STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
4601 N Monroe Street • Spokane, WA 99205-1295 • 509-329-3400

February 6, 2020

Michael Wind
Microsoft Corporation
Columbia Data Center
501 Port Industrial Parkway
Quincy, WA 98848

Re: Approval Order No. 20AQ-E002

Dear Michael Wind:

The Department of Ecology's Air Quality Program (Ecology) approved the installation of five new backup emergency generators and the reduction of operating hours on the existing 35 emergency generators at Microsoft Corporation Columbia Data Center located at 501 Port Industrial Parkway, Quincy, Washington in Grant County.

Ecology's approval is based on the Notice of Construction application and supplemental information submitted on October 17, 2019. The 30-day public comment period required per Washington Administrative Code (WAC) 173-400-171, was completed. Response to comments received is included as an appendix in the Technical Support Document.

Enclosed is Approval Order No. 20AQ-E002 for Microsoft Columbia Data Center.

Thank you for your patience while we processed your application. If you have any questions, please contact me at jfil461@ecy.wa.gov or 509-329-3407.

Sincerely,

Jenny Filipy

Jenny Filipy, P.E.
Commercial/Industrial Unit
Air Quality Program
Eastern Regional Office

JF:jab

Enclosures: Approval Order No. 20AQ-E002
Technical Support Document

Certified Mail 7019 0140 0000 6496 2539

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF APPROVING A NEW )
AIR CONTAMINANT SOURCE FOR ) Approval Order No. 20AQ-E002
**MICROSOFT CORPORATION** )
**COLUMBIA DATA CENTER** )

TO: Michael Wind
Microsoft Corporation
Columbia Data Center
501 Port Industrial Parkway
Quincy, WA 98848

## EQUIPMENT

1. A list of equipment that was evaluated for this order of approval is contained in Tables 1.a through 1.c.

| Table 1.a: 2.5 eMW Engine & Generator Serial Numbers | | | | |
|---|---|---|---|---|
| Phase | Unit ID | Engine SN | Generator SN | Build date |
| CO1/1 | 1 | SBK000170 | G4B00130 | 8/14/06 |
| " | 2 | SBK000179 | G4B00132 | 8/25/06 |
| " | 3 | SBK000169 | G4B00128 | 8/10/06 |
| " | 4 | SBK000181 | G4B00133 | 8/28/06 |
| " | 5 | SBK000176 | G4B00131 | 8/25/06 |
| " | 6 | SBK000168 | G4B00129 | 8/10/06 |
| " | 7 | SBK000160 | G4B00125 | 7/21/06 |
| " | 8 | SBK000159 | G4B00127 | 7/19/06 |
| " | 9 | SBK000162 | G4B00126 | 7/24/06 |
| " | 10 | SBK000158 | G4B00124 | 7/19/06 |
| " | 11 | SBK000172 | G4B00113 | 8/18/06 |
| " | 12 | SBK00990 | KHD00231 | 8/15/10 |
| CO1/2 | 1 | SBK000208 | G4B00173 | 11/1/06 |
| " | 2 | SBK000214 | G4B00171 | 11/6/06 |
| " | 3 | SBK000211 | G4B00176 | 11/3/06 |
| " | 4 | SBK000213 | G4B00177 | 11/6/06 |
| " | 5 | SBK000201 | G4B00178 | 10/20/06 |
| " | 6 | SBK000171 | G4B00112 | 8/17/06 |
| " | 7 | SBK000212 | G4B00175 | 11/6/06 |
| " | 8 | SBK000205 | G4B00170 | 10/30/06 |
| " | 9 | SBK000210 | G4B00172 | 11/3/06 |
| " | 10 | SBK000200 | G4B00179 | 10/20/06 |
| " | 11 | SBK000209 | G4B00174 | 11/2/06 |
| " | 12 | SBK00989 | KHD00230 | 8/14/10 |
| CO3.2 | 25 | SBK00949 | G8D00117 | 7/25/10 |
| " | 26 | SBK00947 | G8D00116 | 7/16/10 |
| " | 27 | SBK00945 | G8D00115 | 7/15/10 |

| Table 1.a: 2.5 eMW Engine & Generator Serial Numbers | | | | |
|---|---|---|---|---|
| Phase | Unit ID | Engine SN | Generator SN | Build date |
| " | 28 | SBK00953 | G8D00119 | 7/28/10 |
| " | 29 | SBK00951 | G8D00118 | 7/28/10 |
| CO3.1 | 30 | SBK01014 | G8D00142 | 10/6/10 |
| " | 31 | SBK01012 | G8D00141 | 10/5/10 |
| " | 32 | SBK01030 | G8D00146 | 10/14/10 |
| " | 33 | SBK01027 | G8D00145 | 10/13/10 |
| CO3.3 | 34 | SBK01013 | G8D00140 | 9/30/10 |
| " | 35 | SBK01015 | G8D00144 | 10/7/10 |
| CO6 | 1 | | | |
| " | 2 | | | |
| " | 3 | | | |
| " | 4 | | | |
| " | 5 | | | |

| Table 1.b: Fire Pump Engine SN | | | |
|---|---|---|---|
| Unit ID | Engine SN | Engine Size | Build Year |
| CO1 | Pe6068t602182 | 149 bhp | 2006 |
| CO2 | Pe6068t679482 | 149 bhp | 2007 |

| Table 1.c: Cooling Towers | | | |
|---|---|---|---|
| Unit ID | # Cooling Tower Banks | # Cooling Tower Units per Bank | Total # Cooling Tower Units |
| CO1 | 1 | 18 | 18 |
| CO2 | 1 | 18 | 18 |
| Total | 2 | na | 36 |

## DETERMINATIONS

In relation to this project, the State of Washington Department of Ecology (Ecology), pursuant to Revised Code of Washington (RCW) 70.94.152, Washington Administrative Code (WAC) 173-460-040, and WAC 173-400-110, makes the following determinations:

1. The project, if constructed and operated as herein required, will be in accordance with applicable rules and regulations, as set forth in Chapter 173-400 WAC, and Chapter 173-460 WAC, and the operation thereof, at the location proposed, will not emit pollutants in concentrations that will endanger public health.
2. The proposed project, if constructed and operated as herein required, will provide all known, available, and reasonable methods of emission control.

**THEREFORE, IT IS ORDERED** that the project as described in the Notice of Construction application and more specifically detailed in plans, specifications, and other information submitted to Ecology is approved for construction and operation, provided the following conditions are met:

## APPROVAL CONDITIONS

### 1. ADMINISTRATIVE CONDITION

a. Notice of Construction Approval Order No.14AQ-E553 is rescinded and replaced entirely with the issuance of this Order.

b. Mountain View Elementary School administrators shall be provided a maintenance testing schedule as contained in the permit, and Microsoft shall update the school whenever Ecology-approved changes occur in the maintenance testing schedule. As decided by the school administrators and Microsoft, an ongoing relationship between the school and Microsoft should be established.

### 2. EQUIPMENT RESTRICTIONS

a. The 40 Caterpillar Model 3516C 2.5 eMW engines used to power the electrical generators shall be operated in accordance with applicable 40 CFR 60, Subpart IIII requirements including but not limited to: certification by the manufacturer to meet the 40 CFR 89 EPA Tier 2 emissions levels as required by 40 CFR 60.4202; and installed and operated as emergency engines, as defined in 40 CFR 60.4219.

i. At the time of the effective date of this permit, Tier 4 interim and Tier 4 final certified engines (as specified in 40 CFR 1039.102 Table 7 and 40 CFR 1039.101 Table 1, respectively), are not required for 2.5 MWe electrical generators used for emergency purposes as defined in 40 CFR 60.4219 in attainment areas in Washington State. Any engines installed at the Columbia Data Center after Tier 4 or other limits are implemented by EPA for emergency generators, shall meet the applicable specifications as required by EPA at the time the emergency engines are installed.

b. The only Caterpillar Model 3516C 2.5 eMW engines and electrical generating units approved for operation at the Columbia Data Center are those listed in Table 1.a.

c. Manufacture and installation of the CO6 engine/generator sets identified in Table 1.a shall take place by July 30, 2021. If the manufacture and installation of these engines has not been completed by July 30, 2021, a NOC application may be required prior to installation.

d. Replacement of failed engines with identical engines (same manufacturer and model) requires notification prior to installation, but will not require Notice of Construction unless there is an emission rate increase from the replacement engines.

**e. Table 2 – Emergency Generator Exhaust Stack Height Requirements**

| Quantity | Location | Minimum Height (feet) | Stack Diameter (inches) | Height Above Roof (feet) |
|---|---|---|---|---|
| 20 | CO1 and CO2 Building | 38' | 18" | 8' |
| 4 | CO1 and CO2 Ground Level | 20' | 18" | |
| 11 | CO3.1, CO3.2, CO3.3 Ground Level | 31' | 18" | |
| 5 | CO6 Building | 38' | 24" | 12.5' |

## 3. OPERATING LIMITATIONS

a. The fuel consumption at the Columbia Data Center facility shall be limited to a total of 439,493 gallons per year and 88,800 gallons per day of diesel fuel equivalent to on-road specification No. 2 distillate fuel oil (less than 0.00150 weight percent sulfur). Total annual fuel consumption by the facility may be averaged over a three-year period using monthly rolling totals.

b. The 35 CO1, CO2, and CO3 generators shall not operate more than 100 hours per year per engine at an average capacity of 53 percent of full standby capacity. Individual units may be operated at a higher load than 53 percent of full standby capacity as long as no emission limit is exceeded. Annual operating hours may be averaged over all 35 CO1, CO2, and CO3 generators.

c. Operation of the 11 CO3.1, CO3.2, and CO3.3 generators for electrical bypass shall be limited to approximately 44 hours per year each at an average electrical load of 40 percent of the standby rating. No more than two engines shall operate at the same time during any electrical bypass operation.

d. Each of the 35 CO1, CO2 and CO3 generator engines require maintenance and testing for approximately one hour per month. To mitigate engine emission impacts, Microsoft Corporation will perform at least 80 percent of all maintenance testing from 7:00 a.m. until 5:00 p.m. on Monday through Wednesday, with no more than three engines tested concurrently. Engine maintenance and testing may take place outside of these restrictions upon coordination by Microsoft with the other data centers in Quincy to minimize engine emission impacts to the community. Microsoft shall maintain records of the coordination communications with the other data centers, and those communications shall be available for review by Ecology. This schedule can be re-negotiated at any time as approved in writing by Ecology, and will not trigger revision or amendment of this Order.

e. CO1 and CO2 each have one bank of six cooling units with a total of 18 cooling towers each. Each individual unit shall have a mist eliminator that will maintain the maximum drift rate to no more than 0.0005 percent of the circulating water rate.

f. Operation of the 11 CO3 generators for power outage emergencies shall be limited to a maximum of 48 hours per engine per calendar year at a maximum average electrical load of 85 percent.

g. The five CO6 generators shall not operate more than 80 hours per year per engine. Annual operating hours may be averaged over all CO6 generators in service. The five CO6 generators shall not operate more than 94 hours per engine for the first year of operation to include commissioning.

h. Operation of more than one CO6 generator for more than 15 hours per generator in any 24-hour period shall not occur more than three times in any three calendar year period.

i. The operation of more than one CO6 generator, operating concurrently at any one time, shall not occur on more than 21 calendar days in any three calendar year period.

j. There is no limit on the number of days that operation of one CO6 generator at a time can occur, but operation under this scenario is limited to daytime hours only (7:00 a.m. to 7:00 p.m.).

