

October 13, 2013

Northwest Air Quality Permit Coordinator  
George Davis, Permit Writer  
David Munro, Air Quality Manager, Northwest Division  
DEQ Northwest Region  
2020 SW 4th Avenue, Suite 400"  
Portland, OR 97201

Dear Northwest Air Quality Permit Coordinator, Mr. Davis, and Mr. Munro,

Please consider the following additional comments on DEQ's proposed Title V air quality permit for Intel's semiconductor manufacturing and research plants in Hillsboro and Aloha (Permit number: 34-2681-TV-01). The comments address inadequacies in the proposed permit not addressed in my comments of Sept. 24. Please consider the comments I submitted on Sept. 24 and the comments I am submitting today as my formal comments on the proposed permit.

1. The number of deficiencies and inadequacies in the proposed air quality permit for Intel's facilities in Hillsboro and Aloha just keeps growing. Earlier the public found, for instance, that fluoride emissions were omitted from prior Intel air quality permits because DEQ thought they were "deminimis," and because Intel failed to report them. While the proposed permit does acknowledge that fluorides are emitted in significant quantities, and does propose an emissions limit of 6.4 tons per year, there is no indication of the exact fluorides emitted, and thus no basis for public understanding and comment.

2. Recently another failure on both Intel's and DEQ's part came to light. Jones Farm and Hawthorn Farm have long been part of Intel's facilities in Hillsboro. Both are large facilities, and one would assume that the Criteria and Hazardous Air Pollutants (HAPs) produced by these facilities would be included within the proposed air quality permit and emissions limits for Intel's Hillsboro and Aloha facilities. Such an assumption turns out to be wrong! There is no acknowledgement or consideration anywhere in the proposed permit of the Criteria and Hazardous Air Pollutants produced by either facility!

The situation is actually even worse than the above. Recently a number of Washington County citizens invested considerable time and energy requesting and examining DEQ records in an attempt to determine the quantities of fuel, solvents, hazardous chemicals, etc. used at Jones Farm and Hawthorn Farm, and the Criteria and HAPs emissions produced by the facilities. One of their biggest discoveries was that both facilities are currently operating, and have operated in the past, without an air quality permit from DEQ!

Since those that discovered the above situation and reviewed DEQ's files on both facilities will be submitting comments detailing the implications of their findings, I won't comment further except to make one comment.

According to federal regulations, semiconductor manufacturing plants, including research & development plants, that emit 25 tons or more per year of combined Hazardous Air Pollutants, or 10

tons or more per year of any one HAP, are subject to Maximum Achievable Control Technology (MACT) standards for limiting emissions [1]. In DEQ's proposed air permit, Intel is not subject to MACT standards, because DEQ estimates Intel's combined HAPS potential emissions to be 19.7 tons per year, and its highest single HAP potential emissions to be 8.7 tons per year.

But the above estimates exclude the HAPs emitted at the Jones Farm and Hawthorn Farm facilities! Inclusion of both facilities into the proposed Intel air permit (as should have been the case a long time ago) is likely to create a situation where the MACT thresholds for HAPs emitted are exceeded, and thus MACT standards for limiting HAPs would be required.

3. DEQ's current permit allows Intel to emit a maximum of 14 tons per year of particulate matter. Re particulate matter (or particle pollution), the U.S. EPA notes that:

[...] Particles less than 10 micrometers in diameter (PM10) pose a health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter (PM2.5) are referred to as "fine" particles and are believed to pose the greatest health risks. Because of their small size (approximately 1/30th the average width of a human hair), fine particles can lodge deeply into the lungs. [...] [2]

Under Intel's current permit, the aggregate of all particulate matter emissions regardless of particle size is limited to 14 tons per year. Under the proposed permit, DEQ is proposing that Intel still be permitted to emit a maximum aggregate of 14 tons per year of particulate matter of varying particle size, but is also proposing that Intel be permitted to emit a maximum of an additional 14 tons per year of "small particulate matter." Such "small particulate matter" is otherwise known as the "fine" PM2.5 particles described above.

DEQ's public notice and its Criteria Pollutant table note that there is no specified limit for "small particulate matter" in the current permit. While technically true, the preceding statement is misleading because under the current permit the aggregate of all particulate matter regardless of particle size (i.e., PM10, PM2.5) must be less than 14 tons per year. Thus, while there may be no specific limits for PM2.5 in the current permit, PM2.5 is part of what is being emitted and included within the overall particulate matter limit of 14 tons per year.

