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

September 16, 2020

John Sasser
Intergate-Quincy
Sabey Data Center Properties
2200 M Street NE
Quincy, WA 98848

Re: Sabey Data Center Properties – Intergate Quincy, Approval Order No. 20AQ-E022
AQPID Number: A0250302

Dear John Sasser:

The Department of Ecology's Air Quality Program has approved the installation of 32 new emergency engines at Sabey Data Center Properties – Intergate Quincy located at 2200 M Street NE, Quincy, Washington in Grant County.

Ecology's approval is based on the Notice of Construction application and supplemental information submitted on February 14, 2020 through May 15, 2020. The 30-day public comment period required per Washington Administrative Code (WAC) 173-400-171, was completed. Comments were received, and a response to comments is in Appendix A of the technical support document.

Enclosed is Coverage Order No. 20AQ-E022 for Sabey Data Center Properties – Intergate Quincy.

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-E022
Technical Support Document

Certified Mail: 7019 0140 0000 6496 3147

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF APPROVING A NEW)
AIR CONTAMINANT SOURCE FOR)
INTERGATE-QUINCY)
SABEY DATA CENTER PROPERTIES)

APPROVAL ORDER NO. 20AQ-E022

TO: John Sasser
Intergate-Quincy
Sabey Data Center Properties
2200 M Street NE
Quincy, WA 98848

EQUIPMENT

The list of equipment for this approval order includes 69 diesel engines used to power emergency electrical generators at the Sabey Data Center Properties Intergate-Quincy (Sabey). The sixty-nine 2.5 megawatt (MWe) or less generators will have a combined capacity of up to 142 MWe using a combination of Caterpillar, Cummins, Kohler and MTU engines. Provisions for the use of smaller engines supplied by these manufacturers are contained in Condition 2.g of this Approval Order.

Sabey's application provided Ecology with a combination of engine size ranges for the anticipated engines to be used, which will have ranges at or smaller than the following sizes:

Table 1: Emergency Engines Evaluated

Manufacturer	Model ID	Rated Capacity (MWe)
Caterpillar	C9	0.30
	3512C	1.5
	3516C	2.0 to 2.5
Cummins	DQDAC	0.30
	QSK50-G5 NR2	1.5
	QSK60-G14 NR2	2.0
	DQKAF	2.25
	DQKAN	2.5
MTU	12V4000G43	1.5
	16V4000G43	2.0
Kohler	KD2250	2.25
	KD2500	2.5

A list of equipment for this project is provided in Tables 1 and 2 below. Engine sizes listed in Tables 1 and 2 are in megawatt (MWe) units with the "e" indicating "electrical" based on generator power ratings listed on the engine specifications provided with the application.

Table 2: Emergency Engine & Generator Serial Numbers						
Building	Unit ID	Manufacturer & Model No.	Capacity MWe	Engine SN	Generator SN	Build Date
A	QABC	Caterpillar C9	0.2504	S9P00927	CAT000C9CNGP00380	2015
A	QA2-D	Caterpillar 3516C	2.0	SFJ00723	G7G01453	8/5/15
A	QA4-R	Caterpillar 3516C	2.0	SFJ00719	G1G01451	8/5/15
A	QA1-A	Caterpillar 3516C	2.0	SFJ00796	G7G01592	2/11/16
A	QA1-B	Caterpillar 3516C	2.0	SFJ00795	G7G01591	2/11/16
A	QA1-C	Caterpillar 3516C	2.0	SFJ00789	G7G01595	2/11/16
A	QA4-B	Caterpillar 3516C	2.0	SFJ00895	G7G01722	7/21/16
A	QA2-C	Caterpillar 3516C	2.0	AFJ00853	G7G00219	4/14/17
A	A09					
A	A10					
A	A11					
B	QBC	Caterpillar C9	0.30	S9P02055	CAT000C9KNTX00648	2019
B	QB1-A	Caterpillar 3516C	2.0	LY500238	G2D00234	5/4/2019
B	QB1-B	Caterpillar 3516C	2.0	LY500239	G2D00235	5/4/2019
B	QB1-R	Caterpillar 3516C	2.0	LY500240	G2D00237	4/26/2019
B	QB2-A	Caterpillar 3516C	2.0	LY500241	G2D00236	5/4/2019
B	QB2-B	Caterpillar 3516C	2.0	LY500242	G2D00239	5/5/2019
B	QB2-R	Caterpillar 3516C	2.0	LY500243	G2D00244	5/8/2019
B	QB3-C	Caterpillar 3516C	2.0	LY500244	G2D00243	5/8/2019
B	QB3-D	Caterpillar 3516C	2.0	LY500246	G2D00242	5/8/2019
B	QB3-E	Caterpillar 3516C	2.0	LY500247	G2D00240	5/10/2019
B	QB4-C	Caterpillar 3516C	2.0	LY500248	G2D00241	5/9/2019
B	QB4-D	Caterpillar 3516C	2.0	SBJ02146	G1Z00226	8/5/2017
B	QB4-E	Caterpillar 3516C	2.0	SBJ02147	G1Z00227	7/31/2017
C	IGQ	Caterpillar C9	0.22	S9C03885	G5A05022	2011
C	QC3-A	Caterpillar 3512C	1.5	EBG00972	G5Y00653	7/22/2011
C	QC3-B	Caterpillar 3512C	1.5	EBG00975	G5Y00652	7/22/2011
C	QC3-C	Caterpillar 3512C	1.5	EBG00973	G5Y00654	7/22/2011
C	QC1-A	Caterpillar 3516C	2.0	DD600363	G7F00178	11/24/2013
C	QC1-B	Caterpillar 3516C	2.0	DD600364	G7F00177	11/22/2013
C	QC4-A	Caterpillar 3512C	1.5	CT200132	G2N00529	3/5/2014
C	QC4-B	Caterpillar 3512C	1.5	CT200134	G2N00532	3/7/2014
C	QC4-C	Caterpillar 3512C	1.5	CT200133	G2N00531	3/5/2014
C	QC2-A	Caterpillar 3516C	2.0	DD600488	G7F00188	7/9/2014
C	QC2-B	Caterpillar 3516C	2.0	DD600490	G7F00187	7/9/2014
C	C11					
C	C12					
D	House					
D	D01					
D	D02					
D	D03					
D	D04					
D	D05					
D	D06					
D	D07					
D	D08					
D	D09					
D	D10					
D	D11					
D	D12					
D	D13*					
D	D14*					
D	D15*					

Table 2: Emergency Engine & Generator Serial Numbers						
Building	Unit ID	Manufacturer & Model No.	Capacity MWe	Engine SN	Generator SN	Build Date
D	D16*					
D	D17*					
D	D18*					
E	House					
E	E01					
E	E02					
E	E03					
E	E04					
E	E05					
E	E06					
E	E07					
E	E08					
E	E09					
E	E10					
E	E11					
E	E12					
E	E13*					
E	E14*					
E	E15*					
E	E16*					
E	E17*					
E	E18*					
*Total main gensets between Building D and E is 30. One building will have 18 main gensets and the other will have 12 main gensets. Total gensets (main + house) for all buildings is 69.						

This approval order also includes 148 Munters Model PV-W35-PVT and 120 Munters Oasis Standard with indirect evaporative cooling units (or equivalent) to dissipate heat from electronic equipment at the facility. Cooling unit information is provided in Table 3.

Table 3: Cooling Units		
# Fans per Cooling Unit	# Cooling Units per engine	Total # Cooling Units
Munters Model PV-W35-PVT Cooling Unts		
3	4	148
Munters Oasis Standard with indirect evaporative cooling units		
3	4	120

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 utilize best available control technology (BACT).

3. The proposed project, if constructed and operated as herein required, will utilize best available control technology for toxic air pollutants (tBACT).
4. In accordance with WAC 173-460-090, the applicant has submitted a second tier health risk analysis for DEEP and NO_2 ambient impacts. Ecology has concluded that this project has satisfied all requirements of a second tier analysis.

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 are met:

APPROVAL CONDITIONS

1. ADMINISTRATIVE CONDITION

a. Notice of Construction Approval Order No. 16AQ-E011 is rescinded and replaced entirely with this Approval Order.

b. Sabey will provide Quincy School District administrators with the telephone number for Sabey and a 24 hour contact number for a Sabey manager. Sabey will notify the school whenever (Ecology) approved changes occur in the maintenance testing schedule. As decided by the school administrators and Sabey, an ongoing relationship shall be established to facilitate future communications.

c. Sabey shall make available information on diesel engine exhaust health risks and emergency generator operations to existing residents and commercial and industrial facilities within 0.25 miles of Sabey property boundaries. Information on diesel exhaust health risks and emergency generator operations shall be provided to the City of Quincy Building and Planning Department for distribution to new homeowners and businesses that locate on undeveloped parcels within 0.25 miles of the Sabey property boundary. The health risk information may be, or should be similar to, Ecology Focus on Diesel Exhaust Health Risks dated February 2011, Publication Number 11-02-005. A copy of the materials to be used to comply with this condition shall be provided to Ecology for review, and distributed prior to starting Phase 1 operations.

2. EQUIPMENT RESTRICTIONS

a. Any engine used to power the electrical generators shall be operated in accordance with applicable 40 C.F.R. Part 60, Subpart IIII requirements including but not limited to: certification by the manufacturer to meet the 40 C.F.R. Part 89 EPA Tier 2 emissions levels as required by 40 C.F.R. 60.4202; and installed and operated as emergency engines, as defined in 40 C.F.R. 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 C.F.R. 1039.102 Table 7 and 40 C.F.R. 1039.101 Table 1, respectively), are not required for 1.5 to 2.5 MWe electrical generators used for emergency purposes as defined in 40 C.F.R. 60.4219 in attainment areas in Washington State. However, any engines installed at Sabey 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 engines and electrical generating units approved for operation at Sabey are those listed by serial number in Table 2 of this permit, which must have equal or less emissions than the engine/generator models specified in the equipment section of this permit.

c. Replacement of failed engines with identical engines (same manufacturer and model) requires notification prior to installation but will not require new source review unless there is an increase in emission rates or community impacts.

d. The installation of any new engines after December 30, 2021 will require notification to Ecology that includes engine manufacturer's specification sheets. Ecology will decide whether new source review is required based on various factors including whether the new engines will have either an increased emission rate or result in an emission concentration that may increase community impacts over those evaluated for this Approval Order, or if an update to the current BACT analysis is necessary.

e. All 69 engines shall be required to verify that exhaust stack parameters such as diameter, height listed in Table 4, and exhaust rate and velocity do not result in community emissions impacts greater than what was evaluated for this project.

Table 4: Engine Exhaust Stack Dimension Requirements

Building	Quantity	Engine Size	Minimum Stack Height (feet)	Maximum Stack Diameter (inches)
A, B, C	34	1.5 to 2.0 MWe	48’	16”
A, B, C	3	0.22 to 0.30 MWe	9.33’	4”
D, E	30	1.5 to 2.0 MWe	60’	18”
D, E	2	0.30 MWe	12’	6”

f. This Order only applies to the 69 engines, each with a rated full standby capacity of up to 2.5 MWe, which are consistent with the engines that were evaluated in the Notice of Construction application and second tier review. New source review will not be required for engines with a rated full standby capacity of less than or equal to 2.5 MWe that comply with the engine certification requirements contained in Conditions 2.a and 5 unless there is an increase in community emission impacts. On a case-by-case basis, Ecology may require additional ambient impacts analyses prior to installation of smaller engines.

g. In addition to meeting EPA Tier 2 or 3 (for 300 kW engines) certification requirements, the source must have written verification from the engine manufacturer that each engine of the same make, model, and rated capacity installed at the facility uses the same electronic Programmable System Parameters, i.e., configuration parameters, in the electronic engine control unit.

3. OPERATING LIMITATIONS

a. The fuel consumption at Sabey shall be limited to a total of 550,616 gallons per year 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 shall be averaged over a 12-month period using monthly rolling totals.

b. The 37 Sabey engines located in buildings A, B, and C are restricted to the annual limit of 57.5 hours per engine averaged over a 12-month period using monthly rolling totals and averaged over all generators in service.

c. The 32 Sabey engines located in buildings D and E are restricted to the annual limit of 55 hours per engine averaged over a 12-month period using monthly rolling totals and averaged over all generators in service.

d. A load bank will be used for electrical energy dissipation whenever prescheduled monthly maintenance testing, corrective testing, or annual load bank testing occurs above zero electrical load.

e. The 69 engines at Sabey require periodic scheduled operation. To mitigate engine emission impacts, Sabey will perform all engine testing during daylight hours. Engine testing may take place outside of these time restrictions upon coordination by Sabey with other data centers in northeast Quincy to minimize engine emissions impacts to the community. Sabey shall maintain records of the coordination communications with other data centers, and those communications shall be available for review by Ecology upon request.

f. All of the cooling units shall comply with the following conditions:

   i. Each individual cooling unit shall use a mist eliminator with a maximum drift rate of 0.001 percent of the circulating water flow rate. The drift rate shall be guaranteed by the unit manufacturer.

   ii. Chemicals containing hexavalent chromium cannot be used to pre-treat the cooling unit makeup water.

4. GENERAL TESTING AND MAINTENANCE REQUIREMENTS

a. Sabey will follow engine-manufacturer's recommended diagnostic testing and maintenance procedures to ensure that each engine (larger than 500 hp, 373 kW) will conform to Condition 5 emission limits and Tier 2 emission specifications as listed in 40 C.F.R. 89 throughout the life of each engine.

b. Sabey shall measure emissions of particulate matter (PM), volatile organic compounds (VOC), nitric oxide (NO), nitrogen dioxide (NO_2), and carbon monoxide (CO) from engine exhaust stacks in accordance with Approval Condition 4.c. This testing will serve to demonstrate compliance with the g/kW-hr EPA Tier 2 average emission limits contained in Section 5, and as an indicator of proper operation of the engines. The selection of the engines(s) to be tested shall be in accordance with Conditions 4.b.i, 4.b.ii and 4.b.iii and shall be defined in a source test protocol submitted to Ecology no less than 30 days in advance of any compliance-related stack sampling conducted by Sabey. Additional testing as described in 40 C.F.R. 60.8 (g) may be required by Ecology at their discretion.

   i. For new engines, at least one representative engine (greater than 500 hp, 373kW) from each manufacturer and each size engine from each manufacturer shall be tested as soon as possible after commissioning and before it becomes operational.

   ii. Every 60 months after the first testing performed in Condition 4.b.i, Sabey shall test at least one engine (greater than 500 hp, 373 kW) from each manufacturer and each size engine from each manufacturer, including the engine with the most operating hours as long as it is a different engine from that which was tested during the previous 60 month interval testing.

   iii. The testing protocol shall include the following information:

A. The location and unit ID of the equipment proposed to be tested.

B. The operating parameters to be monitored during the test.

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

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

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

c. The following procedure shall be used for each test for the engines as required by Condition 4.b unless an alternate method is proposed by Sabey and approved in writing by Ecology prior to the test.

i. Periodic emissions testing should be combined with other pre-scheduled maintenance testing and annual load bank engine testing.

ii. PM (filterable fraction only), VOC, NO, NO_2, and CO emissions measurement shall be conducted at five individual generator electrical loads of 100 percent 75 percent, 50 percent, 25 percent, and 10 percent using weighting factor averaging according to Table 2 of Appendix B to Subpart E of 40 C.F.R. Part 89.

iii. EPA Reference Methods and test procedures from 40 C.F.R. Part 60, 40 C.F.R. Part 51, and/or 40 C.F.R. Part 89 as appropriate for each pollutant shall be used including Method 5 or 40 C.F.R. Part 1065 for PM. A test plan will be submitted for Ecology approval at least 30 days before any testing is conducted and must include the criteria used to select the engine for testing, as well as any modifications to the standard test procedure contained in the above references.

iv. The F-factor method, as described in EPA Method 19, may be used to calculate exhaust flow rate through the exhaust stack. The fuel meter data, as measured according to Condition 4.e, shall be included in the test report, along with the emissions calculations.

v. In the event that any source test shows non-compliance with the emission limits in Condition 5, Sabey shall repair or replace the engine and repeat the test on the same engine plus two additional engines of the same make and model as the engine showing non-compliance. Test reports shall be submitted to Ecology as provided in Condition 9.e of this Order.