## 4. GENERAL TESTING AND MAINTENANCE REQUIREMENTS

a. Microsoft Columbia Data Center will follow engine-manufacturer's recommended diagnostic testing and maintenance procedures to ensure that each of the forty 2.5 eMW engines will conform to 40 CFR 89 emission specifications throughout the life of each engine.

b. Following installation and commissioning of each individual generator, but prior to the transfer of a batch of engines to Microsoft ownership emissions measurement shall be conducted for one engine from each batch or control generation for PM (filterable only), NO, $NO_2$, NMHC, and CO. This is to demonstrate the engines are commissioned and programmed to run within the Tier 2 emission limits in Condition 5.b. Testing shall be conducted at the loads of 100 percent, 75 percent, 50 percent, 25 percent and 10 percent using weighted averaging according to Table 2 of Appendix B to Subpart E of 40 CFR 89. Testing may be conducted using 40 CFR 1065.

c. Within 60 months of the first engine installation of each phase of installation, and every 60 months thereafter, the Columbia Data Center shall measure emissions of particulate matter (PM), Volatile Organic Compounds (VOC), nitric oxide (NO), nitrogen dioxide ($NO_2$), carbon monoxide (CO), and oxygen ($O_2$) from at least one representative engine from each batch of engines installed, in accordance with Approval Condition 4.d. This testing will serve to demonstrate compliance with the emission limits contained in Condition 5.a; confirm that the engine's emissions remain within the EPA Tier 2 certification specifications, and as an indicator of proper operation of the engines. The selection of the engine(s) to be tested shall be subject to prior approval by Ecology and shall be defined in the source test protocol submitted to Ecology no less than 30 days in advance of any compliance- related stack sampling conducted by Microsoft. Each engine tested shall be the engine from each batch of engines installed with the most operating hours since an engine of that batch was last tested.

d. The following procedures shall be used for each test for the engines required by Approval Condition 4.b. and 4.c. unless an alternate method is proposed by Microsoft and approved in writing by Ecology prior to the test:

   i. Periodic emissions testing should be combined with pre-scheduled maintenance testing and annual load bank testing. Additional operation of the engines for the purpose of emissions testing beyond the operating hour and fuel consumptions limits authorized by this Order may be allowed by Ecology upon request.

   ii. For the five load tests, testing shall be performed at each of the five engine torque load levels described in Table 2 of Appendix B to Subpart E of 40 CFR Part 89, and data shall be reduced to a single-weighted average value using the weighting factors specified in Table 2. Microsoft may replace the dynamometer requirement in Subpart E of 40 CFR Part 89 with corresponding measurement of gen-set electrical output to derive torque output.

   iii. For all tests, the F-factor described in Method 19 shall be used to calculate exhaust flow rate through the exhaust stack, except that EPA Method 2 shall be used to calculate the flow rate for purposes of particulate testing (Method 2 is not required if 40 CFR 1065 is used). Fuel meter data measured according to Approval Condition 4.f. shall be included in the test report, along with the emissions calculations.

iv. Three test runs shall be conducted for each engine, except as allowed by the sampling protocol from 40 CFR 1065. Each run shall last at least 60 minutes except as allowed by the sampling protocol from 40 CFR 1065. Source test analyzers and engine control unit data shall be recorded at least once every minute during the test. Engine run time and torque output (measured ekW to convert to torque) and fuel usage shall be recorded during each test run for each load and shall be included in the test report.

v. In the event that any stack test indicates non-compliance with the emission limits in Condition 5, Microsoft shall repair or replace the engine and repeat the test on the same engine plus two additional engines from the same phase of installation as the engine showing non-compliance. Test reports shall be submitted to Ecology within 60 days of the final day of testing. Test reports shall be submitted to the address in Condition 7.

vi. For the gaseous pollutants ($NO_x$, CO, and NMHC), Microsoft may propose using a portable emissions instrument analyzer for subsequent rounds of periodic source testing if initial testing of engines show compliance with each of the Tier 2 emission standards referenced in Condition 4.b. The use of an analyzer and the analyzer model shall be approved in writing by Ecology prior to testing. The analyzer shall be calibrated using EPA Protocol 1 gases according to the procedures for drift and bias limits outlined in EPA Methods 7E and Method 10. Alternate calibration procedures may be approved in advance by Ecology.

k. Each engine shall be equipped with a properly installed and maintained non-resettable meter that records total operating hours.

l. Each engine shall be connected to a properly installed and maintained fuel flow monitoring system that records the amount of fuel consumed by the engine during each operation.

## 5. EMISSION LIMITS

The forty 2.5 MWe engines shall meet the following emission rate limitations:

a. Demonstrate compliance with the g/kW-hr EPA Tier 2 average emission limits through stack testing according to 40 CFR §89.410, Table 2 of Appendix B, 40 CFR Part 89, Subpart E, and/or 40 CFR Part 60, Subpart IIII, or any other applicable EPA requirement in effect at the time the engines are installed. Columbia Data Center shall conduct exhaust stack testing and averaging of emission rates for five individual operating loads (10 percent, 25 percent, 50 percent, 75 percent, and 100 percent) The Tier 2 emission limits for the 40 engine generators are:

i. NMHC and NOx: 6.4 g/kW-hr

ii. CO: 3.5 g/kW-hr

iii. PM (filterable): 0.20 g/kw-hr

b. Total annual facility-wide emissions shall not exceed the 12-month rolling average emissions for $PM_{10}$, $PM_{2.5}$, CO, $NO_X$, VOC, $SO_2$, DEEP, and $NO_2$ as listed in Table 3.

| Table 3 Criteria Pollutant and Toxic Air Pollutant Emission Limits for Total Facility Columbia CO1, CO2, CO3, CO6 (Tons/Year) | | |
|---|---|---|
| **Pollutant** | **Annual Emissions** | **Annual with CO6 Commissioning Emissions** |
| PM smaller than 10 microns in diameter ($PM_{10}$) | 14.18 | 14.23 |
| PM smaller than 2.5 microns in diameter ($PM_{2.5}$)[(a)] | 6.38 | 6.43 |
| PM2.5/PM10 (Gens Only) | 2.88 | 2.93 |
| Carbon monoxide (CO) | 5.71 | 5.96 |
| Nitrogen oxides ($NO_X$) | 37.1 | 39.0 |
| Volatile organic compound (VOC) | 2.31 | 2.35 |
| Sulfur dioxide ($SO_2$) | 0.05 | 0.05 |
| Diesel Engine Exhaust Particulate (DEEP)* | 0.60 | 0.62 |
| Nitrogen Dioxide ($NO_2$)** | 3.67 | 3.86 |
| * All PM emissions from the generator engines are $PM_{2.5}$, and all filterable $PM_{2.5}$ from the generator engines is considered Diesel Engine Exhaust Particulate (DEEP).<br>** $NO_2$ is assumed to be equal to 10 percent of the total NOx emitted. | | |

c. Visual emissions from each diesel electric generator exhaust stack shall be no more than five percent, with the exception of a 10-minute period after unit start-up. Visual emissions shall be measured by using the procedures contained in 40 CFR 60, Appendix A, Method 9.

## 6. OPERATION AND MAINTENANCE MANUALS

A site-specific O&M manual for the Microsoft Columbia Data Center facility equipment shall be developed and followed. Manufacturers' operating instructions and design specifications for the engines, generators, cooling towers, and associated equipment shall be included in the manual. The O&M manual shall be reviewed annually and be updated to reflect any modifications of the equipment or its operating procedures. Emissions that result from failure to follow the operating procedures contained in the O&M manual or manufacturer's operating instructions may be considered proof that the equipment was not properly installed, operated, and/or maintained. The O&M manual for the diesel engines and associated equipment shall at a minimum include:

a. Manufacturer's testing and maintenance procedures that will ensure that each individual engine will conform to the EPA Tiered Emission Standards appropriate for that engine throughout the life of the engine.

b. Normal operating parameters and design specifications.

c. Operating maintenance schedule.

## 7. SUBMITTALS

All notifications, reports, and other submittals shall be sent to:

Washington State Department of Ecology
Air Quality Program
4601 N. Monroe Street
Spokane, WA 99205-1295
*OR AS DIRECTED.*

## 8. RECORDKEEPING

All records, Operations and Maintenance Manual, and procedures developed under this Order shall be organized in a readily accessible manner and cover a minimum of the most recent 60-month period. Microsoft Columbia Data Center is required to collect and maintain the following records.

a. Fuel receipts with amount of diesel and sulfur content for each delivery to the facility.

b. Annual hours of operation for each diesel engine.

c. Annual number of start-ups for each diesel engine.

d. Annual gross power generated by facility-wide operation of the emergency backup electrical generators.

e. Upset condition log for each engine and generator that includes date, time, duration of upset, cause, and corrective action.

f. Recordkeeping required by 40 CFR Part 60 Subpart IIII.

g. Air quality complaints received from the public or other entity, and the affected emissions units.

## 9. REPORTING

a. Within 10 business days after entering into a binding agreement to purchase the engine/generator sets identified in Equipment Table 1.a, Microsoft Corporation shall notify Ecology in writing. The serial number of the engine and the generator, and the engine build date will be submitted prior to installation of each engine.

b. The following information will be submitted to Ecology's Air Quality Program (AQP) at the address in Condition 7 by January 31 of each calendar year.

   i. Monthly rolling annual total summary of air contaminant emissions, monthly rolling hours of operation with annual total, and monthly rolling gross power generation with annual total.

   ii. Written notification that the O&M manual has been developed and updated within 60 days after the issuance of this Order.

c. Any air quality complaints resulting from operation of the emissions units or activities shall be promptly assessed and addressed. A record shall be maintained of Microsoft Corporation's action to investigate the validity of the complaint and what, if any, corrective action was taken in response to the complaint. Ecology shall be notified within three days of receipt of any such complaint.

## 10. STACK TESTING

Any emission testing performed to verify conditions of this Approval Order or for submittal to Ecology in support of this facility's operations shall be conducted as follows:

a. At least 30 days in advance of such testing, the Permittee shall submit a testing protocol for Ecology approval that includes the following information:

   i. The location and Unit ID of the equipment proposed to be tested.

   ii. The operating parameters to be monitored during the test and the personnel assigned to monitor the parameters during the test.

iii. A description of the source including manufacturer, model number and design capacity of the equipment, and the location of the sample ports or test locations.

iv. Time and date of the test and identification and qualifications of the personnel involved.

v. A description of the test methods or procedures to be used.

b. Test Reporting: test reports shall be submitted to Ecology within 60 days of completion of the test and shall include, at a minimum, the following information:

i. A description of the source including manufacturer, model number and design capacity of the equipment, and the location of the sample ports or test locations.

ii. Time and date of the test and identification and qualifications of the personnel involved.

iii. A summary of results, reported in units and averaging periods consistent with the applicable emission standard or limit.

iv. A summary of control system or equipment operating conditions.

v. A summary of production related parameters.

vi. A description of the test methods or procedures used including all field data, quality assurance/quality control procedures and documentation.

vii. A description of the analytical procedures used including all laboratory data, quality assurance/quality control procedures and documentation.

viii. Copies of field data and example calculations.

ix. Chain of custody information.

x. Calibration documentation.

xii. Discussion of any abnormalities associated with the results.

xiii. A statement signed by the senior management official of the testing firm certifying the validity of the source test report.