Two questions emerge. Why is DEQ proposing to basically double the limits on particulate emissions per year? And why is DEQ proposing to permit an additional maximum of 14 tons per year of "small particulate matter," especially given that such "small particulate matter" is comprised of the "fine" PM2.5 pollutants that the EPA and many other sources describe as posing the greatest health risk?

One way of seeking answers to these and related questions is to ask the permit writer for the proposed permit. So on Sept. 27 I sent two questions to George Davis at DEQ inquiring, in part, "Can you direct me to a source or sources (i.e., link or links) that describes the make-up of these particulates? Also can you direct me to a link or links where I can find the tons or pounds/year of particulates Intel reported as emitted." I quickly received the reply: "DEQ has no information on the make-up of the particulate matter emitted by Intel."

That struck me as very strange. How can DEQ possibly write permits and specify emission limits on particle pollutants if it has no information on the make-up of the pollutants it is limiting?

While Mr. Davis indicates that "DEQ has no information on the make-up of the particulate matter emitted by Intel" in Hillsboro and Aloha, considerable information is available about the particulate matter emitted by Intel's plant in Rio Rancho, New Mexico.

One major and controversial type of particle pollutant emitted from Intel's plant in Rio Rancho is silica. Silica particulates are created when VOCs produced by the organic solvent hexamethyldisilazane (HMDS) are captured in the plant's solvent exhaust ducts, and then sent to the plant's VOC abatement systems (thermal oxidizers), which incinerate the HMDS emissions and convert them to silica.

The above described conversion of HMDS to silica when thermally oxidized is acknowledged in multiple sources: the Air Permit issued to Intel by the Air Quality Bureau of the New Mexico Environment Department in 2000 [3,4], by Intel representatives [5], in Intel documents [6], and in a HMDS White Paper available online from Munters Corporation [7], the manufacturer of the Rotary Concentrator Thermal Oxidizer currently used at Intel's New Mexico and Oregon plants.

Inspection of the 2000 New Mexico air permit to Intel [3,4] is quite instructive. "Table CS - Hourly Emission Limits for Combustion Sources" on page 30, for instance, shows that the particulates emitted from the recuperative thermal oxidizer (particulates from the thermal oxidizer combustion of natural gas + particulates created by the conversion of HMDS into silica) are much greater than the particulates from the combustion of natural gas and some fuel oil in the boilers. [3]

Inspection of the 2000 New Mexico air permit also shows that instructions and an emission factor are included in section 2.D.i.c on page 8 for calculating and reporting the amount of HMDS converted into silica particulates by the thermal oxidizers on a monthly basis. [3]

A major question emerges. If all of the above are acknowledged by the New Mexico Environment Department, Intel, and the

manufacturer of the thermal oxidizer used in both New Mexico and Oregon, how is it possible that DEQ's proposed permit includes no sections that address the calculation and reporting of the amounts of HMDS converted into silica particulates by thermal oxidizers?

The above situation seems very similar to the omission of fluorides in past Intel air quality permits. Intel clearly knows about the relationship between HMDS and silica, DEQ should know, and yet attention to a very important dimension -- the conversion of HMDS into silica particulates -- is missing from the permit.

A related question also emerges: How much HMDS is used by Intel in Hillsboro and Aloha? In response to some other inquiries, George Davis at DEQ sent me the Annual Reports submitted by Intel in 2011 and 2012 to DEQ. Section 6.3.b.iii of the reports lists the "quantity and type of VOCs used by weight." The 2012 report breaks it down for each VOC by campus, the 2011 report includes only total lbs. for each VOC for both campuses.

In 2012, a total of 9696 lbs. of HMDS was used, with 9239 lbs. being used on the Ronler Acres campus, and 457 lbs. being used on the Aloha campus. In 2011, 9461 lbs. were used on both campuses.

To put the above use of HMDS by weight in 2011 (4.73 tons) and 2012 (4.85 tons) in perspective, HMDS use at Intel's Rio Rancho facilities showed a general downward trend from 1994 through 2008, with 3.21 tons used in 2007, and 1.63 tons used in 2008 [5].

In DEQ's proposed permit for Intel, VOC criteria pollutants increase from the current limit of 99 tons per year to 178 tons per year. One would assume that some of this increase involves increased quantities of HMDS used, and thus increased quantities of silica particulates emitted when the HMDS is thermally oxidized. (Note: I don't know if HMDS is the only VOC used by Intel that oxidizes to silica dust when combusted in the rotary concentrator thermal oxidizers. If other solvents are used that produce the same conversion, the issue becomes even bigger.)