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

e. Each engine shall be connected to a properly installed and maintained fuel flow monitoring system (either certified physical or generator manufacturer provided software) that records the amount of fuel consumed by that engine during operation.

5. EMISSION LIMITS

a. Engines larger than 500 hp (373 kW) in this Order shall meet the emission rate limitations contained in Table 5. Unless otherwise approved by Ecology in writing, compliance with emission limits for those pollutants that are required to be tested under Conditions 4.b and 4.c shall be based on emissions test data as determined according to those approval conditions.

b. To demonstrate compliance with 40 C.F.R. 89.112 and 89.113 g/kW-hr EPA Tier 2 weighted average emission limits through stack testing, Sabey shall conduct exhaust stack testing as described in Conditions 4.b and 4.c according to Table 2 of Appendix B to Subpart E of 40 C.F.R. Part 89, or any other applicable EPA requirement in effect at the time the engines are installed.

Table 5: Emission Limits and Testing Requirements

Pollutant	Load Test	Test Method[a]	Emission Limits	Compliance Test Frequency
PM	Five-load weighted avg.	EPA Method 5 or 40 C.F.R. Part 1065	0.2 g/kW-hr	See Approval Conditions 4.b.i, 4.b.ii
NO_X + NMHC/VOC	Five-load weighted avg.	EPA Method 7E, or 40 C.F.R. Part 1065	6.4 g/kW-hr	
CO	Five-load weighted avg.	EPA Method 10, or 40 C.F.R. Part 1065	3.5 g/kW-hr	

(a) In lieu of these requirements, Sabey may propose an alternative test protocol to Ecology in writing for approval.

c. 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 6.

Table 6 Criteria Pollutant and Toxic Air Pollutant Emission Limits for Total Facility Sabey Intergate-Quincy Buildings A, B, C, D, and E (Tons/Year)

Pollutant	Annual Emissions
PM smaller than 10 microns in diameter (PM_{10})	5.92
PM smaller than 2.5 microns in diameter ($PM_{2.5}$)[a]	5.92
Carbon monoxide (CO)	18.13
Nitrogen oxides (NO_X)	94.88
Volatile organic compound (VOC)	4.12
Sulfur dioxide (SO_2)	0.20
Diesel Engine Exhaust Particulate (DEEP)*	2.12
DEEP from Buildings A, B, and C	0.408
DEEP from Buildings D and E	1.71
Nitrogen Dioxide (NO_2)**	9.49

* 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.

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

6. OPERATION AND MAINTENANCE (O&M) MANUALS

A site-specific O&M manual for Sabey equipment shall be developed and followed. Manufacturer’s operating instructions and design specifications for the engines, generators, and associated equipment shall be included in the manual. The O&M manual shall include the manufacturer’s recommended protocols for extended low-load operation. The O&M manual shall 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 Tier 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

Electronic Annual Report Submittals: emissions.inventory@ecy.wa.gov

OR AS DIRECTED

8. RECORDKEEPING

All records, O&M 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 except as required for stack testing in Condition 4. Any records required to be kept under the provisions of this Order shall be provided within 30 days to Ecology upon request. The following records are required to be collected and maintained.

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

b. Monthly and annual fuel usage.

c. Monthly and annual hours of operation for each diesel engine. The cumulative hours of operation for each engine shall be maintained for the life of the engine while at Sabey, and shall include which engines have been stack tested, and the report information from Condition 9.e.

d. Purpose, electrical load and duration of runtime for each diesel engine period of operation.

e. Annual gross power generated by each independent building quadrant at the facility, and total annual gross power for the facility.

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

g. Any recordkeeping required by 40 C.F.R. Part 60 Subpart IIII.

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

9. REPORTING

a. The serial number, manufacturer make and model, standby capacity, and date of manufacture shall be submitted to Ecology prior to installation for each engine and generator.

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

   i. Monthly and 12-month rolling annual total summary of fuel usage compared to Condition 3.a.

   ii. Monthly and 12-month rolling annual total summary of the air contaminant emissions for pollutants above the WAC 173-400-110(5) and WAC 173-460-150 de minimis levels.

   iii. Monthly and 12-month rolling hours of operation with annual rolling total.

   iv. Monthly and 12-month rolling gross power generation with annual total as specified in Condition 8.d.

   v. A listing of each start-up of each diesel engine that shows the purpose, fuel usage, and duration of each period of operation.

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 by each tenant of the action taken 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.

d. Sabey shall notify Ecology by e-mail or in writing within 24 hours of any engine operation of greater than 60 minutes if such engine operation occurs as the result of a power outage or other unscheduled operation. This notification does not alleviate Sabey from annual reporting of operations contained in any section of Condition 9.

e. Stack test reports of any engine shall be submitted to Ecology within 45 days of completion of the test and shall include, at a minimum, the following information:

   i. Location, unit ID, manufacturer and model number of the engine(s) tested, including the location of the sample ports.

   ii. A summary of test methods, results (reported in units and averaging periods consistent with the applicable emission standard or limit), field and analytical laboratory data, quality assurance/quality control procedures and documentation.

   iii. A summary of operating parameters for the diesel engines being tested.

   iv. Engine electronic operational data during testing.

   v. Copies of field data and example calculations.

   vi. Chain of custody information.

   vii. Calibration documentation.

   viii. Discussion of any abnormalities associated with the results.

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

10. GENERAL CONDITIONS

a. **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.

b. **Availability of Order:** Legible copies of this Order and the O&M manual(s) shall be available to employees in direct operation of the equipment described in the NOC application and shall be available for review upon request by Ecology.

c. **Equipment Operation:** Operation of the facility 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(s), unless otherwise approved in writing by Ecology.

d. **Commencing/Discontinuing Construction and/or Operations:** This Approval Order shall become invalid if construction of the equipment described in the application and this Approval Order is not commenced within 18 months after receipt of this Approval Order. If construction of operation of a portion or all of the equipment described in the application and this Approval Order 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 request by the Permittee and a satisfactory showing that an extension is justified.

e. **Modifications:** Any modification to the generators or engines 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.

All plans, specifications, and other information submitted to 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, is held invalid, the application of such provision to other circumstances, and the remainder 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 Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel RD SW, STE 301 Tumwater, WA 98501	**Pollution Control Hearings Board** PO Box 40903 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 16th day of September 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:	**Sabey Data Center Properties – Intergate Quincy**
Source Location:	**2200 M Street NE, Quincy, WA 98848**
County:	**Grant**
Approval Order No.:	**20AQ-E022**
Permit Reviewer:	**Jenny Filipy**

Background and Description for 20AQ-E022

On February 14, 2020, Ecology received a Notice of Construction application from Sabey Data Center Properties, requesting an expansion of the Intergate-Quincy – Buildings D and E. The expansion would include thirty 2.25 to 2.5 MWe emergency backup generator engines, two 0.30 MWe emergency backup generator engines and 120 indirect evaporative cooling units. Initial review the application was considered incomplete. The application was considered complete on April 13, 2020. A Second Tier review and Health Impact Analysis was provided for this project for DEEP and NO_2. A 30 day public comment period was conducted from June 3 through July 10, 2020. SEPA review conducted by the City of Quincy was complete on July 1, 2019. A response to comments received during the public comment period are in Appendix B of this TSD.

Emission Units and Pollution Control Equipment

Emergency Generator Engines and Cooling Equipment Sabey Building A, B, C, D and E					
Buildings	Quantity	Engines	Model	Engine Control	Cooling Equipment
Buildings A, B, and C	23	2.0 MWe	Caterpillar 3516C	All engines will meet EPA Tier 2 standards. The 0.30 and 0.25 MWe engines will also meet Tier 3 standards	148 Munters Model PV-W35-PVT cooling units with 0.001% drift eliminators
	6	1.5 MWe	Caterpillar 3512C		
	5	≤ 2.0 MWe planned (models may include Caterpillar, Cummins and MTU)	Cummins QSK60-G14		
			Cummins QSK50-G5		
			MTU 16V400G43		
			MTU 12V4000G43		
	3	0.25 or 0.30 MWe	Caterpillar C9		
Buildings D and E	30	2.25 or 2.5 MWe	Caterpillar 3516C		120 Munters Oasis Std. indirect evaporative cooling units with 0.001% drift eleminators
			Kohler KD2250		
			Kohler KD2500		
			Cummins DQKAF		
			Cummins DQKAN		
	2	0.30 MWe	Caterpillar C9		
			Cummins DQDAC		

Existing Approval Orders

Approval Order No.: 16AQ-E011 –See pages 8-34 for technical support document for equipment in Buildings A, B, and C.

Enforcement Issue(s)

There are no enforcement actions for this site.

Recommendation

Staff recommends that the operation of the Sabey Data Center Intergate-Quincy Buildings A, B, C, D, and E be approved. This recommendation is based on the following facts and conditions: Information used in this review was derived from the application received 2/14/2020 and additional information received on 4/13/2020. Hours of engine operation in the permit were based on modeling inputs.

Emission Calculations

Annual emissions limits are shown below. All pollutants except DEEP, were calculated based on worst case load emissions for all engines and are on a 12-month rolling average. Previous annual limits were based on an average yearly load and then averaged over three years. Modeling for engines in Buildings A, B, and C evaluated triple the annual average load emissions for all pollutants except DEEP. Emission limits for DEEP are calculated based on the average load emissions for Buildings A, B and C and the worst case emissions for Buildings D and E.

Criteria Pollutant and Toxic Air Pollutant Emission Limits for Total Facility Sabey Intergate-Quincy Buildings A, B, C, D, and E (Tons/Year)	
Pollutant	**Annual Emissions**
PM smaller than 10 microns in diameter (PM_{10})	5.92
PM smaller than 2.5 microns in diameter ($PM_{2.5}$)[(a)]	5.92
Carbon monoxide (CO)	18.13
Nitrogen oxides (NO_X)	94.88
Volatile organic compound (VOC)	4.12
Sulfur dioxide (SO_2)	0.20
Diesel Engine Exhaust Particulate (DEEP)*	2.12
DEEP from Buildings A, B, and C	0.408
DEEP from Buildings D and E	1.71
Nitrogen Dioxide (NO_2)**	9.49
* 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.	

Toxic Air Pollutants Potential To Emit for Total Facility Sabey Buildings A, B, C, D, and E (Tons/Year)	
Pollutant	**Annual Emissions**
Acenaphthene	1.75E-04
Acenaphthylene	3.46E-04
Acetaldehyde	1.26E-04
Acrolein	3.32E-04
Anthracene	4.67E-05
Benzene	0.03
Benzo(a)anthracene	2.39E-05
Benzo(a)pyrene	9.66E-06
Benzo(b)fluoranthene	4.14E-05
Benzo(g,h,l)perylene	2.09E-05
Benzo(k)fluoranthene	8.20E-06
1,3-Butadiene	1.63E-05
Carbon Monoxide	18.13
Chrysene	5.72E-05
Diesel Engine Exhaust Particulate[a]	2.12
Dibenz(a,h)anthracene	1.31E-05
Fluoranthene	1.53E-04
Fluorene	4.90E-04
Formaldehyde	3.43E-03
Indeno(1,2,3-cd)pyrene	1.56E-05
Naphthalene	4.88E-03
Nitrogen Dioxide	9.49
Phenanthrene	1.53E-03
Propylene	1.15E-02
Pyrene	1.40E-04
Sulfur Dioxide	0.20
Toluene	1.07E-02
Xylenes	7.32E-03

[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.

Potential emissions are above the exemption limits in WAC 173-400-110(5) of 2.0 tpy NOx; 5.0 tpy CO; 2.0 tpy VOC; 1.25 tpy PM; 0.75 tpy PM_{10}; and 0.5 tpy $PM_{2.5}$, 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 either Cummins, Caterpillar, MTU or Kohler engines. Engines were limited to 55 hours per year on a 12-month average. All indirect evaporative coolers were assumed to operate 8760 hours per year.

County Attainment Status

Pollutant	Status
PM_{10}	attainment
SO_2	attainment
NO_2	attainment
Ozone	attainment
CO	attainment
Lead	attainment

Part 70 Permit Determination

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

(1) A single criteria pollutant is less than 100 tons per year.
(2) A single hazardous air pollutant (HAP) is less than 10 tons per year.
(3) Any combination of HAPs is less than 25 tons per year.

Federal Rule Applicability

(1) New Source Performance Standard (NSPS) 40 C.F.R. 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 C.F.R. 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 C.F.R. 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.

Estimated Project and Background Impacts Compared to NAAQS						
Pollutant	NAAQS Primary/ Secondary	WA State Stds	Modeled Scenario	Modeled Impacts (µg/m^3)	Background (µg/m^3) Reg[b]. + Local[a]	Total Impact (µg/m^3)
Carbon Monoxide (CO) 8-hour average 1-hour average	10,000 / -- 40,000 / --	10,000 40,000	Unplanned power outage	997 [c] 1,426 [c]	927 1,317	1,925 2,743
Sulfur Dioxide (SO_2) 3-hour average 1-hour average	--/ 1,310 200	1,310 200	Unplanned power outage	75.6 [c] 94.5 [c]	14.1 7.6	89.7 102
Particulate Matter (PM_{10}) 24-hour average	150	150	Unplanned power outage	69.3 [d]	77.6	146.9
Particulate Matter ($PM_{2.5}$) Annual average 24-hour average	12 / 15 35	12 35	Max Year Monte Carlo	0.1 [e] 5.71 [f]	5.8 18.9	5.9 24.61
Nitrogen Oxides (NOx) Annual average 1-hour average	100 188 / --	100	Max Year Monte Carlo	1.7 [e] 118 [g]	6.6 68	8.3 186

Notes:

[a] local background sources combined with regional background for NO_2 was by Ecology.
[b] Regional background level obtained from Ecology's Air Monitoring Network website (IDEQ, WADOE and ODEQ)
[c] Reported values represent the 2[nd] –highest modeled impacts.
[d] Reported values represent the 6[th] – highest modeled impacts.
[e] It was assumed that all engines for this project operated at the 55 hour per engine per year limit.
[f] Reported value is based on the Monte Carlo assessment for $PM_{2.5}$, 24-hour average.
[g] Reported value is based on the Monte Carlo assessment for NO_2.