11. **GENERAL CONDITIONS**

a. **Commencing/Discontinuing Construction and/or Operations:** This Approval Order shall become invalid if construction of the equipment described in the NOC application is not commenced within 18 months after receipt of the Approval Order. If construction or operation of a portion or all of the equipment described in the NOC application is discontinued for a period of 18 months, the portion of the Approval Order regulating the inactive equipment shall become invalid. Ecology may extend the 18-month period upon a satisfactory showing that an extension is justified.

b. **Compliance Assurance Access:** Access to the source by representatives of Ecology or the EPA shall be permitted upon request. Failure to allow such access is grounds for enforcement action under the federal Clean Air Act or the Washington State Clean Air Act, and may result in revocation of this Approval Order.

c. **Availability of Order and O&M Manual:** Legible copies of this Order and the O&M manual shall be available to employees in direct operation of the emergency diesel electric generators, and be available for review upon request by Ecology.

d. **Equipment Operation:** Operation of the Caterpillar Model 3516C units and related equipment shall be conducted in compliance with all data and specifications submitted as part of the NOC application and in accordance with the O&M manual, unless otherwise approved in writing by Ecology.

e. **Modifications:** Any modification to the generators, engines, or cooling towers and their related equipment's operating or maintenance procedures, contrary to information in the NOC application, shall be reported to Ecology at least 60 days before such modification. Such modification may require a new or amended NOC Approval Order.

f. **Activities Inconsistent with the NOC Application and this Approval Order:** Any activity undertaken by the permittee or others, in a manner that is inconsistent with the NOC application and this determination, shall be subject to Ecology enforcement under applicable regulations.

g. **Obligations under Other Laws or Regulations:** Nothing in this Approval Order shall be construed to relieve the permittee of its obligations under any local, state or federal laws or regulations.

h. **Fees:** Per WAC 173-455-120, this Approval Order and related regulatory requirements have a fee associated for review and issuance. This Order is effective upon Ecology's receipt of the fee, for which Ecology's fiscal office will provide a billing statement.

All plans, specifications, and other information submitted to the Department of Ecology relative to this project and further documents and any authorizations or approvals or denials in relation thereto shall be kept at Ecology's Eastern Regional Office in the "Air Quality Controlled Sources" files, and by such action shall be incorporated herein and made a part thereof.

Authorization may be modified, suspended or revoked in whole or part for cause including, but not limited to the following:

1. Violation of any terms or conditions of this authorization.
2. Obtaining this authorization by misrepresentation or failure to disclose fully all relevant fact.

The provisions of this authorization are severable and, if any provision of this authorization, or application of any provisions of their circumstances, and the reminder of this authorization, shall not be affected thereby.

## YOUR RIGHT TO APPEAL

You have a right to appeal this Approval Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Approval Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do the following within 30 days of the date of receipt of this Approval Order:

- File your appeal and a copy of this Approval Order with the PCHB (See addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this Approval Order on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

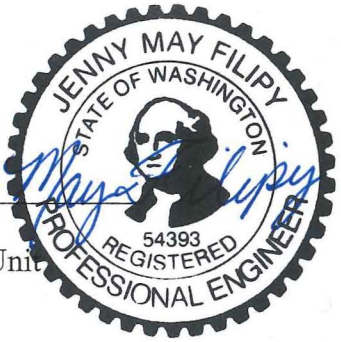
## ADDRESS AND LOCATION INFORMATION

| Street Addresses | Mailing Addresses |
|---|---|
| **Department of Ecology**<br>Attn: Appeals Processing Desk<br>300 Desmond Drive SE<br>Lacey, WA 98503 | **Department of Ecology**<br>Attn: Appeals Processing Desk<br>PO Box 47608<br>Olympia, WA 98504-7608 |
| **Pollution Control Hearings Board**<br>1111 Israel RD SW, STE 301<br>Tumwater, WA 98501 | **Pollution Control Hearings Board**<br>PO Box 40903<br>Olympia, WA 98504-0903 |

*For additional information, visit the Environmental Hearings Office Website: http://www.eho.wa.gov*
*To find laws and agency rules visit the Washington State Legislature Website: http://www1.leg.wa.gov/CodeRevise*

DATED at Spokane, Washington this 6th day of February 2020.

PREPARED BY:




Jenny Filipy, P.E.
Commercial/Industrial Unit
Air Quality Program
Eastern Regional Office

APPROVED BY:

David T. Knight
Section Manager
Air Quality Program
Eastern Regional Office

# State of Washington
# Department of Ecology
## Technical Support Document (TSD)

| | |
|---|---|
| **Source Name:** | **Microsoft Corporation – Columbia Data Center** |
| **Source Location:** | **501 Port Industrial Parkway, Quincy, WA 98848** |
| **County:** | **Grant** |
| **Approval Order No.:** | **20AQ-E002** |
| **Permit Reviewer:** | **Jenny Filipy** |

**Background and Description for Order 20AQ-E002**

On October 17, 2019, Ecology received a Notice of Construction application from Microsoft Corporation, requesting an expansion of the Columbia Data Center – CO6. The expansion would include five 2.5 MWe emergency backup generator engines. Columbia Data Center was previously permitted for 37 engines and only installed 35 engines. The CO6 expansion will bring the total number of permitted backup emergency engines to 40 and all 2.5 MWe in size. Microsoft Columbia will also reduce the annual operating hours per emergency generator for CO1 and CO2 from 121 hours to 100 hours and for CO3 from 104 hours to 100 hours. Initial review the application was considered incomplete. The application was considered complete on November 22, 2019. A 30 day public comment period was conducted from December 11, 2019 through January 10, 2020, with no public hearing. SEPA checklist review was conducted by the City of Quincy on November 14, 2019. The City of Quincy decided that the few additional engines was within the scope of the previous SEPA determination of non-significance for the facility.

**Emission Units and Pollution Control Equipment**

**Table 1 - Emergency Generator Engines and Cooling Equipment**
**Columbia CO1, CO2, CO3 and CO6**

| Buildings | Quantity | Engines | Model | Engine Control | Cooling Eq. |
|---|---|---|---|---|---|
| CO1 | 12 | 2.5 MWe | Caterpillar Model 3516C | All engines will meet EPA Tier 2 standards | 36 - Cooling Towers (0.0005% drift rate) |
| CO2 | 12 | | | | |
| CO3 | 11 | | | | No emissions from CO3 and CO6 cooling systems |
| CO6 | 5 | | | | |

## Existing Approval Orders

Approval Order No.: 14AQ-E553 – See pages 8-23 for technical support document for Columbia CO1, CO2 and CO3.

## Enforcement Issue(s)

There are no enforcement actions for this site.

## Recommendation

Staff recommends that the operation of the Columbia Data Center – CO6 be approved. This recommendation is based on the following facts and conditions: Information used in this review was derived from the application received 10/17/19 and additional information received on 11/14/2019. Hours of engine operation in the permit were based on modeling inputs.

## Emission Calculations

**Table 2 - Criteria Pollutant and Toxic Air Pollutant Emission Limits for Total Facility Columbia CO1, CO2, CO3, CO6 (Tons/Year)**

| Pollutant | Annual Emissions | Annual with CO6 Commissioning Emissions |
|---|---|---|
| PM smaller than 10 microns in diameter ($PM_{10}$) | 14.18 | 14.23 |
| PM smaller than 2.5 microns in diameter ($PM_{2.5}$)[(a)] | 6.38 | 6.43 |
| PM2.5/PM10 (Gens Only) | 2.88 | 2.93 |
| Carbon monoxide (CO) | 5.71 | 5.96 |
| Nitrogen oxides ($NO_X$) | 37.1 | 39.0 |
| Volatile organic compound (VOC) | 2.31 | 2.35 |
| Sulfur dioxide ($SO_2$) | 0.05 | 0.05 |
| Diesel Engine Exhaust Particulate (DEEP)* | 0.60 | 0.62 |
| Nitrogen Dioxide ($NO_2$)** | 3.67 | 3.86 |

* All PM emissions from the generator engines are $PM_{2.5}$, and all filterable $PM_{2.5}$ from the generator engines is considered Diesel Engine Exhaust Particulate (DEEP).
** $NO_2$ is assumed to be equal to 10 percent of the total NOx emitted.

| Table 3 - Toxic Air Pollutants[c] Potential To Emit for Total Facility Columbia CO1, CO2, CO3, CO6 (Tons/Year) | | |
|---|---|---|
| **Pollutant** | **Annual Emissions (lb/yr)** | **Annual Emissions (tons/year)** |
| Carbon Monoxide, CO | 11,920 | 5.96 |
| DEEP[a] | 1,240 | 0.62 |
| Sulfur Dioxide, $SO_2$ | 100 | 0.05 |
| Primary nitrogen dioxide ($NO_2$)[b] | 7,720 | 3.86 |
| Benzene | 47.19 | 0.024 |
| Toluene | 17.08 | 0.0085 |
| Xylenes | 11.73 | 0.0059 |
| 1,3-Butadiene | 2.38 | 0.00119 |
| Formaldehyde | 4.80 | 0.0024 |
| Acetaldehyde | 1.53 | 0.00077 |
| Acrolein | 0.48 | 0.00024 |
| Benzo(a)pyrene | 0.016 | 0.0000078 |
| Benzo(a)anthracene | 0.038 | 0.000019 |
| Chrysene | 0.093 | 0.000047 |
| Benzo(b)fluoranthene | 0.067 | 0.000034 |
| Benzo(k)fluoranthene | 0.013 | 0.0000066 |
| Dibenz(a,h)anthracene | 0.021 | 0.000011 |
| Ideno(1,2,3-cd)pyrene | 0.025 | 0.000013 |
| Naphthalene | 7.90 | 0.0040 |
| Propylene | 169.63 | 0.085 |
| Fluoride | 11.06 | 0.0055 |
| Manganese | 1.07 | 0.00054 |
| Copper | 0.36 | 0.00018 |
| Chloroform | 0.35 | 0.00018 |
| Bromodichloromethane | 0.35 | 0.00018 |
| Bromoform | 9.2 | 0.0046 |
| Vanadium | 0.71 | 0.00036 |

[a] DEEP is filterable (front-half) particulate emissions.
[b] $NO_2$ is assumed to be equal to 10 percent of the total $NO_X$ emitted.
[c] Pollutants above WAC 173-460-150 de minimis levels.

Potential emissions are above the exemption limits in WAC 173-400-110(5) of 2.0 tpy NOx therefore the facility is subject to New Source Review (NSR). An action that triggers NSR is subject to review under WAC 173-460-040 for each toxic air pollutant. See 'State Rule Applicability' section for further information on TAPs.

**Limited Potential to Emit**

Modeling demonstrated the facility would not cause or contribute to a violation of the NAAQS based on worst-case load emissions for Caterpillar engines. Engines were limited to 80 hours per year with one year with commissioning total up to 94 hours.

**County Attainment Status**

| Table 4 – NAAQS Attainment | |
|---|---|
| **Pollutant** | **Status** |
| $PM_{10}$ | attainment |
| $SO_2$ | attainment |
| $NO_2$ | attainment |
| Ozone | attainment |
| CO | attainment |
| Lead | attainment |

**Part 70 Permit Determination**

The Columbia Data Center is not subject to the Part 70 Permit requirements because the potential to emit (PTE) of:

(1) Each criteria pollutant is less than one hundred (100) tons per year;

(2) A single hazardous air pollutant (HAP) is less than ten (10) tons per year, and;

(3) Any combination of HAPs is less than twenty-five (25) tons per year.

**Federal Rule Applicability**

(1) New Source Performance Standard (NSPS) 40 CFR Part 60 Subpart IIII for Stationary Compression Ignition Internal Combustion Engines is applicable to this source. Requires each generator be manufactured and certified to meet EPA Tier 2 emission limits.

(2) National Emission Standards for Hazardous Air Pollutants (NESHAPs) 40 CFR Part 63 Subpart ZZZZ for Reciprocating Internal Combustion Engines is applicable to this source. Requires each generator be manufactured and certified to meet EPA Tier 2 emission limits and meet all requirements of 40 CFR Part 60 Subpart IIII.