At the beginning of this section I noted that in Intel's current permit, PM2.5 particles are part of what is being emitted and included within the overall particulate matter limit of 14 tons per year. I also posed two questions: Why is DEQ proposing to basically double the limits on particulate emissions per year? And why is DEQ proposing to permit an additional maximum of 14 tons per year of "small particulate matter," especially given that such "small particulate matter is comprised of the "fine" PM2.5 pollutants that the EPA and many other sources describe as posing the greatest health risk?

A big part of the answer to the above question is now apparent. Namely, that Intel intends to use greater quantities of HMDS, and the VOCs from such use when oxidized will create greater quantities of small silica particulate matter, aka "fine" PM2.5 pollutants.

Support for the above speculation appears in an Application Summary that Intel filed for its Rio Rancho plant on January 31, 2011 [8]. Section 9, pages 5 and 7 of the application indicates that the maximum 12 month rolling emissions per year of Total Suspended Particulates (TSP) from just the thermal oxidizers will be 14.2 tons.

While the silica particulates from the oxidation of HMDS are included within the yearly limit for TSP from just the thermal oxidizers

above, Intel reveals an even more ambitious goal to expand particulate emissions limits in section 9, on page 46. More specifically, a new and expanded "TSP | PM10 | PM2.5" breakdown appears on page 46, with limits of "95 | 95 | 95" tons! ... with silica now presumably in the PM2.5 category. I don't know what the current status of this dramatically expanded proposed system and limits is.

All of the above lead to the conclusion that silica particles make up a significant proportion of the particulate pollutants emitted by Intel. Not addressed, however, are the health impairing effects of silica particulates; the ongoing controversy in Corrales, Rio Rancho and nearby communities about the health impacts of Intel's Rio Rancho silica emissions; or the question of whether some of Intel's emissions could be crystalline vs. amorphous silica particles.

Each of the above unaddressed issues has implications for the proposed permit, monitoring, and reporting. Excellent commentary on each is available from several groups and news sources: from the members and professionals that comprise Corrales Citizens for Clean Air and Water (CRAAW) [9]; in the excellent and extensive reporting of Jeff Radford in the Corrales Comment [10-14]; in the Rio Ranch Observer [15]; from the Community Environmental Working Group [16] and its silica related task forces [17].

4. Based upon the evidence presented above, and the evidence presented in the comments I submitted on September 24, I believe there is every reason to conclude that the combined Hazardous Air Pollutant emissions from the Intel facilities will be 25 tons or more per year, and/or 10 tons or more per year of any one Hazardous Air Pollutant. Thus, I believe it is imperative that DEQ revise the permit to require Maximum Achievable Control Technology standards for HAPS at Intel.

At a minimum, the proposed Intel air permit must be modified to require (a through c refer to comments submitted today; d through h refer to comments submitted on 9/24):

- a. the inclusion of Jones Farm and Hawthorn Farm Intel facilities into the overall Intel Title V air quality permit.
- b. the inclusion of philosophies and VOC control systems within the permit designed to minimize the production of silica particulate emissions.
- c. the inclusion of sections with instructions and an emission factor within the permit for calculating and reporting the amount of HMDS converted into silica particulates by the thermal oxidizers.
- d. the verification of emissions estimated with emissions factors and models by frequent stack measurements.
- e. the verification of the efficiency and operational integrity of scrubber and other pollution control systems by continuous stack measurements (i.e., continuous emissions monitoring).
- f. the inclusion of short-term (hourly, daily, monthly) emissions limits for VOCs and HAPS within the permit.
- g. the addition of estimated excess emissions during the six categories of events listed in 5C in my 9/24 comments to the estimated emissions that are routinely used to determine whether a plant is designated as a minor or major source of HAPS.
- h. the addition of estimated excess emissions during thermal oxidizer bypass to the estimated emissions that are routinely used to determine whether a plant is designated as a minor or major source of HAPS (see section 34a in the proposed permit on RCTO bypass).