Stack Parameters

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

Engine Exhaust Stack Dimension Requirements				
Building	**Quantity**	**Engine Size**	**Minimum Stack Height (feet)**	**Maximum Stack Diameter (inches)**
A, B, C	34	1.5 to 2.0 MWe	48'	16"
A, B, C	3	0.22 to 0.30 MWe	9.33'	4"
D, E	30	1.5 to 2.0 MWe	60'	18"
D, E	2	0.30 MWe	12'	6"

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 Sabey Data Center Properties Intergate-Quincy. 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 C.F.R. Part 60 Subpart IIII for Stationary Compression Ignition Internal Combustion Engines and National Emission Standards for Hazardous Air Pollutants (NESHAPs) 40 C.F.R. 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:

Best Available Control Technology (BACT) Determinations	
Pollutant(s)	**BACT Determination**
PM, CO, and VOCs	Use of EPA Tier 2 certified engines (1.5 to 2.5 MWe) installed and operated as emergency engines, as defined in 40 C.F.R. Section 60.4219. Use of EPA Tier 3 certified engines (0.25 to 0.30 MWe) installed and operated as emergency engines, as defined in 40 C.F.R. Section 60.4219. Compliance with the operation and maintenance restrictions of 40 C.F.R. Part 60, Subpart IIII. Use of high-efficiency drift eliminators which achieve a liquid droplet drift rate of no more than 0.001 percent of the recirculation flow rate within each indirect evaporative cooling unit.
NO_X	Use of EPA Tier 2 certified engines (1.5 to 2.5 MWe) installed and operated as emergency engines, as defined in 40 C.F.R. Section 60.4219. Use of EPA Tier 3 certified engines (0.25 to 0.30 MWe) installed and operated as emergency engines, as defined in 40 C.F.R. Section 60.4219. Satisfy the written verification requirements of Approval Condition 2.e. 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.) BACT and tBACT emission limitation is EPA's Tier 2 standards. Sabey evaluated, as a part of BACT and tBACT cost analysis, the generators with a selective catalytic reduction (SCR) and catalyzed diesel particulate filter (DPF) controls to meet EPA Tier 4 emission standards. The cost effectiveness (as dollars per ton of pollutant removed) of installing the Tier 4 integrated control package for control of NOx ($22,229) $PM_{10}/PM_{2.5}$ ($738,303), CO ($99,145), VOCs ($1.5 million), combined criteria air pollutants ($17,517), and combined toxic air pollutants ($62,543). 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.

(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:

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.

<u>Conclusion</u>

Ecology has determined the applicant, Sabey Data Center Properties – Intergate Quincy, has satisfied all of the requirements of New Source Review for its proposal to expand the Sabey Data Center by thirty 2.25 MWe or 2.5 MWe emergency backup generators, two 0.30 MWe emergency backup generators and 120 indirect evaporative cooling units in Quincy, Washington. The operation of this facility shall be subject to the conditions of the attached proposed Approval Order No. 20AQ-E022.

Appendix A: Please see pages 8 -33 for the Technical Support Document that covered the Sabey's Notice of Construction Approval Order 16AQ-E011

TECHNICAL SUPPORT DOCUMENT
FOR APPROVAL ORDER No. 16AQ-E011
SABEY INTERGATE QUINCY, DATA CENTER
APRIL 20, 2016

1. PROJECT DESCRIPTION

On October 7, 2014, the Washington State Department of Ecology (Ecology) received a Notice of Construction (NOC) application submittal from the Sabey Intergate Quincy, LLC., Intergate-Quincy Data Center (Sabey) located at 2200 M Street NE, Quincy, Washington. Sabey is requesting approval for revisions to the August 26, 2011 Approval Order No. 11AQ-E424 (previous permit). The NOC application was determined to be incomplete and, on December 5, 2014, Ecology issued an incompleteness letter to Sabey. On March 5, 2015, Sabey provided a revised NOC application (Sabey's application) and a revised Second Tier Risk Analysis to Ecology. Sabey provided Ecology with supplemental information on March 12, April 1, April 2, May 6, May 22, and June 5, 2015. Sabey's application and Second Tier Risk Analysis were considered completed on June 23, 2015. Ecology has concluded that this project has satisfied all requirements of a second tier analysis.

The primary air contaminant sources at the facility consist of 44 electric generators powered by diesel engines to provide emergency backup power to the facility. Sabey data center space will be leased to independent tenants companies that require fully supported data storage and processing space. The project will be phased in over several years depending on customer demand. The phased project will include construction of 3 buildings, i.e., Phase 1, Phase 2, and Phase 3. Phase 1 construction of approximately 135,257 square feet (ft^2) Building C began under the previous permit, and houses ten of twelve planned electric generators with up to 2.0 Megawatts (MWe) capacity per engine. Phases 2 and 3 will include two additional buildings (Buildings A and B) each with approximately 186,660 ft^2 of space, and will each house sixteen electric generators of up to 2.0 Megawatts (MWe) per engine. Upon final build-out of all three Phases, Sabey will consists of 44 electric generators with a total capacity of up to approximately 88 MWe using a combination of Caterpillar, Cummins, and MTU engines with up to 2.0 MWe capacity per engine.

Sabey will also include 176 Munters Model PV-W35-PVT cooling units or equivalents to dissipate heat from electronic equipment at the facility. The cooling units are a source of particulate matter. Each of the units has a design recirculation rate of 80 gallons per minute (gpm) and an air flow rate of 21,000 cubic feet per minute (cfm).

Cooling system particulate matter emissions were calculated based on design and operating parameters for 176 Munters Model PV-W35-PVT. The cooling tower emissions contained in Table 1 has been overestimated by a factor of three times based on actual water usage calculations by the manufacturer.

1.1 Potential To Emit For Criteria Pollutants And Toxic Air Pollutants (TAPs)

Table 1 contains potential-to-emit (PTE) estimates for the diesel engines and cooling system pollutants at Sabey.

Table 1. Potential To Emit For Diesel Engine and Cooling Tower Emissions

Pollutant	**Emission Factor**	**Facility Potential to Emit**	**References**
Criteria Pollutants	**Units = lbs/hr (except where noted)**	**(TPY)**	**(a)**
NOx Total	18.9	23.9	Average of loads
NOx 100% load	41.9	na	(b)
NOx 75% load	22.5	na	(b)
NOx 50% load	15.3	na	(b)
NOx 25% load	9.4	na	(b)
NOx 10% load	6.49	na	(b)
VOC Total	1.0	1.32	Average of loads
VOC 100% load	0.91	na	(b)
VOC 75% load	1.11	na	(b)
VOC 50% load	1.13	na	(b)
VOC 25% load	0.95	na	(b)
VOC 10% load	1.0	na	(b)
CO Total	9.4	13.0	Average of loads
CO 100% load	16.9	na	(b)
CO 75% load	12.7	na	(b)
CO 50% load	8.75	na	(b)
CO 25% load	4.8	na	(b)
CO 10% load	4.05	na	(b)
Total PM10/PM2.5	[See PM2.5 (Engines), DEEP and cooling tower emissions]		
Total PM2.5 (Engines: DEEP + VOC)	DEEP + VOC	1.73	Average of loads, (f)
SO_2	15 ppm	0.028	(c)
Lead	NA	Negligible	(d)
Ozone	NA	NA	(e)
Toxic Air Pollutants (TAPS)	**Units = Lbs/MMbtu (except where noted)**		(a)
Primary NO_2	10% total NOx	2.39	See NOx
Diesel Engine Exhaust Particulate (DEEP) Total	0.35 lb/hr	0.408	Average of loads
DEEP 100% load	0.23 lb/hr	na	(b)
DEEP 75% load	0.22 lb/hr	na	(b)
DEEP 50% load	0.27 lb/hr	na	(b)
DEEP 25% load	0.57 lb/hr	na	(b)
DEEP 10% load	0.45 lb/hr	na	(b)

CO	16.9 lb/hr	13	See CO
SO_2	15 ppm	0.028	(c)
Propylene	2.79E-03	4.2E-02	(g)
Acrolein	7.88E-06	1.9E-04	(g)
Benzene	7.76E-04	1.9E-02	(g)
Toluene	2.81E-04	5.08E-03	(g)
Xylenes	1.93E-04	3.49E-03	(g)
Napthalene	1.30E-04	3.1E-03	(g)
1,3 Butadiene	1.96E-05	4.7E-04	(g)
Formaldehyde	7.89E-05	1.43E-03	(g)
Acetaldehyde	2.52E-05	4.55E-04	(g)
Benzo(a)Pyrene	2.57E-07	2.32E-06	(g)
Benzo(a)anthracene	6.22E-07	1.12E-05	(g)
Chrysene	1.53E-06	2.76E-05	(g)
Benzo(b)fluoranthene	1.11E-06	2.01E-05	(g)
Benzo(k)fluoranthene	2.18E-07	1.97E-06	(g)
Dibenz(a,h)anthracene	3.46E-07	3.13E-06	(g)
Ideno(1,2,3-cd)pyrene	4.14E-07	3.74E-06	(g)
Cooling Tower Emissions			
PM10/PM2.5	7,500 mg/liter water concentration	2.32	(h)

(a) The current list of EPA criteria pollutants (https://www.epa.gov/criteria-air-pollutants)); last updated March 4, 2016) that have related National Ambient Air Quality Standards (NAAQS) (https://www.epa.gov/criteria-air-pollutants/naaqs); last updated February 29, 2016). VOC is not a criteria pollutant but is included here per note (e). Toxic Air Pollutants (TAPs) are defined as those in WAC 173-460. Greenhouse gas is not a criteria pollutant or a TAP and is exempt from New Source Review requirements for non Prevention of Significant Deterioration projects such as at Sabey Data Center per WAC 173-400-110(5)(b).

(b) Emission factors (EFs) based on Caterpillar not-to-exceed (NTE) data and Tier 2 EFs, whichever is higher. For example, the NOx and PM maximum limits are based on Caterpillar NTE data of 41.9 lb/hr (100% load) and 0.57 lb/hr (25% load) respectively. Whereas the CO maximum limit is based on Tier 2 emission factors because they are higher than Caterpillar NTE data for CO. For CO, outage and combined test loads are at 100% load of 2190kWm. The maximum limit of 16.9 lb/hr is calculated as follows: 2190 kWm x 3.5 g/kWm-hr x (1 lb/453.6 g).

(c) Applicants estimated emissions based on fuel sulfur mass balance assuming 0.00150 weight percent sulfur fuel.

(d) EPA's AP-42 document does not provide an emission factor for lead emissions from diesel-powered engines. Lead emissions are presumed to be negligible.

(e) Ozone is not emitted directly into the air, but is created when its two primary components, volatile organic compounds (VOC) and oxides of nitrogen (NOx), combine in the presence of sunlight. *Final Ozone NAAQS Regulatory Impact Analysis EPA-452/R-08-003*, March 2008, Chapter 2.1. http://www.epa.gov/ttnecas1/regdata/RIAs/452_R_08_003.pdf

(f) For this project, all VOC emissions, including were assumed to be condensable particulate.

(g) EPA AP-42 § 3.3 or 3.4 from: Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors http://www.epa.gov/ttn/chief/ap42/.

(h) Based on manufacturer (Munters) cooling unit maximum recirculation rate.

1.2 Maximum Operation Scenarios

Sabey's operation assumptions for their permit revision requests as presented in their application are listed table 2 below along with Ecology comments:

Table 2. Sabey Application Revision Requests

Sabey Application Assumptions/Requests	Ecology Comments
Short-term Emissions: • Short-term emission rate estimates for particulate matter (PM) and diesel engine exhaust particulate matter (DEEP) are now based on maximum emission rates (from the worst-case condition for DEEP emission under 25 percent load). This is the load at which Caterpillar's data indicate mass emission rates for PM are highest. AERMOD modeling for the 24-hour PM10 NAAQS is based on the following assumptions: The data center will experience two 8-hour power outages each year. During each 8-hour power outage the 44 primary generators and the 3 building safety generators will activate at the worst-case operating load of 25%. This scenario includes use of cold-start adjustments and conservative assumption that all hydrocarbons are condensable particulate. The modeling for the 98th-percentile 24-hour PM2.5 NAAQS was based on the following assumptions: The 4 highest days of emissions each year are anticipated to result from a full-building electrical bypass event, two days of unplanned outages, and one day of full-building generator commissioning. The operating event that would cause the 8th-highest emission rate is expected to be "corrective testing" of one generator at a time at 25% load, presumed to occur for up to 12 hours per day. This scenario includes use of cold-start adjustments and conservative assumption that all hydrocarbons are condensable particulate. • Short-term emission rate estimates for nitrogen oxides (NOx), carbon monoxide (CO), and AP-42 (EPA 1995) gaseous toxic air pollutants (TAPs) are based on the assumption that the generators always run at the operating load that would emit the maximum amount for these pollutants, which is 100 percent load for NOx and CO, according to emission rates reported by Caterpillar.	(a), (e)
Annual Average Emissions: The annual-average emission rate estimates for PM, DEEP, NOx, CO, VOCs, and TAPs are based on 57.5 operating hours per year with an emission rate derived by averaging those rates reported by Caterpillar for 10 percent, 25 percent, 50 percent, 75 percent, and 100 percent loads. All permitted emissions allowed during a 3-year rolling average period were conservatively assumed to occur in a single 12-month period (as a "maximum theoretical annual emission" rate) to evaluate compliance with all annual National Ambient Air Quality Standards (NAAQS) and the annual Acceptable Source Impact Levels (ASILs). The 70-year average emission rate for DEEP, which is used to evaluate the 70-year DEEP cancer risk, was revised upward to include the initial emissions from generator commissioning and the emissions from periodic stack emission testing.	(a)
Power Outages and AERMOD Dispersion Factors: • Short-term dispersion factors (for averaging periods of 24 hours, 8 hours, or 1 hour) were derived from AERMOD, with all generators operating at only 25 percent load (the load at which the PM emission rate is highest). The annual-average dispersion factor was derived for a runtime scenario of all generators operating under random, variable load (between 10 and 100 percent), over the course of the entire year. ➢ AERMOD modeling for the 24-hour PM10 NAAQS is based on: (see short-term emission assumptions above).The modeling for the 98th-percentile 24-hour PM2.5 NAAQS was based on: (see short-term emission assumptions above). ➢ The 1st-highest 1-hour NO_2 concentrations during a full power outage were modeled to assess compliance with the ASIL. Because a power outage could occur at any time on any day, all 44 new generators were modeled at their assigned loads continuously, for 24 hours per day and 365 days per year for the five years of meteorology used in the analysis. The AERMOD/PVMRM was set to indicate the 1st-highest 1-hour value for each separate modeling year. See also NO2 Limits Remain Unchanged and NO2 Modeling and Ambient Impacts in this table.	(a)