**NAAQS**

Dispersion modeling was submitted which showed operation of the facility as permitted would not cause or contribute to a NAAQS exceedance.

| Table 5 - Estimated CO6 Project and Background Impacts Compared to NAAQS | | | | | | |
|---|---|---|---|---|---|---|
| Pollutant | NAAQS Primary/ Secondary | WA State Stds | Modeled Scenario | Modeled Impacts[a] ($\mu g/m^3$) | Background ($\mu g/m^3$) Reg[b]. + Local | Total Impact ($\mu g/m^3$) |
| Carbon Monoxide (CO)<br>8-hour average<br>1-hour average | 10,000 / --<br>40,000 / -- | 10,000<br>40,000 | Unplanned power outage | 357 [d]<br>675 [d] | -- | -- |
| Sulfur Dioxide ($SO_2$)<br>3-hour average<br>1-hour average | --/ 1,310<br>200 | 1,310<br>200 | Unplanned power outage | 2.7 [d]<br>3.2 [d] | -- | -- |
| Particulate Matter ($PM_{10}$)<br>24-hour average | 150 | 150 | Unplanned power outage of 15 hours | 29 [d,e] | 118 | 147 |
| Particulate Matter ($PM_{2.5}$)<br>Annual average<br>24-hour average | 12 / 15<br>35 | 12<br>35 | Theo. Max Yr<br>Ranked Day 8 | 0.088<br>4.3 [d,f] | --<br>23.1 | --<br>27 |
| Nitrogen Oxides (NOx)<br>Annual average<br>1-hour average | 100<br>188 / -- | 100 | Theo Max Yr<br>Ranked Day 8 | 3.2 [e]<br>139 [d,f] | 13.4<br>40 | 17<br>179 |

**Notes:**

[a]Maximum design value concentration of proposed new sources alone.

[b]Regional background level obtained form Idaho Department of Environmental Quality for model and monitoring data from July 2014 through June 2017 (IDEQ; accessed August 16, 2019).

[c]Cumulative concentrations are calculated for pollutant's where project related contributions are above the Significant Impact Level.

[d]Reported values represent the 1st-highest modeled impacts.

[e]It was assumed that local data centers were concurrently operating in facility-wide power outage mode. The Lamb Weston facility was modeled as continuously operating at PTE rates. All cooling towers were modeled as continuously operating at PTE rates.

[f]For quarterly and triennial operations one engine is running at a time and operations may occur any time during daytime hours (7am to 7pm). Local background modeling for this scenario assumed nearby data centers were not operating any generators. The Lamb Weston facility was modeled as continuously operating at PTE rates. All cooling towers were modeled as continuously operating at PTE rates.

[g]For cumulative $NO_2$ 1-hour average modeling, there are receptors located within a nearby sources' own property boundary. Due to this, we subtract the contribution of that source to receptors on its property and report only cumulative totals of all other sources in the model at those receptors. The project + local background concentration is 141 $\mu g/m^3$ using the maximum 3-year average.

**Toxic Air Pollutant Modeling:**
On December 23, 2019, the toxic air pollutant (TAP) table in WAC 173-460-150 became effective with updated values. The following table summarizes the compounds that will increase on one hour and 24 hour time scales as a result of this project and compares them to the updated toxics table values. All permitted annual limits remain the same, so there were no annual emission increases as a result of this project. No additional modeling of any TAP was required due to the updated toxics table. Acrolein and Nitrogen Dioxide ($NO_2$) were modeled for this project and were below the old Acceptable Source Impact Level (ASIL). The new ASIL for $NO_2$ is the same as before and Acrolein increased, so the new ASILs are met for these compounds.

| Toxic Air Pollutant WAC Table Update Comparison | | | | | | |
|---|---|---|---|---|---|---|
| Pollutant | Averaging Period (AP) | Project Emission Increase (lb/AP) | SQER (Old Table lb/AP) | ASIL (Old Table, $\mu g/m^3$) | SQER (New Table, lb/AP) | ASIL (New Table, $\mu g/m^3$) |
| $NO_2$ | 1-hr | 22.0 | 1.03 | 470 | 0.87 | 470 |
| CO | 1-hr | 35.5 | 50.4 | 23,000 | 43 | 23,000 |
| $SO_2$ | 1-hr | 0.113 | 1.45 | 660 | 1.2 | 660 |
| Toluene | 24-hr | 0.462 | 657 | 5,000 | 370 | 5,000 |
| Xylenes | 24-hr | 0.317 | 29.0 | 221 | 16 | 220 |
| Acrolein | 24-hr | 0.013 | 0.00789 | 0.06 | 0.026 | 0.35 |
| Propylene | 24-hr | 4.59 | 394 | 3,000 | 220 | 3,000 |

**Stack Parameters**
The following table shows the stack height and diameter requirements that were used in the site modeling.

| Table 6 - Emergency Generator Exhaust Stack Height Requirements | | | | |
|---|---|---|---|---|
| Quantity | Location | Minimum Height (feet) | Stack Diameter (inches) | Height Above Roof (feet) |
| 20 | CO1 and CO2 Building | 38' | 18" | 8' |
| 4 | CO1 and CO2 Ground Level | 20' | 18" | |
| 11 | CO3.1, CO3.2, CO3.3 Ground Level | 31' | 18" | |
| 5 | CO6 Building | 38' | 24" | 12.5' |

**State Rule Applicability and Best Available Control Technology (BACT)**
The proposed installation of emergency backup generators is subject to the requirements of:
(1) WAC 173-400-113 - Requirements for new sources in attainment or unclassifiable areas, is the State regulation that defines the evaluations of Microsoft Corporation. The subsections of WAC 173-400-113 require the following:

(a) WAC 173-400-113(1): "The proposed new source will comply with all applicable new source performance standards (NSPS), national emission standards for hazardous air pollutants (NESHAP)...." New Source Performance Standard (NSPS) 40 CFR Part 60 Subpart IIII for Stationary Compression Ignition Internal Combustion Engines and National Emission Standards for Hazardous Air Pollutants (NESHAPs) 40 CFR Part 63 Subpart ZZZZ for Reciprocating Internal Combustion Engines are applicable to this source.

(b) WAC 173-400-113(2): "The proposed new source or modification will employ BACT for all pollutants not previously emitted or whose emissions would increase as a result of the new source or modification." See the following BACT Table:

| Table 7 - Best Available Control Technology (BACT) Determinations | |
|---|---|
| **Pollutant(s)** | **BACT Determination** |
| PM, CO, and VOCs | Use of EPA Tier 2 certified engines installed and operated as emergency engines, as defined in 40 CFR Section 60.4219.<br>Compliance with the operation and maintenance restrictions of 40 CFR Part 60, Subpart IIII.<br>Use of high-efficiency drift eliminators which achieve a liquid droplet drift rate of no more than 0.0005 percent of the recirculation flow rate within each cooling tower. |
| $NO_X$ | Use of EPA Tier 2 certified engines installed and operated as emergency engines, as defined in 40 CFR Section 60.4219, and satisfy the written verification requirements of Approval Condition 2.e.<br>Compliance with the operation and maintenance restrictions of 40 CFR Part 60, Subpart IIII. |
| $SO_2$ | Use of ultra-low sulfur diesel fuel containing no more than 15 parts per million by weight of sulfur. |

(i.) The BACT and tBACT emission limitation is EPA's Tier 2 standards. The cost effectiveness (as dollars per ton of pollutant removed) of installing the Tier 4 integrated control package for control of NOx ($75,030), $PM_{10}/PM_{2.5}$ ($8.5 million), CO ($643,612), VOCs ($4.9 million), combined criteria air pollutants ($65,766), and combined toxic air pollutants ($356,431). The forecast cost effectiveness for control of individual and combined pollutants exceeds Ecology's thresholds for cost effectiveness; therefore, the Tier 4 integrated control package is cost-prohibitive for reducing criteria and toxic air pollutant emissions. The BACT cost evaluation for Diesel Oxidation Catalysts (DOC) for controlling CO ($9,992), VOC ($75,457), and PM ($447, 911) dipped into the range that we would consider requiring additional control (Combined $8,653 per ton). However, this CO6 project is well below the New Source Review thresholds for CO, VOC, and $PM_{10}/PM_{2.5}$ (5 tons per year for CO and 2 tons per year for VOC, 0.75 and 0.5 tons per year $PM_{10}$ and $PM_{2.5}$), so we will not require this additional emission control.

(c) WAC 173-400-113(3): "Allowable emissions from the proposed new source or modification will not delay the attainment date for an area not in attainment, nor cause or contribute to a violation of any air quality standard."

(d) WAC 173-400-110(2)(d): "If the proposed project will increase emissions of toxic air pollutants regulated under chapter 173-460 WAC, then the project must meet all applicable requirements of that program." See the following tBACT Table:

| Table 8 - tBACT Determinations | |
|---|---|
| **TAPs** | **tBACT Determination** |
| Acetaldehyde, CO, acrolein, benzene, benzo(a)pyrene, 1,3-butadiene, DEEP, formaldehyde, toluene, total PAHs, xylenes, chrysene, benzo(a)anthracene, napthalene, benzo(b)fluoranthene, propylene, dibenz(a,h)anthracene, Ideno(1,2,3-cd)pyrene, fluoride, manganese, copper, chloroform, bromodichloromethane, bromoform, | Compliance with the VOC and PM BACT requirement. |
| $NO_2$ | Compliance with the $NO_X$ BACT requirement. |
| $SO_2$ | Compliance with the $SO_2$ BACT requirement. |

**Conclusion**

Ecology has determined the applicant, Microsoft Corporation, has satisfied all of the requirements of New Source Review for its proposal to expand the Columbia Data Center by five 2.5 MWe emergency backup generators in Quincy, WA. The operation of this facility shall be subject to the conditions of the attached proposed Approval Order No. 20AQ-E002.

## BACKGROUND: Order No. 14AQ-E553, July 2014 Cooling Tower Changes

Microsoft Corporation (Microsoft) submitted a Notice of Construction application for the Columbia Data Center on April 21, 2014. The project consists of a change to the existing cooling tower operation from using well water to using pre-treated wastewater from the City of Quincy's industrial wastewater treatment plant. The resulting changes will lead to an increase in cooling tower cycling of the water, reducing water discharge to the City's industrial sewer system, and significantly increasing particulate emissions caused by cooling tower drift.

Additional information was requested regarding BACT for the cooling towers on April 28, 2014. Additional supporting information was received on May 30, 2014. Upon further inquiry to the

original supplier of the cooling towers a guarantee of 0.0005 percent efficiency was provided for the cooling towers drift eliminators.

This project, triggered a 30 day public comment period for PM, but not for $PM_{10}$ and $PM_{2.5}$. The public comment period was held for the draft approval order from June 19 through July 29, 2014. The comments submitted, and Ecology's response to comments, are appended to this document. All original comments submitted are provided in Section 1 of Appendix A to this Technical Support Document (for Approval Order No. 14AQ-E553). Section 2 of Appendix A is the original comments with Ecology's responses. **The comments received did not result in a change to Ecology's draft approval.**

**BACKGROUND: Order No. 13AQ-E497, April 10, 2013 Corrected Revision**

A correction to Approval Condition 1.1 was made to rescind Order Nos. 10AQ-E374 and 13AQ-E493. Order No. 13AQ-E497 was issued on April 10, 2013.

**BACKGROUND: Order No. 13AQ-E493, April 8, 2013 Revision**

Microsoft-Yes Toxic Air Pollution-No (MYTAPN) appealed Notice of Construction Approval Order No. 10AQ-E374 to the Pollution Control hearings Board. Case PCHB 10-162 was decided on July 25, 2012, and required revision of Order No. 10AQ-E374. Ecology revised the Order as specified in the PCHB decision. In addition to revising the Order, new CO1/1, CO1/2, CO3.1, and CO3.3 engine serial numbers were included in the Equipment section. No other changes were made to the Order.