Sincerely,

Joseph Miller PhD  
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Member, Environmental Health Working Group, Oregon Physicians for Social Responsibility  
Former Member, Board of Directors, Oregon Physicians for Social Responsibility  
Member (representing Oregon PSR), Oregon DEQ Conversion Technology Rulemaking Advisory  
Committee

[1] Subpart BBBB - National Emission Standards for Hazardous Air Pollutants for Semiconductor  
Manufacturing

<http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=8603b782df2d5759e88f9393dd2d893f&rgn=div6&view=text&node=40:14.0.1.1.1.3&idno=40#40:14.0.1.1.1.3.124.2>

[2] Fine Particle (PM2.5) Designations - US EPA

<http://www.epa.gov/pmdesignations/faq.htm#0>

[3] Intel Rio Rancho Air Permit 325-M-9 issued by Air Quality Bureau of the New Mexico Environment  
Department

<http://www.faceintel.com/intelpermit.pdf>

[4] Intel Rio Rancho Air Permit 325-M-9 issued by Air Quality Bureau of the New Mexico Environment  
Department 3/3/2000

<http://www.cewg.org/air-permit/>

[5] See the report (p. 3) by Sarah Chavez at a 7/09 Community Environmental Working Group (CEWG)  
meeting in which she describes the HMDS usage and silica emissions table found at the link below, and  
notes that "Intel's permit requires that Intel assume 100% HMDS is converted to silica and emitted."  
Chavez is an environmental engineer at Intel, and one of two Intel representatives in the CEWG. For the  
report, see:

<http://www.cewg.org/2009-meetings/>, then select "CEWG Meeting Summary 07-15-2009.pdf".

[6] For a table showing HMDS usage and conversion into silica for Intel's Rio Rancho plant from 1994-  
2008, see:

<http://www.cewg.org/miscellaneous-files/>, then select "HMDS Usage for Intel NM 1994-2008.pdf".

[7] HMDS White Paper - Munters Corporation

<http://www.munters.us/upload/Case%20studies/HMDS%20White%20Paper.pdf>

[8] Application Summary for Intel's Rio Rancho Plant - New Mexico Environment Department 1/31/11

[http://www.nmenv.state.nm.us/aqb/permit/documents/06\\_A-0325M11-3\\_thru\\_22\\_UA3\\_24Mar11.pdf](http://www.nmenv.state.nm.us/aqb/permit/documents/06_A-0325M11-3_thru_22_UA3_24Mar11.pdf)

[9] Intel and Corrales History - Corrales Citizens for Clean Air and Water (CRAAW)

<http://www.faceintel.com/corraleshistory.htm>

[10] New Regulations Coming for Silica Dust Exposure [Third in a series] - Corrales Comment 9/22/13  
[http://www.corralescomment.com/index.php?option=com\\_content&task=view&id=2421&Itemid=1](http://www.corralescomment.com/index.php?option=com_content&task=view&id=2421&Itemid=1)

[11] Intel Silica Tests Show Trace Crystalline Dust - Jeff Radford - Corrales Comment 4/24/11  
[http://www.corralescomment.com/index.php?option=com\\_content&task=view&id=1802&Itemid=2](http://www.corralescomment.com/index.php?option=com_content&task=view&id=1802&Itemid=2)

[12] Intel Air Pollution Permit Questions Draw Poor Answers - Jeff Radford - Corrales Comment 4/10/11  
[http://www.corralescomment.com/index.php?option=com\\_content&task=view&id=1790&Itemid=60](http://www.corralescomment.com/index.php?option=com_content&task=view&id=1790&Itemid=60)

[13] Intel's Silica Dust Emissions Tested At National Institute Lab - Jeff Radford - Corrales Comment 12/5/10  
[http://www.corralescomment.com/index.php?option=com\\_content&task=view&id=1699&Itemid=2](http://www.corralescomment.com/index.php?option=com_content&task=view&id=1699&Itemid=2)

[14] Silica Dust from Intel Now Seen as Threat to Downwinders' Lungs - Jeff Radford - Corrales Comment 6/17/10  
[http://www.corralescomment.com/index.php?option=com\\_content&task=view&id=1546&Itemid=2](http://www.corralescomment.com/index.php?option=com_content&task=view&id=1546&Itemid=2)

[15] EPA finds concern in Intel emissions - Christopher Ortiz - Rio Rancho Observer 10/20/10  
[http://www.rrobsserver.com/news/local/article\\_be8bc524-dbb4-11df-a4fd-001cc4c03286.html](http://www.rrobsserver.com/news/local/article_be8bc524-dbb4-11df-a4fd-001cc4c03286.html)

[16] Community Environmental Working Group  
<http://www.cewg.org/>

[17] Silicon Dioxide Issues - Community Environmental Working Group  
<http://www.cewg.org/silicon-dioxide/>