➢ For purposes of the statistical "Monte Carlo" analysis used to demonstrate compliance with the 1-hour NO_2 NAAQS it was assumed there would be power outages lasting at least one hour on 4 days per year. See also NO2 Limits Remain Unchanged and NO2 Modeling and Ambient Impacts in this table.	
Cold Start Factors: The short-term and annual emission rates have been updated to account for the "black puff factors" applied to the first 15 minutes during each cold start. Those "black puff factors" were derived from the recent air quality permit application for the Microsoft Project Oxford Data Center (Landau Associates 2014) and correspond to 1.26 for PM and VOC emissions and 1.56 for CO emissions.	(b)
NO2 Limits Remain Unchanged: Sabey will continue to comply with a 1-hour NO2 limit of 990 lbs/hour as was required in the previous permit. This limit was developed by assuming that there would be 44 generators, each 2,000 kWe, operating at 75 percent load. Sabey believes there is a negligible potential for the actual emission rate to approach that limit because they have already installed six generators in Building C that are smaller and lower-emitting (1,500 kWe) than the permitted 2,000-kWe generators. Sabey's electrical systems are designed so most of the generators will operate at loads less than 75 percent during an outage. As an additional margin of safety, Sabey's stack emission testing to date has shown the actual NOx emission rates at high load have been much lower than the allowable limit of 41.9 lbs/hour. Therefore, Sabey believes that after full build-out of the data center, the actual NOx emissions will be lower than the 990 lbs/hour limit. Sabey proposed to revise the Approval Order to require keeping records of the calculated actual NOx emission rate during each unplanned outage or scheduled electrical bypass event, to demonstrate compliance with the 990 lbs/hour limit and make it an enforceable limit.	(a), (c)
NO2 Modeling and Ambient Impacts: The 1-hour NO2 impacts during a power outage (for comparison to the ASIL), and the 98th-percentile 1-hour NO2 impacts (for comparison to the NAAQS) were not remodeled. • NO2, as a TAP exceeds the ASIL and is addressed in Sections 5.3 and 6 of this TSD. • Sabey's 2011 Monte Carlo modeling demonstrated compliance with the 98th-percentile NO2 NAAQS with a safety margin. Sabey proposes that by retaining the current operational limits (runtime and load limits) for the most frequent scheduled routine activities (monthly testing and annual load bank testing) that comprise the typical 8th-highest daily NOx emission events each year, will ensure continued compliance with the NAAQS (using the 990 lb/yr limit).	(d)

(a) Ecology accepts this approach. The most recent 3-year average annual hours of operation per engine for planned and unplanned outages (2013 = 1.6 hr/yr/engine; 2014 = 2.0 hr/yr/engine; 2015 = 4.6 hr/yr/engine) was significantly less than the 57.5 hours per year per engine of total runtime allowed by the permit.
(b) Ecology accepts the cold start black puff factors derived from the Microsoft Project Oxford Data Center.
(c) See footnote (b) of section 5.3 of this TSD.
(d) See background information about the 2011 Monte Carlo modeling in Section 5.2 of this TSD.
(e) Page 7 of the Sabey application states that VOC max hourly lb/hr emissions are at 100% load. However, table E-1 of application shows highest VOC hourly lb/hr emissions at 50% load. Sabey used the high emission load (50%) for short term emissions and the average emissions load for annual emission estimates.

The summary effect of accepting the requests based on the scenarios above is that Sabey has conservatively estimated emissions by assuming the following worst case conditions:

- Instead of load-based emission estimates, Sabey conservatively over-estimated short-term emissions at the load that causes the highest emissions, when in reality, the facility will operate engines at a range of loads and not solely at the load with highest emissions.
- Sabey assumed a worst case scenario in which 351,670 gallons of fuel would be used per year, when in reality, the permit limits fuel usage to 263,725 gallons per year.
- The new permit emission estimates assume the worst-case scenario that the three-year rolling average permitted emission limits are released entirely within a single year. In reality, this is unlikely, because it would prohibit Sabey from operating those generators for two years within that three-year timeframe.

2. APPLICABLE REQUIREMENTS

The proposal by Sabey 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 Sabey Data Center is regulated by the requirements specified in:

- Chapter 70.94 Revised Code of Washington (RCW), Washington Clean Air Act.
- Chapter 173-400 Washington Administrative Code (WAC), General Regulations for Air Pollution Sources.
- Chapter 173-460 WAC, Controls for New Sources of Toxic Air Pollutants.
- 40 CFR Part 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ* (* See section 2.2).

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.

2.1 Support for permit Approval Condition 2.1 regarding applicability of 40CFR Part 60 Subpart IIII:

As noted in the applicability section of 40CFR1039 (part 1039.1.c), that regulation applies to non-road compression ignition (diesel) engines and; *(c) The definition of nonroad engine in 40 CFR 1068.30 excludes certain engines used in stationary applications.* According to the definition in 40CFR1068.30(2)(ii): *An internal combustion engine is not a nonroad engine if it meets any of the following criteria: The engine is regulated under 40 CFR part 60, (or otherwise regulated by a federal New Source Performance Standard promulgated under section 111 of the Clean Air Act (42 U.S.C. 7411)).* Because the engines at Sabey are regulated under 40CFR60 subpart IIII (per 40CFR60.4200), they are not subject to 40CFR1039 requirements except as specifically required within 40CFR60.

Some emergency engines with lower power rating are required by 40CFR60 to meet 40CFR1039 Tier 4 emission levels, but not emergency engines with ratings that will be used at Sabey (approximately 1.5 MWe to 2.0 MW or less). Instead, 40CFR60 requires the engines at Sabey to meet the Tier 2 emission levels of 40CFR89.112. The applicable sections of 40CFR60 for engine owners are pasted below in italics with bold emphasis on the portions requiring Tier 2 emission factors for emergency generators such as those at Sabey:

§60.4205 What emission standards must I meet for emergency engines if I am an owner or operator of a stationary CI internal combustion engine?

(b) Owners and operators of 2007 model year and later emergency stationary CI ICE with a displacement of less than 30 liters per cylinder that are not fire pump engines must comply with the emission standards for new non-road CI engines in §60.4202 (see below), *for all pollutants, for the same model year and maximum engine power for their 2007 model year and later emergency stationary CI ICE.*

Based on information provided by the applicant, Sabey will use engines that will use the following 2007 model year engines or later with 2.0 MWe (or smaller) sizes: Caterpillar Model 3516C rated 2.0 MWe; Caterpillar Model 3512C rated 1.5 MWe; Cummins QSK60-G14 NR2 rated 2.0 MWe; Cummins Inc QSK50-G5 NR2 rated 1.5 MWe; MTU 16V4000G43 rated 2.0 MWe; MTU 12V4000G43 rated 1.5 MWe.

Based on these specifications, each engine's displacement per cylinder was calculated and compared to subpart (b) of §60.4205 as follows:

2.1.1 Caterpillar Engine Model 3516C rated 2.0 MWe

Displacement is not listed among the manufacturer specifications for this engine. However, displacement can be calculated by multiplying the volume of a cylinder by the number of cylinders as follows:

Displacement = (cross-sectional area of cylinder = πr^2) x (cylinder height) x (# cylinders)

The bore of an engine represents the cylinder diameter and the stroke represents the cylinder height. Substituting bore/2 for radius, and the stroke height, the equation for calculating the volume of an engine cylinder is:

[Cylinder Volume = $\pi/4 \times (\text{bore})^2 \times (\text{stroke})$][1]

Simplifying and using a metric units conversion factor, the equation for total displacement becomes:

Displacement = $0.7854 \times \text{bore(cm)}^2 \times \text{stroke(cm)} \times (\text{\# cylinders}) \times (1\ \text{Liter}/1000\ \text{cm}^3)$

Using this equation, and plugging in the manufacturer specifications for bore (170mm), stroke (190mm), and 16 cylinders, this engine's total displacement and displacement per cylinder are calculated as follows:

Total Displacement = $0.7854 \times (170/10)^2 \times (190/10) \times 16$ cylinders $\times (1/1000)$

Total Displacement = 69.0 Liters.

Displacement per cylinder = $0.7854 \times (170/10)^2 \times (190/10) \times (1/1000)$

Displacement per cylinder = 4.31 liters/cylinder.

2.1.2 Caterpillar Engine Model 3512C rated 1.5 MWe

The specification sheet for this engine lists displacement as 51.8 liters, with 12 cylinders total. The single cylinder displacement for this engine is therefore 4.32 liters/cylinder.

[1] HPBooks Auto Math Handbook., Lawlor, John., The Berkeley Publishing Group, A division of Penguin Putnam Inc. (www.penguinputnam.com), 1992, p. 2.

2.1.3 Cummins Engine QSK60 rated 2.0 MWe

The specification sheet for this engine lists displacement as 60.1 liters, with 16 cylinders total. The single cylinder displacement for this engine is therefore 3.76 liters/cylinder.

2.1.4 Cummins Engine QSK50 rated 1.5 MWe

The specification sheet for this engine lists displacement as 50.2 liters, with 16 cylinders total. The single cylinder displacement for this engine is therefore 3.14 liters/cylinder.

2.1.5 MTU Engine 16V4000G43 rated 2.0 MWe

The specification sheet for this engine lists displacement as 76.3 liters, with 16 cylinders total. The single cylinder displacement for this engine is listed as 4.77 liters/cylinder.

2.1.6 MTU Engine 12V4000G43 rated 2.0 MWe

The specification sheet for this engine lists displacement as 57.3 liters, with 12 cylinders total. The single cylinder displacement for this engine is listed as 4.77 liters/cylinder.

Thus, because Sabey will use engines with a displacement of less than the *§60.4205 (b)* limit of 30 liters per cylinder, and are for emergency purposes only, the engines are therefore required to meet *§60.4202* manufacturer requirements listed below.

> *§60.4202 What emission standards must I meet for emergency engines if I am a stationary CI internal combustion engine manufacturer?*
>
> *(a) Stationary CI internal combustion engine manufacturers must certify their 2007 model year and later emergency stationary CI ICE with a maximum engine power* ***less than or equal to 2,237 KW*** *(3,000 HP) and a displacement of less than 10 liters per cylinder that are not fire pump engines to the emission standards specified in paragraphs (a)(1) through (2) of this section.*
>
> *(1) For engines with a maximum engine power less than 37 KW (50 HP):*
>
> *(i) The certification emission standards for new nonroad CI engines for the same model year and maximum engine power in 40 CFR 89.112 and 40 CFR 89.113 for all pollutants for model year 2007 engines, and*
>
> *(ii) The certification emission standards for new nonroad CI engines in 40 CFR 1039.104, 40 CFR 1039.105, 40 CFR 1039.107, 40 CFR 1039.115, and table 2 to this subpart, for 2008 model year and later engines.*
>
> ***(2) For engines with a maximum engine power greater than or equal to 37 KW (50 HP), the certification emission standards for new nonroad CI engines for the same model year and maximum engine power in 40 CFR 89.112 and 40 CFR 89.113 for all pollutants beginning in model year 2007.***

Thus, based on the power ratings listed in *40 CFR 60.4202(a),* and because the engines to be used at Sabey will also have less than 10 liters per cylinder displacement, the engines are required to meet the applicable 40CFR89 Tier 2 emission standards.

2.2 Support for complying with 40 CFR 63 Subpart ZZZZ from Section 3 of TSD.

According to section 40 CFR 63 Subpart ZZZZ section 636590 part (c) and (c)(1), sources such as this facility, are required to meet the requirements of 40 CFR 60 IIII and "*no further requirements apply for such engines under this* (40 CFR 63 Subpart ZZZZ) *part.*"

3. SOURCE TESTING

Source testing requirements are outlined in Sections 4 of the Approval Order. The five-mode stack testing in Condition 4 of the permit is required to demonstrate compliance with 40CFR89(112 & 113) g/kW-hr EPA Tier 2 average emission limits via the five individual operating loads (10%, 25%, 50%, 75% and 100%) according to Table 2 of Appendix B to Subpart E of 40CFR89, or according to any other applicable EPA requirement in effect at the time the engines are installed. For this permit, engine selection testing will be determined as follows:

3.1 NEW ENGINE STACK TESTING:

Because Sabey can utilize multiple engine manufacturer and make options, Conditions 4.2 and 4.3 require testing of at least one engine from each manufacturer and each size engine from each manufacturer, immediately after commissioning any new proposed engine. These conditions apply in addition to the testing Sabey has performed on a subset of the 10 engines already installed at the time of this permit.

3.2 PERIODIC STACK TESTING:

Every 60 months after the first testing performed starting with engines tested after the date of this permit, Sabey shall test at least one engine, including the engine with the most operating hours as long as it is a different engine from that which was tested during the previous 60 month interval testing.

3.3 AUDIT SAMPLING

According to Condition 4.2, audit sampling per 40 CFR 60.8(g), may be required by Ecology at their discretion. Ecology will not require audit samples for test methods specifically exempted in 40 CFR 60.8(g) such as Methods, 7E, 10, 18, 25A, and 320. For non-exempted test methods, according to 40 CFR 60.8(g):

"The compliance authority responsible for the compliance test may waive the requirement to include an audit sample if they believe that an audit sample is not necessary."

Although Ecology believes that audit sampling is not necessary for certified engines, Ecology may choose at any time to require audit sampling for any stack tests conducted. Audit sampling could include, but would not necessarily be limited to, the following test methods: Methods 5, 201A, or 202.

4. SUPPORT FOR BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

BACT is defined[2] 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. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results.*

For this project, 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 (based upon the factors within the BACT definition), 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 unique technical, environmental, or economic objections.[3] 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 and/or cooling towers 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_{10} and $PM_{2.5}$), and sulfur dioxide. BACT for toxics (tBACT) is included in Section 4.5.

4.1 BACT ANALYSIS FOR NOx FROM DIESEL ENGINE EXHAUST

Sabey reviewed EPA's RACT/BACT/LAER Clearinghouse (RBLC) database to look for 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.

4.1.1 BACT Options for NOx

Sabey'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, and was therefore considered the top-case control technology and evaluated for technical

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

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

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 by Ecology through a literature review include: selective non-catalytic reduction (SNCR), non-selective catalytic reduction (NSCR), water injection, as well as emerging technologies. Ecology reviewed these options and addressed them below.

4.1.1.1 ***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. SCR can reduce NOx emissions by approximately 90 percent.

For SCR systems to function effectively, exhaust temperatures must be high enough (about 200 ^{o}C to 500^{o}C) to enable catalyst activation. For this reason, SCR control efficiencies are expected to be relatively low during the initial minutes after engine start up, especially during maintenance, testing and storm avoidance loads. Minimal amounts of the urea-nitrogen reducing agent injected into the catalyst does not react, and is emitted as ammonia. Optimal operating temperatures are needed to minimize excess ammonia (ammonia slip) and maximize NOx reduction. SCR systems are costly. Most SCR systems operate in the range of 290^{o}C to 400^{o}C. Platinum catalysts are needed for low temperature range applications (175^{o}C – 290^{o}C); zeolite can be used for high temperature applications (560^{o}C); and conventional SCRs (using vanadium pentoxide, tungsten, or titanium dioxide) are typically used for temperatures from 340^{o}C to 400^{o}C.

Sabey has evaluated the cost effectiveness of installing and operating SCR systems on each of the proposed diesel engines by taking into account direct costs (equipment, sales tax, shipping, installation, etc…) and indirect costs (startup, performance tests, etc...). Assuming a mid-range California Area Resource Board (CARB) annual operation and maintenance cost estimate to account for urea, fuel for pressure drop, increased inspections, and periodic OEM visits, the use of SCR systems would cost approximately $37,100 per ton of NOx removed from the exhaust stream each year. If SCR is combined with a Tier 4 capable integrated control system, which includes SCR, as well as control technologies for other pollutants such PM, CO, and VOC (see section 4.3), the cost estimate would be approximately $43,600 for NOx alone or $27,600 per ton of combined pollutants removed per year.

Ecology concludes that while SCR is a demonstrated emission control technology for diesel engines, and preferred over other NOx control alternatives described in subsection 4.1.1.3., it is not economically feasible for this project. Furthermore, although NOx is a criteria pollutant, the only NOx that currently have NAAQS is NO2. Cost per ton removal of NO2 is an order of magnitude more expensive than for NOx, and is addressed under tBACT in section 4.5.