**BACKGROUND: Order No. 10AQ-E374, October 26, 2010**

Microsoft submitted a NOC application on May 14, 2010 for the Phased CO3.2 (Phase I), CO3.1 (Phase II), and CO3.3 (Phase II) Expansion of the Columbia Data Center, hereafter referred to as the Microsoft Expansion. The Microsoft Expansion consists of the addition of three new buildings with thirteen 2.5 electrical-megawatts (MW) generators powered by Caterpillar 3516C engines, one smaller 111 kWm diesel firewater pump, and no evaporative coolers.

Microsoft has asked for a $NO_x$ emission limitation for the Columbia Data Center plus the Microsoft Expansion of 89.4 tons per year. Further, Microsoft would like to limit fuel usage at the original Columbia Data Center plus the Microsoft Expansion to 439,493 gallons of on-road specification ultra-low sulfur diesel fuel. The $NO_x$ limit of 89.4 tons per year is currently allowed in NOC Approval Order No. 09AQ-E308. These limits will be achieved by reducing the hours of operation and fuel usage of the original 24 engines permitted at the Columbia Data Center.

**BACKGROUND: Order No. 09AQ-E308, August 28, 2009**

Microsoft Corporation (Microsoft) submitted a Notice of Construction (NOC) application for the Columbia Data Center on October 23, 2006. The Columbia Data Center project consisted of twenty-four 2.5 MW generators powered by Caterpillar 3516C engines and 2 banks of evaporative coolers. The generators have a capacity of 60 Megawatts.

The Department of Ecology (Ecology) issued Order No. 07AQ-E230 on August 8, 2007 to Microsoft. Subsequently, Microsoft notified Ecology's Air Quality Program (AQP) that several small engines were missed in the original NOC application, and Microsoft submitted a NOC application for a minor modification on June 12, 2009. Ecology's Eastern Regional Office (ERO) approved the minor modification by issuing Order No. 09AQ-E308 on August 28, 2009. NOC Approval Order No. 09AQ-E308 included all the approval conditions of 07AQ-E230, and rescinded Order No. 07AQ-E230. The Microsoft Columbia Data Center has a single Air Quality permit.

NOC Approval Order No. 09AQ-E308 allows each engine to operate for an average of 285 hours per year, limits total fuel to 890,021 gallons of road specification diesel fuel, and restricts $NO_x$ emissions to 89.4 tons per year.

## 1. PROJECT DESCRIPTION

1.1 Microsoft, Columbia Data Center uses 12 Evapco Model USS-312-454 mechanical draft cooling towers to cool the computer servers inside CO1 and CO2 buildings. Microsoft currently uses well water with scale forming minerals (calcium and magnesium), which require scale inhibitor chemicals and biocide additives in addition to frequent water discharge (or blow down) to the City of Quincy (City) industrial sewer system. Microsoft proposes to change cooling tower feed water to pre-treated wastewater from the City's industrial wastewater treatment plant and to increase the water cycling from less than 3 cycles to 100 cycles before blow down. The new cycling protocol licensed by Water Conservation Technology International (WCTI) will greatly decrease water discharge to the City's sewer system and increase particulate matter emissions.

The Microsoft Expansion consists of three buildings with thirteen 2.5 MW generators powered by Caterpillar 3516C engines. Microsoft reduced the fuel usage at the Columbia Data Center from 890,021 gallons per year to 439,493 gallons per year. The 13 Microsoft Expansion engines will be limited to 139,493 gallons of on-road specification diesel fuel per year. The fuel limitation for the original 24 engines at the Columbia Data Center will be reduced to 300,000 gallons per year. The new facility-wide fuel limit will be 439,493 gallons of on-road specification diesel fuel per year. The new fuel limit will be achieved by reducing the hours of operation of the original 24 engines permitted. Microsoft agreed to limit the fuel usage as follows:

**Table 1: Summary of Fuel Use Limitation**

| Project | Historical allowed fuel usage (gallons per year) | Proposed allowed fuel usage (gallons per year) | Percent reduction (Total) |
|---|---|---|---|
| CO 1 & 2 | 890,021 | 300,000 | 66.3% |

| | | | |
|---|---|---|---|
| CO3.2 (Phase I), CO3.1 (Phase II), & CO3.3 (Phase II) | - | 139,493 | |
| Total | 890,021 | 439,493 | 50.6% |

## 2. EMISSIONS

2.1 Potential to Emit Criteria and Toxic Air Pollutant Emissions

**Table 2.1.1: Potential to Emit for Microsoft Columbia Data Center - Generators**

| **Pollutant** | **Emission Factor** | **Emission Factor Reference** | **Existing Units 1 thru 24 Potential To Emit[1]** | **Expansion Units 25 thru 37 Potential To Emit** | **Facility Potential to Emit** |
|---|---|---|---|---|---|
| **Criteria Pollutant** | g/kW-hr | | tons/yr | tons/yr | tons/yr |
| $NO_x$ | 6.12 | §89.112a | 30.1 | 13.9 | 44.0 |
| CO | 3.50 | §89.112a | 2.1 | 8.0 | 10.1 |
| $SO_2$ | 15 ppm/gal | MassBal | 0.032 | 0.015 | 0.047 |
| $PM_{2.5}$ | 0.200 | §89.112a | 0.58 | 0.45 | 1.03 |
| VOC | 0.282 | CEC-05-049 | 1.4 | 0.60 | 2.0 |
| **Toxic Air Pollutants** | | | | | |
| Primary $NO_2$ | 0.62 | 10% $NO_x$ | 3.01 | 1.39 | 4.40 |
| Diesel Engine Exhaust Particulate | 0.200 | $PM_{2.5}$ | 0.58 | 0.45 | 1.03 |
| Carbon monoxide | 3.50 | CO | 2.1 | 8.0 | 10.1 |
| Sulfur dioxide | 15 ppm/gal | $SO_2$ | 0.032 | 0.015 | 0.047 |
| **Carbon based TAPs** | lbs/MMBtu | | | | |
| Acrolein | 8.04E-06 | AP-42 §3.4 | 2.29E-03 | 7.90E-05 | 2.37E-03 |
| Benzene | 7.92E-04 | " | 2.16E-02 | 7.80E-03 | 2.94E-02 |
| Toluene | 2.87E-04 | " | 7.75E-03 | 2.80E-03 | 1.06E-02 |
| Xylenes | 1.97E-04 | " | 5.39E-03 | 1.90E-03 | 7.29E-02 |
| 1,3 Butadiene | 1.99E-05 | " | 2.02E-03 | 2.00E-04 | 2.22E-03 |
| Formaldehyde | 8/05E-05 | " | 5.39E-02 | 7.90E-04 | 5.47E-02 |
| Acetaldehyde | 2.57E-05 | " | 2.29E-02 | 2.50E-04 | 2.32E-02 |
| Benzo(a)Pyrene | 1.31E-07 | " | 3.71E-06 | 1.30E-06 | 5.01E-06 |
| PAH (sum) | 3.96E-06 | " | na | 3.90E-05 | na |
| PAH (w/ TEF) | 5.08E-07 | " | na | 5.00E-06 | na |

[1] **Potential to Emit** accounts for reduction in fuel use from the existing engines.

2.2 Maximum Operation

| Table 2.2.1: Microsoft Expansion 13 Generator Engines Annual Operations | | | | |
|---|---|---|---|---|
| **No.** | **Operation** | **Average Load** | **Annual Hours** | **kW-hr/yr** |
| 1 | Scheduled Testing | 10% | 12* | 57,720 |
| 2 | Power Outage | 85% | 48 | 1,342,560 |
| 3 | UPS Maintenance | 40% | 44 | 659,516 |
| 4 | Total Operations | 53% | 104 | 2,059,796 |

* Maximum of one hour per month operation.

2.3 Tier 4 transitional emissions referenced in NOC Approval Order No. 10AQ-E374 can be found in the following EPA document:

Report No. NR-009c
EPA 420-P-04-009
Revised April 2004
Appendix A, Table A2, page A8

| Table 2.2: Tier 4 Transitional emission factors | | | | |
|---|---|---|---|---|
| **Pollutant** | **NMHC** | **CO** | **$NO_x$** | **PM** |
| g/hp-hr | 0.282 | 0.076 | 0.460 | 0.069 |
| g/kWm-hr[1] | 0.378 | 0.102 | 0.617 | 0.093 |

[1]Conversion factor of 0.74558

2.4 Total emissions from the two banks of cooling towers shall be less than or equal to the amounts contained in the following Table:

| Table 2.3: Combined Cooling Tower Emissions | | | | |
|---|---|---|---|---|
| **Pollutant** | **Water supply conc. Mg/l** | **Recirc. water conc. Mg/l** | **Emission rate lbs/yr** | **Emission rate tons/yr** |
| TDS as TSP | 1,500 | 150,000 | 53520 | 26.8 |
| $PM_{10}$ | | | 22478 | 11.3 |
| $PM_{2.5}$ | | | 6958 | 3.5 |
| Fluoride | 0.31 | 31 | 11.06 | |
| Manganese | 0.03 | 3 | 1.07 | |
| Copper | 0.01 | 1 | 0.36 | |
| Vanadium | 0.02 | 2 | 0.71 | |
| Chloroform | 0.0004 | 0.04 | 0.35 | |
| Bromodichloromethane | 0.0004 | 0.04 | 0.35 | |
| Bromoform | 0.0105 | 0.0105 | 9.2 | |

* There shall be no hexavalent chromium added to treat the cooling tower water.

2.5 The Columbia Data Center has four small emergency engines consist of three 149 bhp engines to power fire water pumps and one 398 bhp emergency engine to power the cooling water pre-treatment facility. The three fire water pump engines and the

cooling water pre-treatment engine are considered permit exempt under Washington Administrative Code (WAC) 173-400-110(4)(h)(xxxix), and will not be further addressed in the Approval Order.

## 3. APPLICABLE REQUIREMENTS

The proposal by Microsoft qualifies as a new source of air contaminants as defined in Washington Administrative Code (WAC) 173-400-110 and WAC 173-460-040, and requires Ecology approval. The installation and operation of the Columbia Data Center is regulated by the requirements specified in:

3.1 Chapter 70.94 Revised Code of Washington (RCW), Washington Clean Air Act,
3.2 Chapter 173-400 Washington Administrative Code (WAC), General Regulations for Air Pollution Sources,
3.3 Chapter 173-460 WAC, Controls for New Sources of Toxic Air Pollutants, and
3.4 40 CFR Part 60 Subpart IIII

All state and federal laws, statutes, and regulations cited in this approval shall be the versions that are current on the date the final approval order is signed and issued.

## 4. BEST AVAILABLE CONTROL TECHNOLOGY

Best Available Control Technology (BACT) is defined[1] as "*an emission limitation based on the maximum degree of reduction for each air pollutant subject to regulation under chapter 70.94 RCW emitted from or which results from any new or modified stationary source, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques for control of each such pollutant. In no event shall application of the "best available control technology" result in emissions of any pollutants which will exceed the emissions allowed by any applicable standard under 40 CFR Part 60 and Part 61....*"

For the cooling tower WCTI project, the CO1 and CO2 cooling towers are currently equipped with the most efficient drift eliminators that are commercially available. Ecology determines BACT for particulate matter for the cooling towers to be 0.0005 percent efficient drift eliminators as designed.

