GENERATOR ENGINE OPERATION 2008-2014

Yearly Hours Ran	Reporting Year (July-June) 2008	2009	2010	2011	2012	2013	2014
Tier II Emission Unit							
1-GEN-01	9.9	14.5	11.6	11.0	13.6	3.1	4.0
1X-GEN-01	10.3	14.2	9.8	9.2	10.0	3.3	4.7
4-GEN-01	9.9	14.2	11.6	10.2	10.9	3.6	4.5
6-GEN-01	9	13.2	10.7	9.3	10.0	3.4	4.6
10-GEN-01	10.5	11.7	13.2	10.4	9.1	3.4	4.5
15-GEN-01	9.7	11.5	12.0	10.0	11.0	3.2	4.3
17-GEN-01	11	14.6	11.5	12.3	9.1	4.5	4.1
17C-GEN-01	10.5	14.5	10.0	10.7	11.2	3.6	5.2
24-GEN-01	9.9	12.1	10.6	9.4	8.9	4.0	4.4
24D-GEN-02	8.9	13	9.4	9.8	7.2	3.7	3.7
24D-GEN-03	7.4	12.4	10.1	9.4	8.1	3.1	4.1
25-GEN-01	9	17.3	10.9	9.6	8.7	3.8	4.7
26-GEN-01	9.9	12.7	10.2	9.4	9.9	3.6	3.7
36-GEN-01	9.4	13.1	10.4	9.7	9.0	3.2	4.1
36-GEN-02	9.3	12.2	11.9	10	9.3	2.5	3.9
38-GEN-01	10.7	13.3	17.3	8.3	10.0	3.4	4.0
50-GEN-01	0	0	0	0	4.9	8.3	7.5
80-GEN-01	11	14.3	10.4	10.7	9.2	3.3	4.7
FWP-02 *	13.0	13.0	13.0	13.0	29.9	21.2	24.4

*Prior to March 2012, FWP emissions were monitored using 13 hours estimated run time per year for 2008-2011 reports and 2.5 hours per month run time for July 2011-February 2012.