Therefore, Ecology agrees with the applicant that this NOx control option can be excluded as BACT (both as SCR alone and as part of Tier 4 capable integrated control system, which includes a combination of SCR with other control technologies for other pollutants).

4.1.1.2. ***Combustion Controls, Tier 2 Compliance, and Programming Verification.***

Diesel engine manufacturers typically use proprietary combustion control methods to achieve the overall emission reductions needed to meet applicable EPA tier standards. Common general controls include fuel injection timing retard, turbocharger, a low-temperature aftercooler, use of EPA Tier-2 certified engines operated as emergency engines as defined in 40 CFR§60.4219, and compliance with the operation and maintenance restrictions of 40 CFR Part 60, Subpart IIII. Although it may lead to higher fuel consumption, injection timing retard reduces the peak flame temperature and resulting NOx emissions. While good combustion practices are a common BACT approach, for the Sabey engines however, a more specific approach, based on input from Ecology inspectors after inspecting similar data centers, is to obtain written verification from the engine manufacturer that each engine of the same make, model, and rated capacity installed at a facility use the same electronic Programmable System Parameters, i.e., configuration parameters, in the electronic engine control unit. These BACT options are considered further in section 4.1.2.

4.1.1.3. ***Other Control Options*.**

Other NOx control options listed in this subsection were considered but rejected for the reasons specified:

4.1.1.3.1. ***Selective Non-Catalytic Reduction (SNCR)*.**

This technology is similar to that of an SCR but does not use a catalyst. Initial applications of Thermal DeNOx, an ammonia based SNCR, achieved 50 percent NOx reduction for some stationary sources. This application is limited to new stationary sources because the space required to completely mix ammonia with exhaust gas needs to be part of the source design. A different version of SNCR called NOxOUT, uses urea and has achieved 50-70 percent NOx reduction. Because the SNCR system does not use a catalyst, the reaction between ammonia and NOx occurs at a higher temperature than with an SCR, making SCR applicable to more combustion sources. Currently, the preferred technology for back-end NOx control of reciprocating internal combustion engine (RICE) diesel applications, appears to be SCR with a system to convert urea to ammonia.

4.1.1.3.2. ***Non-Selective Catalytic Reduction (NSCR):***

This technology uses a catalyst without a reagent and requires zero excess air. The catalyst causes NOx to give up its oxygen to products of incomplete combustion (PICs), CO and hydrocarbons, causing the pollutants to destroy each other. However, if oxygen is present, the

PICs will burn up without destroying the NOx. While NSCR is used on most gasoline automobiles, it is not immediately applicable to diesel engines because diesel exhaust oxygen levels vary widely depending on engine load. NSCR might be more applicable to boilers. Currently, the preferred technology for back-end NOx control of reciprocating internal combustion engine (RICE) diesel applications, appears to be SCR with a system to convert urea to ammonia. See also Section 4.2.1.3 (Three-Way Catalysts).

4.1.1.3.3. ***Water Injection:***

Water injection is considered a NOx formation control approach and not a back-end NOx control technology. It works by reducing the peak flame temperature and therefore reducing NOx formation. Water injection involves emulsifying the fuel with water and increasing the size of the injection system to handle the mixture. This technique has minimal effect on CO emissions but can increase hydrocarbon emissions. This technology is rejected because there is no indication that it is commercially available and/or effective for new large diesel engines.

4.1.1.3.4. ***Other Emerging Technologies****:*

Emerging technologies include: NOx adsorbers, RAPER-NOx, ozone injection, and activated carbon absorption.

- ***NOx Adsorbers:*** NOx adsorbing technologies (some of which are known as SCONOx or EMx^{GT}) use a catalytic reactor method similar to SCR. SCONOx uses a regenerated catalytic bed with two materials, a precious metal oxidizing catalyst (such as platinum) and potassium carbonate. The platinum oxidizes the NO into NO2 which can be adsorbed onto the potassium carbonate. While this technology can achieve NOx reductions up to 90% (similar to an SCR), it is rejected because it has significantly higher capital and operating costs than an SCR. Additionally, it requires a catalyst wash every 90 days, and has issues with diesel fuel applications, (the GT on EMx^{GT} indicates gas turbine application). A literature search did not reveal any indication that this technology is commercially available for stationary backup diesel generators.
- ***Raper-NOx****:* This technology consists of passing exhaust gas through cyanic acid crystals, causing the crystals to form isocyanic acid which reacts with the NOx to form CO2, nitrogen and water. This technology is considered a form of SNCR, but questions about whether stainless steel tubing acted as a catalyst during development of this technology, could make this another form of SCR. To date, it appears this technology has never been offered commercially.

- ***Ozone Injection:*** Ozone injection technologies, some of which are known as LoTOx or BOC, use ozone to oxidize NO to NO2 and further to NO3. NO3 is soluble in water and can be scrubbed out of the exhaust. As noted in the literature, ozone injection is a unique approach because while NOx is in attainment in many areas of the United States (including Quincy, WA), the primary reason to control NOx is because it is a precursor to ozone. Due to high additional costs associated with scrubbing, this technology is rejected.
- ***Activated Carbon Absorption with Microwave Regeneration.*** This technology consists of using alternating beds of activated carbon by conveying exhaust gas through one carbon bed, while regenerating the other carbon bed with microwaves. This technology appears to be successful in reducing NOx from diesel engine exhaust. However, it is not progressing to commercialization and is therefore rejected.

4.1.2. ***BACT determination for NOx***

Ecology determines that BACT for NOx is the use of EPA Tier-2 certified engines operated as emergency engines as defined in 40 CFR§60.4219, and compliance with the operation and maintenance restrictions of 40 CFR Part 60, Subpart IIII. In addition, Approval Condition 2.8 in the permit requires that the source must have written verification from the engine manufacturer that each engine of the same make, model, and rated capacity installed at the facility uses the same electronic Programmable System Parameters, i.e., configuration parameters, in the electronic engine control unit. “Installed at the facility” could mean at the manufacturer or at the data farm because the engine manufacturer service technician sometimes makes the operational parameter modification/correction to the electronic engine controller at the data farm. Sabey will install engines consistent with this BACT determination. Ecology believes this is a reasonable approach in that this BACT requirement replaces a more general, common but related BACT requirement of “good combustion practices.”

Note: Because control options for PM, CO, and VOCs, are available as discussed in BACT section 4.2., which are less costly per ton than the Tier 4 capable integrated control system option for those pollutants, both the SCR-only option as well as the Tier 4 capable integrated control system option are not addressed further within BACT.

4.2 BACT ANALYSIS FOR PM, CO AND VOC FROM DIESEL ENGINE EXHAUST

Sabey reviewed the available published literature and the RBLC and identified the following demonstrated technologies for the control of particulate matter (PM), carbon monoxide (CO), and volatile organic compounds (VOC) emissions from the proposed diesel engines:

4.2.1. BACT Options for PM, CO, and VOC from Diesel Engine Exhaust

4.2.1.1 ***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.

Sabey 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 $450,300 per ton of engine exhaust particulate removed from the exhaust stream at Sabey each year. DPFs also remove CO and VOCs at costs of approximately $63,500 and $715,900 per ton per year respectively. If the cost effectiveness of DPF use is evaluated using the total amount of PM, CO, and VOCs reduced, the cost estimate would be approximately $51,600 per ton of pollutants removed per year.

Ecology concludes that use of DPF is not economically feasible for this project. Therefore, Ecology agrees with the applicant that this control option can be rejected as BACT.

4.2.1.2. ***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, DOCs have also been demonstrated to reduce diesel engine exhaust particulate emissions, and also hydrocarbon emissions.

Sabey has evaluated the cost effectiveness of installing and operating DOCs on each of the proposed diesel engines. The following DOC BACT cost details are provided as an example of the BACT and tBACT cost process that Sabey followed for engines within this application (including for SCR-only, DPF-only, and Tier 4 capable integrated control system technologies).

- Sabey obtained the following recent DOC equipment costs: $30,828 for a stand-alone catalyzed DOC per single 2.0 MWe generator. For thirty two 2.0 MWe generators, this amounts to $986,496. According to the vendor, DOC control efficiencies for this unit are CO, HC, and PM are 80%, 70%, and 20% respectively.
- The subtotal becomes $1,287,442 after accounting for shipping ($49,325), WA sales tax ($64,122), and direct on-site installation ($187,499).

- After adding indirect installation costs, the total capital investment amounts to: $1,502,245. Indirect installation costs include but are not limited to: startup fees, contractor fees, and performance testing.
- Annualized over 25 years and included with direct annual costs based on EPA manual EPA/452/B-02-001, the total annual cost (capital recovery and direct annual costs) is estimated to be $182,094.
- At the control efficiencies provided from the vendor, the annual tons per year of emissions for CO (13 tpy), HC (1.32 tpy), and PM (1.73 tpy) become 10.46 tpy, 0.92 tpy, and .346 tpy removed respectively.
- The last step in estimating costs for a BACT analysis is to divide the total annual costs by the amount of pollutants removed ($182,094 divided by 10.46 tpy for CO, etc..).

The corresponding annual DOC cost effectiveness value for carbon monoxide destruction alone is approximately $17,500 per ton. If particulate matter and hydrocarbons are individually considered, the cost effectiveness values become $527,000 and $197,000 per ton of pollutant removed annually, respectively. If the cost effectiveness of using DOC is evaluated using the total amount of carbon monoxide, particulate matter and hydrocarbons reduced, the cost estimate would be approximately $15,600 per ton of combined pollutants removed per year.

These annual estimated costs (for DOC use alone) provided by Sabey are conservatively low estimates that take into account installation, tax, shipping, and other capital costs as mentioned above, but assume no greater than mid-range CARB estimates for operational, labor and maintenance costs.

Ecology concludes that use of DOC is not economically feasible for this project. Therefore, Ecology agrees with the applicant that these control option can be rejected as BACT.

4.2.1.3 Three-Way Catalysts.

Three way catalyst (TWC) technology can control CO, VOC and NOx in gasoline engines, but is only effective for CO and VOC control in diesel engines. According to DieselNet, an online information service covering technical and business information for diesel engines, published by Ecopoint Inc. of Ontario, Canada (https://www.dieselnet.com):

"The TWC catalyst, operating on the principle of non-selective catalytic reduction of NOx by CO and HC, requires that the engine is operated at a nearly stoichiometric air to- fuel (A/F) ratio… In the presence of oxygen, the three-way catalyst becomes ineffective in reducing NOx. For this reason, three-way catalysts cannot be employed for NOx control on diesel applications, which, being lean burn engines, contain high concentrations of oxygen in their exhaust gases at all operating conditions."

As noted by the applicant, diesel engine stack tests at another data center in Washington State (Titan Data Center in Moses Lake, WA), showed that TWC control increased the emission rate for nitrogen dioxide (NO2). This technology is therefore rejected as a control option.

4.2.2 BACT Determination for PM, CO, and VOC

Ecology determines BACT for particulate matter, carbon monoxide and volatile organic compounds is restricted operation of EPA Tier-2 certified engines operated as emergency engines as defined in 40 CFR§60.4219, and compliance with the operation and maintenance restrictions of 40 CFR Part 60, Subpart IIII. Sabey will install engines consistent with this BACT determination.

4.3 BACT ANALYSIS FOR SULFUR DIOXIDE FROM DIESEL ENGINE EXHAUST

4.3.1. BACT Options for SO2

Sabey did not find any add-on control options commercially available and feasible for controlling sulfur dioxide emissions from diesel engines. Sabey's proposed BACT for sulfur dioxide is the use of ultra-low sulfur diesel fuel (15 ppm by weight of sulfur).

4.3.2. BACT Determination for SO2

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 BACT ANALYSIS FOR PM FROM COOLING TOWERS

Because no changes are proposed for cooling tower operations or emission estimates, a BACT analysis was not performed. The following BACT determination from the previous Sabey permit is continued into this permit: "maintaining the water droplet drift rate from cooling systems and drift eliminators to a maximum drift rate of 0.001% of the circulating water flow rate."

4.5 BEST AVAILABLE CONTROL TECHNOLOGY FOR TOXICS

Best Available Control Technology for Toxics (tBACT) means BACT, as applied to toxic air pollutants.[4] For TAPs that exceed small quantity emission rates (SQERs), the procedure for determining tBACT followed the same procedure used above for determining BACT. Of the technologies Sabey considered for BACT, the minimum estimated costs as applied to tBACT are as follows:

- The minimum estimated costs to control diesel engine exhaust particulate is estimated to be $1.9 million per ton removed.
- The minimum estimated costs to control NO2 is estimated to be $370,700 per ton removed.
- The minimum estimated costs to control CO is estimated to be $17,500 per ton removed.
- For the other TAPS above SQERs, the minimum estimated costs per ton removed would be as follows: $14 million for benzene; $81 million for naphthalene; $552 million for 1,3-butadiene; and $1.4 billion for acrolein.

[4] WAC 173-460-020

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. Based on the information presented in this TSD, Ecology has determined that Table 4 below represents tBACT for the proposed project.

Table 4 tBACT Determination

Toxic Air Pollutant	tBACT
Primary NO_2	Compliance with the NOx BACT requirement
Diesel Engine Exhaust Particulate	Compliance with the PM BACT requirement
Carbon monoxide	Compliance with the CO BACT requirement
Sulfur dioxide	Compliance with the SO_2 BACT requirement
Benzene	Compliance with the VOC BACT requirement
Toluene	Compliance with the VOC BACT requirement
Xylenes	Compliance with the VOC BACT requirement
1,3 Butadiene	Compliance with the VOC BACT requirement
Formaldehyde	Compliance with the VOC BACT requirement
Acetaldehyde	Compliance with the VOC BACT requirement
Acrolein	Compliance with the VOC BACT requirement
Benzo(a)Pyrene	Compliance with the VOC BACT requirement
Benzo(a)anthracene	Compliance with the VOC BACT requirement
Chrysene	Compliance with the VOC BACT requirement
Benzo(b)fluoranthene	Compliance with the VOC BACT requirement
Benzo(k)fluoranthene	Compliance with the VOC BACT requirement
Dibenz(a,h)anthracene	Compliance with the VOC BACT requirement
Ideno(1,2,3-cd)pyrene	Compliance with the VOC BACT requirement
Napthalene	Compliance with the VOC BACT requirement
Propylene	Compliance with the VOC BACT requirement
PAH (no TEF)	Compliance with the VOC BACT requirement
PAH (apply TEF)	Compliance with the VOC BACT requirement
Cooling Tower Emissions (TAPs as PM)	Compliance with Cooling Tower BACT requirement

5. AMBIENT AIR MODELING

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.

5.1 AERMOD Assumptions:

- Five years of sequential hourly meteorological data (2001–2005) from Moses Lake Airport were used. Twice-daily upper air data from Spokane were used to define mixing heights. [Note: The Engine Operating Restrictions listed in Table 3.2 of the Approval Order were based on 2011 Monte Carlo modeling for the 98th-percentile one-hr NO2 NAAQS. The 2011 modeling used 2004-2008 meteorological data (see Section 5.2 of this TSD)].