Ecology is implementing the "top-down" approach for determining BACT for the proposed diesel engines. The first step in this approach is to determine, for each proposed emission unit, the most stringent control available for a similar or identical emission unit. If that review can show that this level of control is not technically or economically feasible for the proposed source, then the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or

[1] RCW 70.94.030(7) and WAC 173-400-030(12)

unique technical, environmental, or economic objections.[2] The "top-down" approach shifts the burden of proof to the applicant to justify why the proposed source is unable to apply the best technology available. The BACT analysis must be conducted for each pollutant that is subject to new source review.

The proposed diesel engines will emit the following regulated pollutants which are subject to BACT review: nitrogen oxides (NOx), carbon monoxide (CO), volatile organic compounds (VOCs), particulate matter (PM, $PM_{10}$ and $PM_{2.5}$) and sulfur dioxide.

### 4.1 BACT ANALYSIS FOR NOx

Microsoft reviewed EPA's RACT/BACT/LAER Clearinghouse (RBLC) database to look for NOx add-on controls recently installed on internal combustion engines. The RBLC provides a listing of BACT determinations that have been proposed or issued for large facilities within the United States, Canada and Mexico. Microsoft's review of the RBLC found that urea -based selective catalytic reduction (SCR) was the most stringent add-on control option demonstrated on diesel engines. The application of the SCR technology for NOx control was therefore considered the top-case control technology and evaluated for technical feasibility and cost-effectiveness.

The most common BACT determination identified in the RBLC for NOx control was compliance with EPA Tier 2 standards using engine design, including exhaust gas recirculation (EGR) or fuel injection timing retard with turbochargers. Other NOx control options identified through a literature review include water injection and NOx adsorbers.

*4.1.1* ***Selective Catalytic Reduction.*** The SCR system functions by injecting a liquid reducing agent, such as urea, through a catalyst into the exhaust stream of the diesel engine. The urea reacts with the exhaust stream converting nitrogen oxides into nitrogen and water. The use of a lean ultralow sulfur fuel is required to achieve good NOx destruction efficiencies. SCR can reduce NOx emissions by up to 90-95 percent while simultaneously reducing hydrocarbon (HC), CO and PM emissions.

For SCR systems to function effectively, exhaust temperatures must be high enough (about 200 to 500°C) to enable catalyst activation. For this reason, SCR control efficiencies are expected to be relatively low during the first 20 to 30 minutes after engine start up, especially during maintenance, testing and storm avoidance loads. There are also complications of managing and controlling the excess ammonia (ammonia slip) from SCR use.

Microsoft has evaluated the cost effectiveness of installing and operating SCR systems on each of the proposed diesel engines. The analysis indicates that the use of SCR systems would cost approximately $23,500 per ton of NOx removed from the exhaust stream. A previous survey by Ecology found that the permitting agencies surveyed have required installation of NOx controls as BACT with expected operational costs ranging from $143 to $9,473 per ton of NOx removed. Ecology concludes that while SCR is a demonstrated

[2] J. Craig Potter, EPA Assistant Administrator for Air and Radiation memorandum to EPA Regional Administrators, "Improving New Source Review (NSR) Implementation", December 1, 1987.

emission control technology for diesel engines, it is not economically feasible for this project. Therefore, Ecology rejects this NOx control option as BACT.

*4.1.2* ***NOx adsorbers.*** The use of NOx adsorbers (sometimes called lean NOx traps) is a catalytic method being developed and tested by diesel engine manufacturers to reduce NOx emissions, primarily from mobile sources. The NOx adsorber contains a catalyst (e.g., zeolite or platinum) that is used to "trap" NOx (NO and $NO_2$) molecules found in the exhaust. NOx adsorbers can achieve NOx reductions greater than 90% at typical steady-state exhaust gas temperatures.

However, as of this writing, NOx adsorbers are experimental technology and are, therefore, very expensive. Additionally, a literature search did not reveal any indication that this technology is commercially available for stationary backup generators. Thus, Ecology rejects NOx adsorbers as BACT for the proposed diesel engines.

*4.1.3* ***Combustion Controls and Tier 2 compliance.*** Diesel engine manufacturers typically use proprietary combustion control methods to achieve the emission reductions needed to meet applicable EPA tier standards. Common controls include fuel injection timing retard and exhaust gas recirculation. Injection timing retard reduces the peak flame temperature and NOx emissions, but may lead to higher fuel consumption. Microsoft will install Caterpillar engines that will use a combination of combustion control methods, including fuel injection timing retard, to comply with EPA Tier-2 emission limits.

*4.1.4* ***Other control options***. Other NOx control options, such as water injection, were rejected because there was no indication that they are commercially available and/or effective in new large diesel engines.

4.1.5 **BACT determination for NOx**

Ecology determines that BACT for NOx is the use of good combustion practices, an engine design that incorporates fuel injection timing retard, turbocharger and a low-temperature aftercooler, EPA Tier-2 certified engines, and compliance with the operation and maintenance restrictions of 40 CFR Part 60, Subpart IIII.

## 4.2 BACT ANALYSIS FOR PARTICULATE MATTER, CARBON MONOXIDE AND VOLATILE ORGANIC COMPOUNDS

Microsoft reviewed the available published literature and the RBLC and identified the following demonstrated technologies for the control of diesel engine exhaust particulate, carbon monoxide and volatile organic compounds from the proposed diesel engines:

*4.2.1* ***Diesel particulate filters (DPFs)***. These add-on devices include passive and active DPFs, depending on the method used to clean the filters (i.e., regeneration). Passive filters rely on a catalyst while active filters typically use continuous heating with a fuel burner to clean the filters. The use of DPFs to control diesel engine exhaust particulate emissions has been demonstrated in multiple engine installations worldwide. Particulate

matter reductions of up to 85% or more have been reported. Therefore, this technology was identified as the top case control option for diesel engine exhaust particulate emissions from the proposed engines.

Microsoft has evaluated the cost effectiveness of installing and operating DPFs on each of the proposed diesel engines. The analysis indicates that the use of DPFs would cost approximately $270,000 per ton of engine exhaust particulate removed from the exhaust stream, assuming 48 hours per year of emergency operation. A previous survey by Ecology found that none of the permitting agencies surveyed had required installation of a particulate matter control device (as BACT) that was expected to cost more than $23,200 per ton of particulate removed.

Since the estimated DPF cost effectiveness value for the proposed Microsoft project far exceeds the $23,200 per ton upper limit, Ecology concludes that the use of DPFs is not economically feasible for this project. Therefore, Ecology rejects this control option as BACT for particulate matter.

4.2.2 ***Diesel oxidation catalysts***. This method utilizes metal catalysts to oxidize carbon monoxide, particulate matter, and hydrocarbons in the diesel exhaust. Diesel oxidation catalysts (DOCs) are commercially available and reliable for controlling particulate matter, carbon monoxide and hydrocarbon emissions from diesel engines. While the primary pollutant controlled by DOCs is carbon monoxide (approximately 90% reduction), DOCs have also been demonstrated to reduce up to 30% of diesel engine exhaust particulate emissions, and more than 50% of hydrocarbon emissions.

Microsoft has evaluated the cost effectiveness of installing and operating DOCs on each of the proposed diesel engines. If the cost effectiveness of DOC use is evaluated using the total amount of carbon monoxide, particulate matter and hydrocarbons reduced, the normalized operational cost estimate becomes $4,500 per ton of pollutants removed, assuming 48 hours per year of emergency operation. The corresponding DOC cost effectiveness value assuming only carbon monoxide destruction is approximately $5,000 per ton of carbon monoxide removed. If particulate matter and hydrocarbons are individually considered, the cost effectiveness values become $387,610 and $116,500 per ton of pollutant removed, respectively.

Microsoft acknowledges that DOC technology is commercially available and "would be reliable". A previous survey by Ecology found that the permitting agencies surveyed have required installation of carbon monoxide controls as BACT on other types of emission units, with expected operational costs ranging from $300 to $9,795 per ton of carbon monoxide removed. The upper level of that range is suspect and it is possible that that number actually reflects California BACT which is typically equivalent to a Lowest Achievable Emissions Rate (LAER) limit. In Washington, costs for controlling CO from combined cycle natural gas electric generating facilities are usually in the $3,500 to $5,000 range. The cost effectiveness estimates calculated for Microsoft's project fall within this range when all pollutants to be controlled are considered, or if only carbon monoxide is considered.

4.2.3 **BACT Determination for Particulate Matter, Carbon Monoxide and Volatile Organic Compounds**

Diesel oxidation catalysts can reduce particulate matter by up to 30%, hydrocarbons by up to 50%, and carbon monoxide by approximately 90%, Ecology considered applying diesel oxidation catalysts as BACT for these compression ignition engines. The fact that the oxidation catalyst also reduced approximately 25% of the diesel engine exhaust particulate emissions from the proposed new engines made this option attractive to Ecology. Microsoft's offer to reduce fuel usage by 50% even with the instillation of the 13 new engines, would result in a reduction of more than 7 times the amount of diesel engine exhaust particulate being reduced over the use of an oxidation catalyst. Therefore, Ecology determines BACT for particulate matter, carbon monoxide and volatile organic compounds is restricted operation of the EPA Tier-2 certified engines, and compliance with the operation and maintenance restrictions of 40 CFR Part 60, Subpart IIII.

## 4.3 BACT ANALYSIS FOR SULFUR DIOXIDE

4.3.1 Ecology and Microsoft did not find any add-on control options commercially available and feasible for controlling sulfur dioxide emissions from diesel engines. Microsoft's proposed BACT for sulfur dioxide is the use of ultra-low sulfur diesel fuel (15 ppm by weight of sulfur). Using this control measure, sulfur dioxide emissions would be limited to 0.015 tons per year.

4.3.2 **BACT Determination for Sulfur Dioxide**

Ecology determines that BACT for sulfur dioxide is the use of ultra-low sulfur diesel fuel containing no more than 15 parts per million by weight of sulfur.

## 4.4 BEST AVAILABLE CONTROL TECHNOLOGY FOR TOXICS

Best Available Control Technology for Toxics (tBACT) means BACT, as applied to toxic air pollutants.[3] The procedure for determining tBACT follows the same procedure used above for determining BACT. Under state rules, tBACT is required for all toxic air pollutants for which the increase in emissions will exceed de minimis emission values as found in WAC 173-460-150.

For the proposed project, tBACT must be determined for each of the toxic air pollutants listed in Table 1 below. As illustrated by Table 1, Ecology has determined that compliance with BACT, as determined above, satisfies the tBACT requirement.

**Table 1. tBACT Determination**

| Toxic Air Pollutant | tBACT |
|---|---|

[3] WAC 173-460-020

| | |
|---|---|
| Acetaldehyde | Compliance with the VOC BACT requirement |
| Acrolein | Compliance with the VOC BACT requirement |
| Benzene | Compliance with the VOC BACT requirement |
| Benzo(a)pyrene | Compliance with the VOC BACT requirement |
| 1,3-Butadiene | Compliance with the VOC BACT requirement |
| Carbon monoxide | Compliance with the CO BACT requirement |
| Diesel engine exhaust particulate | Compliance with the PM BACT requirement |
| Formaldehyde | Compliance with the VOC BACT requirement |
| Nitrogen dioxide | Compliance with the NOx BACT requirement |
| Sulfur dioxide | Compliance with the $SO_2$ BACT requirement |
| Toluene | Compliance with the VOC BACT requirement |
| Total PAHs | Compliance with the VOC BACT requirement |
| Xylenes | Compliance with the VOC BACT requirement |

## 5. AMBIENT AIR MODELING

For the cooling tower WCTI project, particulate matter ($PM_{10}$ and $PM_{2.5}$) ambient air quality impacts were modeled using EPA's AERMOD dispersion model. Building downwash and impacts from Columbia Data Center generators, Dell Data Center generators, Project Oxford generators and cooling towers, and Con-Agra Food stack emissions were all accounted for in the modeling. The ambient impacts caused by cooling tower emissions are less than the NAAQS and WAAQS, after adding local and regional background levels.

For Microsoft Expansion project, ambient air quality impacts at and beyond the property boundary were modeled using EPA's AERMOD dispersion model, with EPA's PRIME algorithm for building downwash. For purposes of demonstrating compliance with the national ambient air quality standards (NAAQS) and acceptable source impact levels (ASILs), Microsoft assumed the entire Columbia Data Center would experience 2 full days of power outage, in which case 12 backup engines were assumed to operate at their rated load at the same time, and the 13$^{th}$ engine running at idle (approximately 10% load). For engine testing, Microsoft assumed that all 13 engines were tested on a single day (with five engines operating at the same time) while operating at low (i.e., approximately 10%) load.

The AERMOD model used the following data and assumptions:

5.1 Five years of sequential hourly meteorological data (2004–2008) from Moses Lake Airport were used. Twice-daily upper air data from Spokane were used to define mixing heights.

5.2 Digital topographical data (in the form of Digital Elevation Model files) for the vicinity were obtained from BeeLine software.

5.3 Each generator was modeled with a stack height of 31- feet above local ground.

5.4 The existing CO1/CO2 data center building, the proposed new CO3.2 (Phase I), CO3.1 (Phase II) and CO3.3 (Phase II) server buildings, and each expansion generator's acoustical enclosure were included to account for building downwash.

5.5 The receptor grid for the AERMOD modeling was established using a 10-meter grid spacing along the facility boundary extending to a distance of 300 meters from each facility boundary. A grid spacing of 25 to 50 meters was used for distances more than 300 meters from the boundary.

5.6 1-hour $NO_2$ concentrations at and beyond the facility boundary were modeled using the Plume Volume Molar Ratio Method (PVMRM) module, with default concentrations of 40 parts per billion (ppb) of background ozone, and an equilibrium $NO_2$ to NOx ambient ratio of 90%. For purposes of modeling $NO_2$ impacts, the primary NOx emissions at the stack exit were assumed to consist of 10% $NO_2$ and 90% nitric oxide by mass.

5.7 Dispersion modeling is sensitive to the assumed stack parameters (i.e., flowrate and exhaust temperature). The stack temperature and stack exhaust velocity at each generator stack were set to values corresponding to the engine loads for each type of testing and power outage. Stack parameters are provided in Appendix E.

Except for diesel engine exhaust particulate which is predicted to exceed its ASIL, AERMOD model results show that no NAAQS or ASIL will be exceeded at or beyond the property boundary. As required by WAC 173-40-090, emissions of diesel engine exhaust particulate are further evaluated in the following section of this document.

## 6. THIRD TIER REVIEW FOR DIESEL ENGINE EXHAUST PARTICULATE

As discussed above, proposed emissions of diesel engine exhaust particulate (DEEP) from the 13 additional engines exceed the regulatory trigger level for toxic air pollutants (also called an Acceptable Source Impact Level, (ASIL). A second or third tier review is required for DEEP in accordance with WAC 173-460-090 or WAC 173-460-100, respectively.

Microsoft's existing computer data center is currently one of three data centers operating in the rural town of Quincy, WA. The three data centers utilize dozens of large (>2 MW) diesel engines to supply backup power in support of data center operations. Additionally, due to the April, 2010 enactment of the *Computer Data Centers – Sales and Tax Exemption* law in Washington State, several companies have expressed interest in expanding existing or developing new data centers in Quincy. Thus, more large diesel-powered generators will be needed to supply backup power for the additional data centers.

Large diesel-powered backup engines emit DEEP, which is a high priority toxic air pollutant in the state of Washington. In light of the potential rapid development of other data centers in the Quincy

area, and recognizing the potency of DEEP emissions, Ecology decided to evaluate Microsoft's proposal on a community-wide basis. The community-wide evaluation approach considers the cumulative impacts of DEEP emissions resulting from Microsoft's project, and includes consideration of prevailing background emissions from existing permitted data centers and other DEEP sources in Quincy. This evaluation was conducted under the third tier review requirements of WAC 173-460-100.

The results of Ecology's evaluation of cumulative risks associated with Microsoft's project are included in a separate technical support document. Please refer to that technical support document for a discussion and evaluation of the risks associated with diesel engine exhaust particulate emitted by Microsoft.

## 7. CONCLUSION

Based on the above analysis, Ecology concludes that operational changes to the cooling towers and operation of the 13 generators will not have an adverse impact on air quality. Ecology finds that Microsoft has satisfied all requirements for NOC approval.

******END OF MICROSOFT 2010 EXPANSION TSD ******

## NOC APPROVAL ORDER NO. 09AQ-E308 NON-NSR MODIFICATIONS (RWK)

On June 12, 2009, Microsoft Corporation (MSN) submitted a request to modify its order of approval (No. 07AQ-E230) to add 3 emergency diesel engines MSN omitted from its original application (installed and operating at this time) and to extend the period of time allowed for construction of the 23rd and 24th large engines approved in Order 07AQ-E230. WAC 173-460 and WAC 173-400 were revised in the period of time since the MSN data center was approved, adding an exemption from NSR for emergency engines equal to or smaller than 500 HP. Each of the three existing engines included in the June 12, 2009 request qualifies for this exemption if it is new equipment. Because the engines are in place already, they were installed subject to the rules in place at the time of installation and so, are subject to BACT and t-BACT and the other requirements of NSR if their addition to this project involves increases in emissions. The application indicates that these engines will be operated solely for diagnostic and readiness testing, that the facility diesel fuel limit is not to be changed, and that the engines will satisfy the BACT requirements imposed on the large engine generators approved in 07AQ-E230, so this proposal is a project not subject to NSR under old 400 and 460 or new 400 and 460.

The emission inventory for this project does not change with the addition of these engines because MSN has agreed to retain the facility-wide fuel limit of Approval Order 07AQ-E230. The smaller engines do not emit significantly different levels of pollutants for a given energy output, and will not change the inventory if the overall fuel consumption limit is not changed.

This modification to the MSN Approval Order, then, is to identify the 3 engines omitted from the earlier order, include NSPS paperwork requirements as approval conditions if they are not already requirements for the large engines, and to agree to extend the period of time allowed for MSN to start construction of engines 23 and 24.

## FINDINGS & EVALUATIONS FOR NOC APPROVAL ORDER NO. 07AQ-E230 (RWK)

Microsoft Corporation (MSN) submitted a Notice of Construction (NOC) application on October 23, 2006, for the installation of the Columbia Data Center located at 501 Port Industrial Parkway, Quincy, in Grant County. The Columbia Data Center will be used by MSN as an electronic data storage facility. Air contaminant sources at the facility consist of twenty-four (24) Caterpillar Model 3516C-TA diesel powered generator units with a combined 100 percent standby rating capacity of 60 megawatts (MW) used for emergency backup power, six banks of evaporative cooling towers on three buildings, and associated support equipment such as fuel tanks, cooling water storage and treatment, and electrical systems. The generators will be used to provide emergency backup electrical power to the Grant County PUD hydroelectric power grid. Operation of each generator has been estimated at 70 hours per year for maintenance purposes and a maximum of 215 hours per year of operation for emergency backup electrical generation. The diesel generators will exclusively burn ultra-low sulfur (less than 0.0015 wt %), EPA on-road specification No. 2 distillate diesel oil.

The Ecology Air Quality Program (AQP or Ecology) reviewed the October 23, 2006, NOC application and responded to MSN with a completeness determination dated October 26, 2006. MSN responded to the completeness determination on January 10, 2007, and Ecology informed MSN that a Tier II analysis would be necessary in correspondence dated January 11, 2007. The Tier II analysis was considered complete based on submittals from MSN dated March 14, May 10, June 5 and 6, 2007. The MSN NOC application was considered complete on June 25, 2007, and the Preliminary Determination was issued for the project on June 25, 2007. After a thirty day public comment period, NOC approval ORDER No. 07AQ-E230 was issued on August 8, 2007.

## FINDINGS:

### 1. LAWS AND REGULATIONS

The proposal by Microsoft qualifies as a new source of air contaminants as defined in Washington Administrative Code (WAC) 173-400-110 and WAC 173-460-040, and requires Ecology approval. The installation and operation of the Columbia Data Center is regulated by the requirements specified in:

1.1 Chapter 70.94 Revised Code of Washington (RCW), Washington Clean Air Act,
1.2 Chapter 173-400 Washington Administrative Code (WAC), General Regulations for Air Pollution Sources,
1.3 Chapter 173-460 WAC, Controls for New Sources of Toxic Air Pollutants, and
1.4 40 CFR Part 60 Subpart IIII

All state and federal laws, statutes, and regulations cited in this approval shall be the versions that are current on the date the final approval order is signed and issued.

### 2. EMISSIONS

2.1 Operation of the twenty-four 2006 model year Caterpillar Model 3516C-TA diesel engines coupled to Caterpillar Model SR5 generators will result in the following potential emissions based on 70 hours of planned diagnostic testing and

215 hours of full standby operation per year. Emission factors for Criteria Pollutants are based upon emission rate guarantees by the manufacturer. The Toxic Air Pollutants (TAPs) are based on AP-42 emission rate factors.

| Table 2.1: Generator and Fire Pump Engines Potential to Emit | | |
|---|---|---|
| **Pollutant** | **Hourly Emissions** | **Annual Emissions** |
| **Criteria Pollutant (Caterpillar)** | (lbs/hr) | (tons/yr) |
| 2.1.1 Nitrogen Oxides ($NO_x$) | 648 | 89.4 |
| 2.1.2 Carbon Monoxide (CO) | 45 | 6.27 |
| 2.1.3 Sulfur Dioxide ($SO_2$) | 0.61 | 0.094 |
| 2.1.4 Particulate Matter ($PM_{10}$) | 12 | 1.71 |
| 2.1.5 Hydrocarbons (HC) | 30 | 4.18 |
| **Toxic Air Pollutants (AP-42)** | | |
| 2.1.6 Nitric Oxide (NO) | 402 | 55.41 |
| 2.1.7 Acrolein | 0.49 | 0.0068 |
| 2.1.8 Benzene | 0.46 | 0.064 |
| 2.1.9 Toluene | 0.17 | 0.023 |
| 2.1.10 Xylenes | 0.12 | 0.016 |
| 2.1.11 1,3 Butadiene | 0.01 | 0.006 |
| 2.1.12 Formaldehyde | 1.18 | 0.16 |
| 2.1.13 Acetaldehyde | 0.49 | 0.068 |
| 2.1.14 Benzo(a)Pyrene | 0.000077 | 0.000011 |

2.2 Cooling tower emissions are mass balance calculations based on the concentrations of toxic air pollutants in the City of Quincy municipal water supply and the worst case amount of bromine in the NALCO biocide.

**BACT**

As required by WAC 173-400-113, this project shall use Best Available Control Technology (BACT) to control criteria air contaminant emissions. BACT for the diesel electric generators and the cooling towers is as follows:

3.1 The use of EPA on-road Specification No. 2 distillate fuel oil with a sulfur content of 0.0015 weight percent or less.

3.2 The use of generator engines certified to EPA Tier II (40 CFR 89) emission standards for NOx, CO, and HC.

3.3 The use of mist eliminators on all the cooling tower units that will maintain the maximum drift rate to less than 0.001 percent of the circulating water rate, reducing criteria and toxic air pollutant emissions.

## 4. T-BACT

As required in WAC 173-460-040(4)(b), this project shall use Best Available Control

Technology for Toxics (T-BACT) to control toxic emissions. T-BACT for this project is the same as BACT.