- The AMS/EPA Regulatory Model Terrain Pre-processor (AERMAP) was used to obtain height scale, receptor base elevation, and to develop receptor grids with terrain effects. For area topography required for AERMAP, Digital topographical data (in the form of Digital Elevation Model files) were obtained from www.webgis.com.
- Each generator was modeled with a stack height of 48- feet above local ground.
- The data center buildings, in addition to the individual generator enclosures were included to account for building downwash.
- The receptor grid for the AERMOD modeling was established using a 10-meter grid spacing along the facility boundary extending to a distance of 350 meters from each facility boundary. A grid spacing of 25 meters was used for distances of 350 meters to 800 meters from the boundary. A grid spacing of 50 meters was used for distances from 500 meters to 2000 meters from the boundary. A grid spacing of 100 meters was used for distances beyond 2000 meters from the boundary.
- One-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 49 parts per billion (ppb) of background ozone, and an equilibrium NO_2 to NOx ambient ratio of 90%.
- 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.
- AERMOD Meteorological Pre-processor (AERMET) was used to estimate boundary layer parameters for use in AERMOD.
- AERSURFACE was used to determine the percentage of land use type around the facility based on albedo, Bowen ratio, and surface roughness parameters.

5.2 Background Information for 2011 Monte Carlo Modeling

As explained in the TSD for the previous permit, a Monte Carlo statistical analysis was used to determine operational limits to address NO2. Portions of the following information from that TSD are re-presented below and updated as applicable to the current Approval Order.

5.2.1 "Monte Carlo" Statistical Analysis for Demonstrating Compliance with the One-Hour NO_2 NAAQS

The one-hour NO_2 NAAQS is based on the three-year rolling average of the 98th percentile of the daily maximum one-hour NO_2 impacts. Data centers operate their generators on an intermittent basis under a wide range of engine loads, under a wide range of meteorological conditions. As such it is difficult to determine whether high-emitting generator runtime regimes coincide with meteorological conditions giving rise to poor dispersion, and trigger an exceedance of the one-hour NO_2 NAAQS at any given location beyond the facility boundary. This issue has been recognized by EPA when they stated that "[m]odeling of intermittent emission units, such as emergency generators, and/or intermittent emission scenarios, such as startup/shutdown operations, has proven to be one of the main challenges for permit applicants undertaking a demonstration of compliance with the one-hour NO_2 NAAQS".[5]

To address this problem, Ecology developed a statistical re-sampling technique, that we loosely call the "Monte Carlo analysis". This technique performs a statistical analysis of the AERMOD-derived ambient NO_2 impacts caused by individual generator operating regimes, each of which exhibits its own NOx emission rates at various locations throughout the facility. The randomizing function of the Monte Carlo analysis allows inspection of how the combination of sporadic generator operations, sporadic generator emissions at various locations, and variable meteorology affect the modeled 98th-percentile concentrations at modeling receptors placed within the facility and outside the facility boundary.

The first step in the Monte Carlo NO_2 analysis was to use the AERMOD/PVMRM model for each representative generator runtime regime by each tenant at the Sabey facility. To do so, 14 different generator operating regimes proposed by Sabey were each modeled separately with AERMOD, using five years of meteorology (2004-2008). For each of the 14 AERMOD runs, the number of calendar days per year of operation for that generator operating regime was established. To test the effect of initial startup and commissioning testing on ambient air quality, the NOx-emitting scenarios corresponding to the initial startup testing were included in the 2004 meteorological set. For all five years of modeling, it was assumed that all of the tenants conducted their scheduled maintenance each year. For each of the five modeling years, the existing emissions contributed by the existing Ask.com facility were included in the analysis. For each of the five modeling years, it was assumed there would be four random days on which power outages lasted at least one hour.

The Monte Carlo method then randomly selected the days on which the generators operated in each regime, combined the modeled concentrations on those days across all operating regimes and iterated the process 1,000 times, so as to obtain a distribution of the possible concentrations at each receptor.

5.2.2 AERMOD Modeling of Individual Runtime Scenarios

In order to conduct the Monte Carlo analysis, the hierarchy of individual generator runtime events was clustered into 15 separate AERMOD runs, which are described in the Table 5. The NOx emissions from the offsite background sources are also listed in Table 5. For each of the 15 independent AERMOD scenarios, the number of calendar days of generator runtime was established. The two yellow-highlighted rows on the right side of Table 5 show the number of calendar days per year of generator runtime for each AERMOD scenario.

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

Table 5. AERMOD Runs Used for Monte Carlo Analysis

Tenant	No. of Installed Gens	Runtime Regime	Monte Carlo Days/yr	Day of Regime	% Load	kWm	No. Running Gens	Hrs/Day	kWmhrs/ day	E.F.	Nox lbs/hour	Monte Carlo AERMOD Run	Monte Carlo Days/yr
All	44	Full Power Outage, 75% Load	4	1	75%	1650	44	1	72600	6.2	991	1	4
Bldg B	16	Bldg B Main Switchgear	1		75%	1650	16	1	26400	6.2	361	2	1
B-1	8	Startup: Int. Sys Test Day 2	1		75%	1650	8	1	13200	6.2	180	3	1
C-3	6	Transf. Maint., 75%	2	1	75%	1650	2	1	3300	6.2	45.1	4	2
A-1	8	Transf. Maint., 75%	2	1	75%	1650	2	1	3300	6.2	45.1	5	2
A-2	8	Transf. Maint., 75%	2	1	75%	1650	2	1	3300	6.2	45.1	6	2
B-2	4	Transf. Maint., 75%	2	1	75%	1650	2	1	3300	6.2	45.1	7	2
C-1	3	Annual Test, 100% load		1	100%	2191		1	2191	8.68			
C-2	3	Annual Test, 100% load		1	100%	2191		1	0	8.68			
C-3	6	Annual Test, 100% load	12	1	100%	2191	1	1	0	8.68	41.9	8	12
A-1	8	Annual Test, 100% load		1	100%	2191		1	2191	8.68			
A-2	8	Annual Test, 100% load	16	1	100%	2191	1	1	0	8.68	41.9	9	16
B-1	8	Annual Test, 100% load		1	100%	2191		1	2191	8.68			
B-2	4	Annual Test, 100% load		1	100%	2191		1	0	8.68			
B-3	4	Annual Test, 100% load		1	100%	2191		1	0	8.68			
B-1	4	Startup: Mfr Testing Day 1			100%	2191		1	0	8.68			
B-1	4	Startup: Funct. Perf Test	24		100%	1135	1	1	0	8.68	41.9	10	24
C-1	3	Montly Test, 50% Load		1	50%	1135		1	1135	6.12			
C-1	3	Corrective Testing, 50% load		1	50%	1135		1	0	6.12			
C-2	3	Montly Test, 50% Load		1	50%	1135		1	0	6.12			
C-2	3	Corrective Testing, 50% load		1	50%	1135		1	0	6.12			
C-3	6	Montly Test, 50% Load		1	50%	1135		1	0	6.12			
C-3	6	Corrective Testing, 50% load	45	1	50%	1135	1	1	0	6.12	15.3	11	45
A-1	8	Montly Test, 50% Load		1	50%	1135		1	1135	6.12			
A-1	8	Corrective Testing, 50% load		1	50%	1135		1	0	6.12			
A-2	8	Montly Test, 50% Load		1	50%	1135		1	0	6.12			
A-2	8	Corrective Testing, 50% load	38	1	50%	1135	1	1	0	6.12	15.3	12	38
B-1	8	Montly Test, 50% Load		1	50%	1135		1	1135	6.12			
B-1	8	Corrective Testing, 50% load		1	50%	1135		1	0	6.12			
B-2	4	Montly Test, 50% Load		1	50%	1135		1	0	6.12			
B-2	4	Corrective Testing, 50% load		1	50%	1135		1	0	6.12			
B-3	4	Montly Test, 50% Load		1	50%	1135		1	0	6.12			
B-3	4	Corrective Testing, 50% load		1	50%	1135		1	0	6.12			
B-1	4	Startup: Int. Sys Test Day 1	53		50%	1135	1	1	0	6.12	15.3	13	53
CELITE	1	Continuous Operation	365		--		--				8.6	14	365
Intuit	9	Outage			90%		7				200		
Yahoo	23	Outage	8		90%		19				544	1	4
Intuit	9	Annual tests			100%		1				32.0		
Yahoo	23	Annual tests	15		100%		1				32.0	15	15

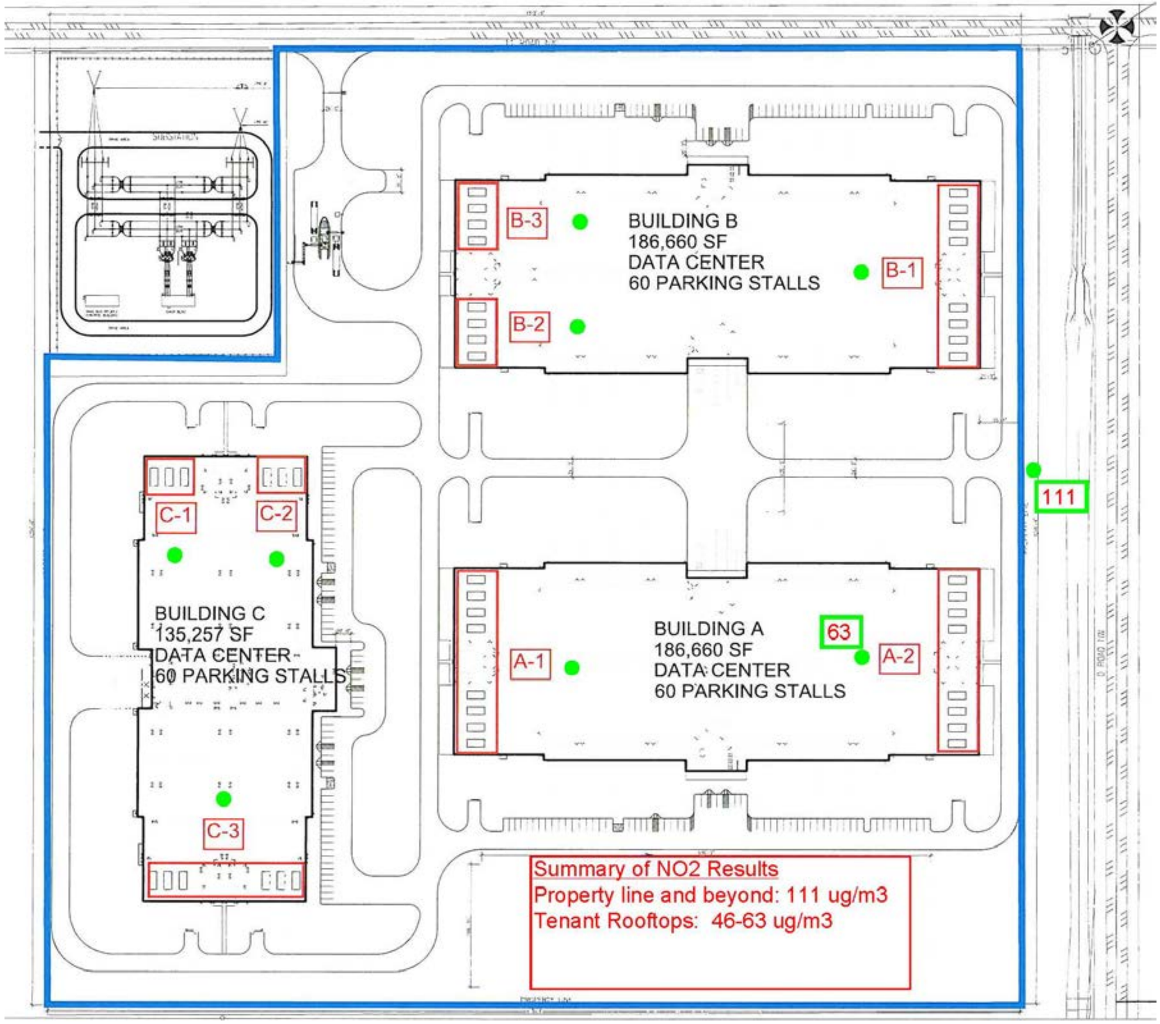
5.2.3 Monte Carlo NO_2 Results

The results of the Monte Carlo analysis are listed in Table 6. For each modeling year, the Monte Carlo analysis lists the 98th-percentile daily one-hour NO_2 concentration at the maximally impacted receptor. Compliance is demonstrated by the median value of the five modeling years. As listed in Table 6, the maximum impact at or beyond the Sabey property line (or on the tenant building rooftops) is 111 µg/m^3. Figure 1 shows the location of that maximally impacted receptor, which is on the east property line in unpopulated industrially-zoned land roughly midway between the northeast and southeast property corners.

Table 6. Monte Carlo NO_2 Results

	98th-Percentile Daily 1-Hour NO_2, ug/m3					
Receptor Location	**2004**	**2005**	**2006**	**2007**	**2008**	**Median (2004-2008)**
Property Line and Beyond (Eastern property line)	114	111	108	108	111	111
Within Sabey Property (rooftop of Tenant A-2)	63	63	63	62	59	63

Figure 1. Locations of Maximum Modeled 98th-Percentile One-Hour NO_2 Impacts.



5.2.4 Updates to 2011 Monte Carlo Results

Between 2011 and the time of this permit preparation, another data center (Vantage) has been constructed to the north of Sabey. In addition, available updated regional background emissions of 15.6 ug/m3were used.[6] Sabey also assumed that Vantage emissions would contribute up to an additional 10% of the total Monte Carlo maximum impact of 111 ug/m3 or 11 ug/m3. Based on 2012 Vantage AERMOD modeling performed by consultant ICF International, this is a conservatively high estimate. According to the 2012 modeling, local one-hour NO2 background at the maximum Vantage receptor caused by combined data center emissions from nearby Sabey, Yahoo, and Intuit data centers was only 0.02 ug/m3. The combined emissions from Sabey and regional sources would be as follows:

Impact from Sabey and Offsite-Sources	122 $\mu g/m^3$ (111 $\mu g/m^3$ +11 $\mu g/m^3$ Vantage)
Regional Background:	15.6 $\mu g/m^3$
Total NO_2 Concentration	148.6 $\mu g/m^3$
Allowable NAAQS:	188 $\mu g/m^3$

Consistent with the 2011 Monte Carlo results, Sabey could emit up to approximately 160 ug/m3 (161.4 ug/m3) and still be in compliance with the one-hr NO2 NAAQS of 188 ug/m3 (15.6ug/m3 + 11ug/m3 + 161.4 ug/m3 = 188 ug/m3 ≤ 188 ug/m3). Considering Sabey's conservative Vantage background emission estimate of 11 ug/m3, it is possible that Sabey emissions above 161.4 ug/m3 would still be in compliance with the NAAQS. However, Sabey has agreed to use the conservative Vantage background estimate as a safety buffer for compliance with the one-hr NO2 NAAQS.

Based on this analysis, it is concluded the intermittent NOx emissions from the Intergate-Quincy Data Center, combined with the emissions from other local sources and regional background, would not cause ambient impacts exceeding the allowable NAAQS limit at any point at or beyond the fenced facility boundary or on the tenant building rooftops within the facility. As shown in Table 5, the lb/hr emission rate at which the one-hr NO2 NAAQS is met, is at 991 lb/hr. For this reason, Approval Order Condition 8.4 places a limit on NOx at 990 lb/yr.