## MODELING

Dispersion modeling was conducted by the applicant to evaluate near-source and distant impacts. The modeling evaluation did not result in any exceedances of either criteria or toxic ambient air quality standards.

6.1 The dispersion modeling was conducted using ISCST3 for criteria and toxic air pollutants from the twenty-four (24) diesel electric generators. Acrolein and nitric oxide were the only air pollutants that exceeded the acceptable source impact level (ASIL). A Tier II risk analysis was required by Ecology in correspondence dated January 11, 2007. MSN submitted information dated March 14, May 10, June 5 and 6, 2007, to complete the Tier II risk analysis. Ecology determined that alternative risk based exposure limits to nitric oxide and acrolein that were above the ASIL would be adequately protective of public health with a five foot exhaust stack extension on all the diesel electric generators to reduce acrolein to below the alternative risk based exposure limit. Exhaust stack extensions raising the engine genset stacks five feet higher than proposed in the application were also determined to reduce impacts of NO emissions. NO is expected to be removed from the list of compounds requiring review under WAC 173-460 in the on-going WAC 173-460 rule revision process (anticipated to be completed prior to significant operations at this facility).

The facility will have six banks of cooling tower units installed, two banks in each of the three buildings. Each bank of cooling towers will have eighteen (18) cooling units (total 108 cooling towers). Dispersion modeling was also conducted for the worst-case toxic air pollutant and $PM_{10}$ emission rates from the six sets of cooling towers. EPA model SCREEN3 ambient impacts were below the ASIL for toxic air pollutant and the National Ambient Air Quality Standards (NAAQS) for $PM_{10}$ emissions. No further dispersion modeling was conducted.

# Appendix A

## Ecology Response to Comments for Columbia Data Center

**Comment 1:**
I am commenting on the proposed expansion of Microsoft Columbia, Quincy, Washington. The proposal is to build out to a total of 40 2.5 MWe Emergency backup generators. The facility was permitted for 37 generators and Microsoft is proposing to add two generators to the 35 already installed and those additional engines have been permitted.

**Response to Comment 1:**
Microsoft is planning to add five new diesel emergency generators to the 35 currently installed at Columbia Data Center for a total of 40 diesel emergency generators. Columbia Data Center was permitted for 37 engines, however only 35 were installed. Due to the gap in time from when construction finished on the 35 engines (2010) and when these five new engines are proposed to be installed (2020), a review of Best Available Control Technology (BACT) was required for all five engines including the two previously permitted engines.

**Comment 2:**
In addition, Microsoft is proposing to add five generators not permitted in the initial air quality study done by the Department of Ecology. When Microsoft is adding an additional 5 generators, this must be a different permit. Microsoft wants to build-out on a permit that does not include those additional 5 generators. I protest this casual change in a permitting process that is done to protect the air quality in and around Quincy, WA. If Microsoft wants to add five generators, I believe they need to provide data on how these five generators add to the air quality, especially because Microsoft Columbia is right across the street from the Mountain View K-5 School.

**Response to Comment 2:**
Microsoft did provide emission calculations and a modeling assessment in their Notice of Construction application for the addition of the five new engines. Local background from Columbia and neighboring facilities and regional background for pollutants is included with the modeling. The National Ambient Air Quality Standards (NAAQS) were met at the property boundary to ensure protection of the public.

**Comment 3:**
The letter from Ecology discusses the changes to Microsoft emissions and commented the operational hours of existing generators will be reduced to allow the addition of the seven added generators. I believe that if Microsoft has that much flexibility in their operating hours, Microsoft should reduce their operating hours to protect the air quality in Quincy. Microsoft has also stated that "facility annual emissions will not increase, since the facility-wide fuel use will remain the same as previously permitted." I want to point out that the cold-start of these 5 engines significantly adds diesel particulate material to

the air. Those additional engines must do the monthly tests (cold start) and to pretend there are not additional emissions in the air is not an honest response to the public.

**Response to Comment 3:**
Microsoft proposed the addition of five engines to the 35 installed engines at the Columbia Data Center. Emission estimates from the five new engines including cold start emissions were calculated and used in determining the number of hours to reduce from the existing facility engines (NOC application, page 3-2, Tables 3, 4, and 5, and Appendix B). Microsoft does not start their engines at ambient temperature. Microsoft engines are equipped with block heaters that keep their engines at approximately 105 degrees Fahrenheit. This greatly reduced cold start emission to less than one minute. The Diesel Engine Exhaust Particulate (DEEP) annual limit for the facility was also decreased due to the reduction in hours of operation from all of the facility's existing 35 engines.

**Comment 4:**
When I read this notice about Microsoft Columbia expansion, I have some questions. I have been told the focus of Ecology in permitting data centers in Quincy is air quality. When I asked questions about the volume of water used in cooling towers, I have been told these data center permits only concern air quality, nothing else. This notice appears to consider diesel fuel use and from my attendance at permitting meetings, fuel use is not part of the permitting process. Since the volume of fuel has not been part of the permit in the past, the public has no way to know if Microsoft is using more or less fuel to operate these additional five generators. I believe the statement that these 5 engines will generate no additional emissions, because of no increase in fuel use, is not an honest statement

**Response to Comment 4:**
Air emissions from cooling towers are evaluated in air quality permits. Where water is sourced, how much is used, and any wastewater issues are handled by the Water Resources Program and the Water Quality Program within the Department of Ecology (Ecology) and these matters are subject to other types of regulations and permits. Fuel use limits have always been included in Columbia Data Center permits. The amount of fuel combusted in these engines is a very useful metric, much like hours of operation, that can be limited to ensure that the facility is operating as they proposed in their Notice of Construction application.

**Comment 5:**
I believe the addition of these five engines is flawed and Microsoft must provide the public data on the emissions from these engines before Ecology allows their instillation

**Response to Comment 5:**
As stated in response to Comment 2, Microsoft did provide in their Notice of Construction application emission calculations and a modeling assessment for the addition of these five engines and included local background from the existing facility and neighboring facilities in addition to regional background.

**Comment 6:**

First, the Columbia Data Center was never reviewed for PM2.5 condensables, cold starts or cooling tower emissions. Have these emissions been considered under the new permit? If not, why not? Was a new BACT determination using these emissions conducted to justify not using controls?
Also, what kind of emissions should the community expect when the substations are switched to?

**Response to Comment 6:**
Condensable Particulate Matter that was not considered in previous permitting efforts was calculated for the entire facility and modeled as local background for the five new generators. Best Available Control Technology (BACT) analysis was not performed for the existing facility engines in this current NOC application. A BACT analysis was performed for emissions from the five new engines. BACT was determined to be EPA Tier 2 emissions standards achieved with combustion controls and ultra-low sulfur diesel fuel, as was previously determined for all existing engines at the facility.
The proposed five engines and facility emissions are summarized in Tables 4 and 5 in the NOC application. The modeling assessment included in the NOC application provides a prediction of what kind of concentrations to expect from the combination of the current air quality background and the contributions from the 5 additional permitted engines.

**Comment 7:**
Second, what are the actual operating hours at the Columbia Data Center over the past two years? Please provide actual engine data to support the hours reported, not just the hand written year end report provided by Microsoft.

**Response to Comment 7:**
Microsoft reports their actual engine data annually. The electronically submitted data is used to evaluate compliance with permitted operational limits for that operating year. If you would like a copy of the submitted engine data, or any information not included in this permitting effort, you will need to submit a public records request.

**Comment 8:**
Third, is Ecology aware that Microsoft now owns the Vantage data center? If so, why hasn't the public been made aware?

**Response to Comment 8:**
Based on our current information we are not aware of any such changes in ownership of the Vantage data center.

**Comment 9:**
Fourth, it is my understanding that Microsoft will be tenant of Cyprus One. At what point do all the emissions from Microsoft get aggregated to declare them a major facility?

Ecology has the prerogative to regulate Microsoft under common control.
Why aren't they?

**Response to Comment 9**:
Cyrus One is not currently built and Ecology is not aware of Microsoft being a tenant of Cyrus One. The scope of a facility for purposes of a Notice of Construction approval permit is determined by applying the definition of "source" in RCW 70.94.030(22). *See MYTAPN v. Ecology*, PCHB No. 17-022, at 10-11 (July 19, 2018).

**Comment 10:**

Thank you. I would appreciate an extension of time to review the documents.

**Response to Comment 10:**
An extension the 30 day public comment period was not granted.

January 8, 2020

Comment on the Microsoft Columbia CO6 Expansion, Quincy, WA

I am commenting on the proposed expansion of Microsoft Columbia, Quincy, Washington. The proposal is to build out to a total of 40 2.5 MWe Emergency backup generators. The facility was permitted for 37 generators and Microsoft is proposing to add two generators to the 35 already installed and those additional engines have been permitted.

In addition, Microsoft is proposing to add five generators not permitted in the initial air quality study done by the Department of Ecology. When Microsoft is adding an additional 5 generators, this must be a different permit. Microsoft wants to build-out on a permit that does not include those additional 5 generators. I protest this casual change in a permitting process that is done to protect the air quality in and around Quincy, WA. If Microsoft wants to add five generators, I believe they need to provide data on how these five generators add to the air quality, especially because Microsoft Columbia is right across the street from the Mountain View K-5 School.

The letter from Ecology discusses the changes to Microsoft emissions and commented the operational hours of existing generators will be reduced to allow the addition of the seven added generators. I believe that if Microsoft has that much flexibility in their operating hours, Microsoft should reduce their operating hours to protect the air quality in Quincy. Microsoft has also stated that "facility annual emissions will not increase, since the facility-wide fuel use will remain the same as previously permitted." I want to point out that the cold-start of these 5 engines significantly adds diesel particulate material to the air. Those additional engines must do the monthly tests (cold start) and to pretend there are not additional emissions in the air is not an honest response to the public.

When I read this notice about Microsoft Columbia expansion, I have some questions. I have been told the focus of Ecology in permitting data centers in Quincy is air quality. When I asked questions about the volume of water used in cooling towers, I have been told these data center permits only concern air quality, nothing else This notice appears to consider diesel fuel use and from my attendance at permitting meetings, fuel use is not part of the permitting process. Since the volume of fuel has not been part of the permit in the past, the public has no way to know if Microsoft is using more or less fuel to operate these additional five generators. I believe the statement that these 5 engines will generate no additional emissions, because of no increase in fuel use, is not an honest statement

I believe the addition of these five engines is flawed and Microsoft must provide the public data on the emissions from these engines before Ecology allows their instillation.

Danna Dal Porto

-----Original Message-----
From: Patty Martin
Sent: Friday, January 10, 2020 4:59 PM
To: Johnson, Kari D. (ECY) <KAJO461@ECY.WA.GOV>
Subject: Re: Microsoft Columbia C06 expansion: Comment period begins today

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Please accept my comments and questions below.

First, the Columbia Data Center was never reviewed for PM2.5 condensables, cold starts or cooling tower emissions. Have these emissions been considered under the new permit? If not, why not? Was a new BACT determination using these emissions conducted to justify not using controls?

Also, what kind of emissions should the community expect when the substations are switched to?

Second, what are the actual operating hours at the Columbia Data Center over the past two years? Please provide actual engine data to support the hours reported, not just the hand written year end report provided by Microsoft.

Third, is Ecology aware that Microsoft now owns the Vantage data center? If so, why hasn't the public been made aware?

Fourth, it is my understanding that Microsoft will be tenant of Cyprus One. At what point do all the emissions from Microsoft get aggregated to declare them a major facility?

Ecology has the prerogative to regulate Microsoft under common control.
Why aren't they?

Thank you. I would appreciate an extension of time to review the documents.

Patty