[6] Provided by Washington State University, Northwest International Air Quality Environmental Science and Technology Consortium, NW AIRQUEST, Lookup 2009-2011 design values of criteria pollutants. Lookup values from the NW AIRQUEST website on June 3, 2015: http://lar.wsu.edu/nw-airquest/lookup.html

5.3 Ambient Impact Results

Except for diesel engine exhaust particulate (DEEP) and NO2 which are predicted to exceed its ASIL, AERMOD model results show that no NAAQS or ASIL will be exceeded at or beyond the property boundary. The applicant's modeling results are provided below:

Criteria Pollutant	Standards in µg/m³ NAAQS(e) Primary	Secondary	Maximum Ambient Impact Concentration (µg/m³)	AERMOD Filename	Background Concentrations (µg/m³) (a)	Maximum Ambient Impact Concentration Added to Background (µg/m³) (If Available)
Particulate Matter (PM_{10})						
1st-Highest 24-hour average during power outage with cooling towers	150	150	57	DEEP_011915	90	147 (c)
Particulate Matter ($PM_{2.5}$)						
Annual average (d)	12	15	1.2 (c)	DEEP_011515	6.5	7.7 (c)
1st-highest 24-hour average for cooling towers and electrical bypass	35	35	10.4	DEEP_011915	23.5	33.9 (c)
Carbon Monoxide (CO)						
8-hour average	10,000 (9 ppm)		3,014	DEEP_011915	482	3,496
1-hour average	40,000 (35 ppm)		6,223	DEEP_011915	842	7,065
Nitrogen Oxides (NO_2)						
Annual average (d)	100 (53 ppb)	100	15.8	2011 Monte Carlo files	2.8	18.6
1-hour average	188 (100 ppb)	--	161 (max allowed) (b)	2011 Monte Carlo files	26.6 [15.6 regional + 11 local (Vantage)]	<188
Sulfur Dioxide (SO_2)						
3-hour average	--	1,300 (0.5 ppm)	See note (f)			
1-hour average	195 (75 ppb)	--	See note (f)			

Toxic Air Pollutant	ASIL (µg/m³)	Averaging Period	1st-Highest Ambient Concentration (µg/m³)	AERMOD Filename
DEEP (d)	0.00333	Annual average	0.307	DEEP_011515
NO_2	470	1-hour average	960	(b)
CO	23,000	1-hour average	7,065	DEEP_011915
S02	660	1-hour average	See note (f)	
Acrolein	0.06	24-hour average	0.017	DEEP_011915

Benzene (d)	0.0345	Annual Average	0.012	DEEP_011515
1,3-Butadiene (d)	0.00588	Annual Average	0.00031	DEEP_011515
Naphthalene (d)	0.0294	Annual Average	0.0021	DEEP_011515

Notes:
µg/m^3 = Micrograms per cubic meter.
ppm = Parts per million.
ASIL = Acceptable source impact level.
DEEP = Diesel engine exhaust, particulate

(a) Sum of "regional background" plus "local background" values. Regional background concentrations obtained from WSU NW Airquest website. Local background concentrations include emissions from: proposed generators, nearby data centers, and other background sources including highways and the Railroad (see Section 6 of this TSD).
(b) 1-hour NO2 criteria pollutant emissions to be kept below 990 lbs/year to comply with NAAQS. Approval Condition 8.4 includes language to monitor this emission limit requirement. See Section 6 regarding NO2 as a TAP.
(c) The PM values take into account the following very small and yet very conservative cooling tower estimated values of: 0.0996 ug/m3 for the 24-hour averages (using 0.4 scale factor from conservative 1-hour estimate), and 0.0199 ug/m3 for the annual average (using 0.08 scale factor from conservative 1-hour estimate). Scale factors are from California Air Resources Board (CARB) *Appendix H Recommendations for Estimating Concentrations of Longer Averaging Periods from the Maximum One-Hour Concentration for Screening Purposes http://www.arb.ca.gov/toxics/harp/docs/userguide/appendixH.pdf*
(d) Annually averaged concentrations are based on the theoretical maximum annual concentration, which assumes the worst-case scenario that the 3-year rolling average permit limit is released entirely within a single year.
(e) Ecology interprets compliance with the National Ambient Air Quality Standards (NAAQS) as demonstrating compliance with the Washington Ambient Air Quality Standards (WAAQS).
(f) Based on nearby data center (Microsoft Oxford) S02 annual emissions of 0.047 tpy, which are estimated through modeling to cause ambient impacts of 5.7 ug/m3 (1-hr avg) and 4.4 ug/m3 (3-hr avg), Sabey, with emissions of 0.028 tpy are expected have ambient impacts far below the NAAQS. Sabey was not required to model SO2 for comparison to the ASIL because estimated emissions of 0.006 lb/hr (0.028 tpy) are below the WAC 173-460-150 small quantity emission rate of 0.457 lb/hr (2.0 tpy).

Sabey has demonstrated compliance with the national ambient air quality standards (NAAQS) and acceptable source impact levels (ASILs) except for DEEP and NO2. As required by WAC 173-460-090, emissions of DEEP and NO2 are further evaluated in the following section of this document.

6. SECOND TIER REVIEW FOR DIESEL ENGINE EXHAUST PARTICULATE

Proposed emissions of diesel engine exhaust, particulate (DEEP) and NO2 from the 44 Sabey engines exceed the regulatory trigger level for toxic air pollutants (also called an Acceptable Source Impact Level, (ASIL)). A second tier review was required for DEEP and NO2 in accordance with WAC 173-460-090, and Sabey was required to prepare a health impact assessment (HIA). The HIA presents an evaluation of both non-cancer hazards and increased cancer risk attributable to Sabey's increased emissions of identified carcinogenic compounds. Large diesel-powered backup engines emit DEEP, which is a high priority toxic air pollutant in the state of Washington. In light of the rapid development of other data centers in the Quincy area, and recognizing the potency of DEEP emissions, Ecology decided to evaluate Sabey's proposal in a community-wide basis, even though it is not required to do so by state law. Sabey reported the cumulative risks associated with Sabey and prevailing sources in their HIA document based on a cumulative modeling approach. The Sabey cumulative risk study is based on proposed generators, nearby data centers, and other background sources including highways and railroads.

Because Sabey requests that the 1st-highest NOx emission rate be retained at the current limit of 990 lbs/hour (or 99 lb/hr of NO2 per Condition 5.7 of Approval Order), Ecology's 2011 Technical Support Document for Second Tier Review of NO2 does not need to be repeated but can be re-used to satisfy this permit revision. The Sabey DEEP HIA document along with a brief summary of Ecology's review will be available on Ecology's website.

7. CONCLUSION

Based on the above analysis, Ecology concludes that operation of the 44 generators and 176 cooling units will not have an adverse impact on air quality. Ecology finds that Sabey's Data Center has satisfied all requirements for NOC approval.

******END OF SABEY TSD** ****

Technical Support Document - Appendix B

Ecology Response to Comments
Sabey Data Center – Inergate Quincy expansion project in Quincy, WA

Comments 1-21 from Patricia Martin

Comment 1 – At what load were the pollutant emissions determined for PM2.5, VOCs, PM10, NOx, SO2 and CO? How was it determined that each of these loads resulted in the worst emissions? When modeling for 24-hr, 1-hr and annual NAAQS compliance, why aren't these same "worst case" loads used?

> **Response to Comment 1 –** A load analysis was conducted looking at worst case emissions over all engine venders and worst case flow and temperature across all vendors to determine at which load and building configuration would result in the greatest concentration impacts. The emission rates that are modeled for the annual standard are annualized due to the engines only running 55 hours out of 8760 hours per year. Emission rates, flow, and temperature are the three variables that are fed into the model that change depending on the load. Because the annualized hourly emissions that are modeled are lower that the max 24-hr emissions this variable became a smaller factor in the modeling in comparison to the flow and temperature. The worst case load changed because the resulting worst case concentration from model runs at each load changed for PM2.5 and PM10. Furthermore, different pollutants have a different distribution of load emissions rates and in some instances the higher emission rate actually occurs at a lower load (e.g. PM).
>
> VOC is not a criteria pollutant and therefore was not modeled for directly in comparison with a standard, however worst case VOC concentrations were added to the PM2.5 and PM10 emission values to account for condensable particulate matter emissions.
>
> Please see Table 6-2 on page 32 of the NOC application for the worst case load, based on the load analysis.

Comment 2 – If monthly maintenance testing will take place, how is it determined that 28 cold starts is enough? That essentially assumes that there will be very few scheduled maintenance activities within the facilities, which seems unlikely. Please consider this a request under the PDA for run-time records for existing engines at Sabey, as well as, for power outages that have impacted their operations. Cold-start assumptions so low need to be verified. Please produce the evidence to support them.

> **Response to Comment 2 –** The 28 cold starts estimated in the NOC application are on an annual, per engine, basis. These are emergency engines and Sabey plans to run them for maintenance, testing, and unplanned power outages. Twenty-eight cold starts per engine per year is considered conservative based on their minimal use. On average, Sabey's engines had 13 cold starts per engine in year 2019. For the run-time records for existing engines at Sabey, as well as for power outages that have impacted their operation please make a public records request at www.ecology.wa.gov/publicrecords.

Comment 3 – Please provide evidence that VOC emissions are equivalent to Condensable Particulate Matter as claimed in the NOC.

> **Response to Comment 3 –** A portion of the Volatile Organic Compounds (VOC) or hydrocarbons produced from a combustion source will form condensable particulate matter. Trinity Consultants has taken a conservative approach in assuming all hydrocarbons produced from the generator engines will form condensable particulate matter.

Comment 4 – Ecology now has performance data collected from several engine tests conducted at engines representing those in use at the data centers in Quincy. Please consider this a request under PDA for a copy of these performance tests so that confirmation can be made as to the emission assumptions made in the NOC. Please address any differences in emission assumptions that Ecology found during review of the NOC.

> **Response to Comment 4 –** The last four engines that were tested at Sabey (two in 2016 and two in 2020) met all emission limits of Sabey's NOC Approval Order. The current NOC is requesting larger engines than were installed in Buildings A, B, and C, but are still required to meet EPA tier 2 emission standards. For copies of performance tests, please make a public records request at www.ecology.wa.gov/publicrecords .

Comment 5 – Assumptions based on manufacturer guarantees are inappropriate for purposes of emission estimates. As Ecology is aware, startup, shutdown and malfunctions are not included in the manufacturer's guarantee; the engine is warmed up for 30 minutes prior to the test and run for only 5 minutes, and the loads are based on weighted averages. Real data should be used, not manipulated data that makes it appear that these engines meet the NSPS. Vendor specifications are not representative of engine emissions. Please provide evidence that Ecology compared actual performance data to data submitted by Sabey in support of the NOC. If Ecology did not do a comparison, please explain why.

> **Response to Comment 5 –** The vendor specifications provided by manufacturers are Not to Exceed emission rates for each load. The worst case load conditions are modeled for all pollutants across all vendors proposed in the application and cold start emissions are added into the modeled emission rates. Required performance tests that were conducted by Sabey showed that all permit limits were met, which means the results of the engine tests showed that engine emissions were less than what was modeled for in the previous NOC application.

Comment 6 – Are emissions higher during engine shutdown? If so, why isn't Ecology requiring that these higher emissions be identified and included in the emission data?

> **Response to Comment 6 –** Engine emissions during shutdown are not higher than any emissions that are modeled in the NOC application. Engines are turned off, access to fuel is stopped and no excess emissions occur.

Comment 7 – Are the VOCs from the diesel storage tanks included in the NOC? What is the estimate for the total VOC emitted from the diesel storage tanks? Why isn't Ecology's air program including these air emissions in the total emission from Sabey?

Response to Comment 7 – Yes, the conservative VOC emission estimates for the storage tanks were less than one ton per year and are included in the NOC application. The total emissions for the facility are shown in Table 6, page 8 in the NOC preliminary determination.

Comment 8 – Emergency engines – which is not supported by WA Statute – are allowed to run indefinitely if there is an extended power outage. What mechanism does Ecology have in place to hold Sabey to a 55-hour limit should a situation arise where there is a power outage lasting longer than 2.25 days? If Ecology has no means to protect our health in this unlikely event, why is the BACT determination not based on longer hours?

Response to Comment 8 – The permit restricts Sabey to an annual limit of 55 hours per engine averaged over a 12-month period using monthly rolling totals and averaged over all generators in service. If Sabey exceeds these limits for any reason, they violate the conditions of the permit and are subject to enforcement.

Since Sabey's initial construction in Quincy in 2011, they have required only a fraction of their allowable limits.

From Sabey's June 24, 2020 presentation:

- In the nine years that our Quincy facility has been operating, we have had a total of two unplanned outages, each lasting one hour.
- In the last five years, our generators have each run for an average of 13 hours per year.

Comment 9 – When does Ecology plan to update the dollar values for BACT? Shouldn't there have been incremental increases overtime? (draft BACT guidance, from 1990, if the cost is within 30% then it is acceptable) If this had happened repeatedly over the years since 1990, wouldn't the BACT costs be more in line with today's estimates?

Response to Comment 9 – Because BACT is determined on a "case-by-case" basis, Ecology does not have official BACT thresholds. Ecology may make a presumptive BACT determination based on what other similar sources have determined for BACT. However, while presumptive BACT is the preferred starting point for minor NSR BACT determinations, Ecology may also perform or require a top-down analysis (such as those presented for data centers). This allows Ecology to keep up to date with cost values and technologies, that while maybe not completely feasible for emergency engines with intermittent use today, may possibly evolve to be feasible in the future.

When cost thresholds are considered (keeping in mind that cost is not the only consideration for BACT determinations), Ecology has seen incremental increases over time as shown below.

1980s	Costs over about $2,000 per ton considered unreasonable
1990s-mid 2000s	Costs over $4,000 - $7,000 per ton considered unreasonable
~2017:	Costs below $5,000 considered reasonable

Costs between $5,000 and $10,000 Ecology takes a close look

Costs over $10,000 per ton considered unreasonable

Comment 10 – Is the 2014-2018 the most recent meteorological data available? Does it represent worse-case weather conditions when compared to other 5-year periods previously used?

Response to Comment 10 – 40 C.F.R. Part 51 Appendix W, section 9 describes the meteorological input data for modeling to be 5-year period, if National Weather Service data is used. This period is the most recent at the time of modeling and represents the average microclimatic condition of the area of interest. The use of 1-min Automated Surface Observing System data to minimize the calm/missing to less than 10% complements the dispersion model to produce a worse-case conditions (conservative) pollutant concentrations.

Comment 11 – Why hasn't Ecology required – after 13 years of data center construction – that meteorological data be collected in Quincy? Doesn't Appendix W recommend that?

Response to Comment 11 – Ecology has been collecting meteorological data at the Quincy air quality monitoring site since August 2017. When three full calendar years of data are available, we will require those data to be used in future permit applications.

Comment 12 – To use an in-stack ratio of 0.1 for NOx conversion to NO2, there must be a demonstration that this is accurate. Please provide documentation of the required demonstration proving that this conversion factor is in fact accurate.

Response to Comment 12 - EPA's clarification memo for NO2 modeling is **here** (https://www3.epa.gov/scram001/guidance/clarification/NO2_Clarification_Memo-20140930.pdf). Recommended values for in-stack ratio is also presented in the final report (also see **here:** https://www3.epa.gov/scram001/no2_isr_database.htm).

The last two performance tests conducted at Sabey (two engines in 2016 and two engines in 2020), all four engines tested had NO2 values of less than 10% NOx at all five loads tested (10%, 25%, 50%, 75%, and 100% load).

Comment 13 – Why is Ecology relying on Ozone calculations from Idaho DEQ? And for the years 2014-2017? The ozone data was collected in January. Does the value of 52 ppb reflect a winter ozone level, rather than a higher summer-time ozone level?

Response to Comment 13 – Idaho DEQ volunteered to host the site for the comprehensive Pacific Northwest States' gridded pollutant background values map, but Ecology led the effort. The 52 ppb reflects the year-round conditions driving the NO → NO_2 conversion in AERMOD. Please read the documentation on how the "Ozone for PVMRM" was determined.

Comment 14 – Is anyone in Ecology paying attention to the fact that our air quality background levels are rising? The rise will have an impact on health, which Ecology is to protect. How does Ecology justify allowing these levels to rise when controls could be used to prevent it?

Response to Comment 14 – We consider background levels of air pollutants as part of the ambient impact analyses. We use these analyses to determine if increased emissions from a new source may cause violations of ambient air quality standards.

Based on these analyses, the Quincy area meets ambient air quality standards. Washington regulations pertaining to new source review in attainment or unclassifiable areas (WAC 173-400-113) specifies that "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." Ecology determined that Sabey's proposed use of Tier II certified engines meets the BACT requirement.

Comment 15 – Why was Sabey allowed to use cost-analysis from other data centers rather than getting quotes directly from the vendors? Having quotes from multiple sources is the equivalent of split-sampling testing, i.e., it keeps people honest. Ecology should not allow one data center to use another's data for this reason. Ecology should want the "checks and balances" that come from multiple sources of information.

Response to Comment 15 – Sabey was allowed to use cost estimates for tier 4 controls from CyrusOne and Vantage Notice of Construction applications that had Approval Orders issued fall of 2019. Sabey conservatively averaged the add-on costs for the two sizes of engines previously permitted, 3.0 MW and 2.25 MW to provide an estimate for add on controls for their proposed 2.5 MW engines. Due to similar BACT determinations being quite recent, Ecology accepted the use of the previously used cost estimates for add on control equipment. If the determinations were more out of date, then, updated equipment costs might have been required.

Comment 16 – All emission impacts are off-site, which may put employees and others working onsite at risk. Why doesn't Ecology require NAAQS compliance inside the fence line?

Response to Comment 16 – Every new source or modification must demonstrate that it will not contribute to violations of the NAAQS. RCW 70.94.152(4); WAC 173-400-133(3). The NAAQS are set by federal law, (42 U.S.C. §7409(a) and 40 C.F.R. §50.17), and apply to the ambient air as defined in 40 C.F.R §50.1(e). Ambient air is defined as "that portion of the atmosphere, external to buildings, to which the general public has access." 40 C.F.R §50.1(e). Both the state Clean Air Act, RCW 70.94.030(4), and its implementing regulations, WAC 173-400-030(6), define "ambient air" to be consistent with the federal definition of ambient air in 40 C.F.R. §50.1(e) the air that is outside the restricted and controlled area of the facility to which there is no public access.

Comment 17 – Were emissions from nearby sources, e.g., existing Sabey engines, other data center engines, cooling towers, Imery, diesel storage tanks, etc., considered during modeling? Please specify, which, if any of these nearby sources were not included in modeling.

Response to Comment 17 – Existing Sabey and other Data Centers' Engines were not included in this modeling. However, their impacts were included in the cumulative analysis from their contribution in the local and regional background values. Sabey has shown that their new cooling towers and diesel fuel tanks were below the de Minimis thresholds and, hence they were not included.

Comment 18 – The public hearing that was held electronically would have excluded most of our Hispanic and low-income community that does not have access to internet or computers. How does Ecology justify its decision to hold this hearing electronically, rather than using other methods of outreach?

Response to Comment 18 – On March 24, 2020, Washington Governor Jay Inslee issued a proclamation suspending provisions of the state Open Public Meetings Act during the State of Emergency for the COVID-19 pandemic. As a result of that directive, Ecology is either postponing in-person meetings or shifting them online when possible. Our goal is to continue to honor the public's right to participate in environmental reviews and regulatory actions, while keeping people safe. We recognize that these restrictions may create barriers to participation for some Washington residents, and we are working to address these barriers. For this public meeting, we offered a call-in option, and we had a Spanish interpreter in attendance. We also added an extra week beyond the required 30 days for the comment period, knowing folks might need additional support.

Comment 19 – Is Sabey still releasing untreated water into the upper aquifer? This is an important question since the upper aquifer is connected to our drinking water aquifer, and as more water is extracted by the data centers, more of this contaminated aquifer recharges our drinking water supply. Please find out.

Response to Comment 19 – Ecology's Air Quality Program only has the authority to address air emissions, and is not knowledgeable about water discharges. The City of Quincy has delegated authority over industries discharging to their municipal and industrial wastewater treatment plants. You may contact Sam Snead, Operations Manager/Pretreatment Coordinator with Woodard & Curran at (509) 855-3360 to find out the answer to your question. Alternatively, you may contact Ecology's Vijay Kubsad with the Water Quality Program, who manages that delegation. To contact Mr.Kubsad, you may email *vijay.kubsad@ecy.wa.gov* or call (509) 329-3473.

Comment 20 – What is the Greenhouse gas equivalency of the emissions from Sabey? Does Sabey required to report their GHG emissions and equivalencies?

Response to Comment 20 – Based on the proposed facility wide fuel limits for Sabey of 550,616 gallons per year and AP-42 emission factor for CO2 and Methane in the VOC emissions (AP-42, Table 3.4-1), Sabey's potential to emit for CO2 equivalent (CO2e) is 6,146 tons per year. Facilities are required to report actual CO2e emissions if they are over 25,000 metric tons per year. Sabey is not required to report their CO2e emissions to EPA.

Comment 21 – Why hasn't Ecology taken the initiative to monitor Quincy's air for all of the criteria pollutants, to: 1) create a base line, and 2) protect our community?

Response to Comment 21 – We did monitor NO_2 and Diesel Particulate Matter (by proxy) in Quincy to create a baseline, and we still monitor $PM_{2.5}$ to help the community protect themselves from harmful exposure. There are no major sources releasing CO or SO_2 in the area, so no justification for the expense. In addition, Ecology invested substantial resources in determining statewide background levels of all criteria pollutants using a fusion of monitoring and modeling data.

Comments 22 – 34 from Danna Dal Porto

Comment 22

I have followed the data center construction in Quincy since the first public hearings regarding the operation of the Microsoft Columbia facility. Since that first construction, the Washington State Department of Ecology has made constant comments to assure the Quincy pubic that these data centers, and their diesel generators, are safe as permitted. I have contended, and will continue to declare, that these diesel generators, as permitted, are not safe.

Quincy is a rural, agricultural community with a population of 7,930 as reported by the City of Quincy (7/1/20). The footprint of the City is 5.1 square miles and all 8 of the computer data centers are clustered tightly inside the Quincy City limits. With the Sabey addition, Quincy will have 335 diesel generators, and that means that there is one diesel generator for every 23.67 residents of Quincy. All of these generators are operated regularly and emit various levels of toxic emissions, many exceeding the ASIL. Ecology regularly cites the railroad and the highway as sources of dangerous emission in Quincy. That is true, however, the emissions from the 335 generators is from a constant, static position as opposed to irregular emissions from vehicular traffic.

In the June 24, 2020, presentation Ecology submitted a map showing the areas in and around Quincy in which "ambient impacts from Sabey's project-related diesel emissions exceed the ASIL". (Chart labeled "Sabey's proposal required a higher level or review") The map shows most of the town of Quincy affected by emissions above the ASIL. And, as usual, Ecology tells the community that these "health risks are considered acceptable according to Washington rules" and bad things are "unlikely to occur" and "not likely to occur frequently or for sustained periods". I believe the effects of diesel contaminants in the air have seriously and negatively impacted the health of Quincy citizens.

Ecology documents regarding the health impacts of Sabey's Diesel Engine Exhaust (Palcisko, June 24,2020) include:

Effects on respiratory systems

Allergic reactions to particles in the lungs become worse

Heart attack and stroke in people who already have heart disease

Higher chance of lung infections

Impaired lung growth in children

Lung cancer and other forms of cancer

In air quality metrics, Ecology regards cancer as the measuring tool for diesel emissions. Cancer is a long-term disease that might take years to measure. I believe respiratory disease is more measurable and more immediate in the Quincy community, especially because of COVID-19.

The COVID-19 outbreak in Washington State has affected all residents but the number of cases in Quincy is greatly elevated above other communities in Grant County.

Grant County Department of Health information from July 8, 2020

QUINCY: Population 7930. 168 confirmed cases of COVID-19: one (1) in 47 residents test positive for COVID-19. The rate of infection is 2.11%

MOSES LAKE: Population 24,009. 193 confirmed cases of COVID-19: The rate of infection is .80%

I am requesting Ecology study and report back discussing the disparity in infection rates between Quincy and Moses Lake. I want the Washington State Health Department to make an official comment on the probable effects of diesel emissions on the health of Quincy residents, specific to COVID-19.

> **Response to Comment 22** - Ecology does not have the expertise to evaluate COVID-19 occurrences or the reasons that the disease incidence varies between communities. International and national studies provide evidence that air pollution may worsen COVID-19 effects, and we acknowledge that air pollution is linked to a variety of health concerns. Our role in permitting proposed sources of air pollution is to ensure that any increase in air pollutants meets all legal requirements. Such requirements were put in place to prevent air quality from becoming unhealthy.

Comment 23 -

Given the communities of Quincy and Moses Lake are similar in most respects, the most important difference in health implications is the presence, in Quincy, of 335 diesel generators, each operating at frequent random times throughout the year. If each engine is tested monthly, there is not one day without at least one, if not numerous, locomotive-size diesel engines operating. Throughout the years, Ecology has allowed data center developers to use cost analysis (too expensive) to avoid putting on emission controls to lower the toxic emissions over Quincy residents. It is morally and ethically wrong to put a value on the quality of human life but that is the effect of not requiring the best (not the least expensive) available emission controls on these diesel engines. I am asking Ecology to respond to the tons of emissions from Sabey without the best, most effective emissions controls, not the cheapest emission controls. Is Ecology going to continue to allow these levels of emissions to continue in Quincy without making the companies install better quality controls? This is a request for better controls on the emissions of PM 10, DEEP and NOX. I am requesting the reasons for your not requiring better emission controls. Unofficial sources report that more data centers are being considered for Quincy as well as rural George. Is Ecology going to allow data center development to continue with substandard emission controls for community protection? Please respond to this specific question.

> **Response to Comment 23 –** Currently, Sabey is the only Data Center Notice of Construction application in process for the Quincy area. All new projects that trigger New Source Review will require a Best Available Control Technology (BACT) analysis. BACT does include a cost evaluation as well as environmental and energy impacts.

> BACT as defined in WAC 173-400-030: "Best available control technology (BACT)" means 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 C.F.R. Part 60 and Part 61

Comment 24 -

Ecology documents presented on-line for the Public Hearing list the potential Maximum One Year Emissions from the (Sabey) Expansion Project: 75.37 tons of emissions.

75.37 tons is the tonnage from Sabey's 69 diesel engines and that would be 1.09 average tons per engine.

Because Ecology has permitted 266 diesel engines in Quincy, (not counting Sabey) the total emissions over Quincy would be 289.94 tons of material containing Nitrogen Oxide (NOX), Carbon Monoxide (CO), Particulate Matter (PM10), Volatile Organic Compounds (VOC), and Diesel Engine Exhaust Particulate (DEEP).

Adding the 75.37 tons from Sabey to the other data center emissions, the yearly tons of emissions over Quincy are 365.31 TONS.

Over ten years, that is 3,653.1 tons and the expected life of the data centers is 20 + years.

That is an incredible amount of toxic material spread out, every year, day after day, on my community. [On a housekeeping note: Ecology did not list the DEEP tons (1.71) on the Notice of Comment Period for Sabey. Since Ecology focuses on the DEEP materials for their measurement of cancer, this is an important omission in a public notice.]

The Seattle Times newspaper printed an article on June 19, 2020, (Page D-1) by Laura Watson, Director, Washington State Department of Ecology. Her Opinion piece in the newspaper was in reference to the "massive rollback of our nation's environmental protections". Ms. Watson writes that by rolling back protections: "Who pays the price? Often communities of color and people living in underprivileged neighborhoods. These populations are disproportionately burdened by air and water pollution, and by exposures to toxics in their communities and at their jobs." …"More that 1,000 Washingtonians die each year from outdoor air pollution. Studies show that diesel and industrial emissions exact a disproportionate toll on communities

…and have been linked to higher cancer risk, asthma and other health concerns. And several national studies have linked increased air pollutions exposure to worse outcomes for people who have contracted COVID-19." The Watson article concludes: "We (Washington State) commit to making decisions that do not place disproportionate burdens on communities of color, and we seek to lift the weight of pollution and contaminations borne by those communities today." I am requesting that Ms. Watson comment on my letter outlining the disproportionate toxic pollution in Quincy that could be prevented by the instillation of higher quality and more effective emission controls.

Data provided by the City of Quincy lists the July 2019, percentage of Hispanic population of Quincy as 76.6% The Hispanic school population in Quincy has been as high as 86%. This is a community of color. This is an underprivileged community, exactly the type of community Ms. Watson focuses on to protect and to "lift the weight of pollution". I want to know if, under her guidance, the City of Quincy will see more protections from toxic air pollution and enforcement of stricter ruler regarding emissions, specifically NOX, PM10 and DEEP.

Response to Comment 24 - We recognize that Quincy is a highly diverse community with a significant Latinx population, and environmental justice is a routine consideration in our activities. Our efforts to meaningfully engage the Latinx community, combined with our data collection and scientific evaluation of the airshed, show our high level of commitment to the community.

- We strive to ensure our public participation opportunities are accessible to as many members of the community as possible; this includes reducing barriers to engagement for the Latinx community. For example, we advertise comment periods in the local Spanish language newspaper, translate information for online access and in-person events, and provide interpretation services at our public meetings.
- We perform the same scientific analyses required by state and federal law in order to issue Notice of Construction permits for the Quincy community as we do anywhere else in Ecology's jurisdiction.
- We placed a monitor within Quincy at 330 3rd Avenue NE. This monitor is operational with data available 24 hours a day each day of the week. You can view the information from this monitoring site at: https://enviwa.ecology.wa.gov/home/map . Currently the site records weather and PM 2.5 data. Data show PM 2.5 and NO_2 levels meet the National Ambient Air Quality Standards. PM2.5 levels found in the Quincy area are similar to other nearby sites.
- We recently performed an analysis of the data center impacts in the Quincy area and are in the process of finalizing the report. We will translate and publish the Executive Summary in Spanish. We are also working on a visual tool summarizing the information in the report that the community can access online. These resources will be available in the coming months.

We carefully evaluate all data center Notice of Construction applications against federal and state regulations. None of these regulations and evaluation standards in reviewing this permit request have been put on hold or relaxed as a result of COVID-19. We continue to protect Quincy's air quality through our evaluation of control technology and review of health impacts:

- Diesel engine controls that cost more do not necessarily perform better than lower cost options. Some controls are designed to work more effectively when the engines run at a high load, and work less efficiently at lower engine loads. So, engine operations are a consideration in our evaluation of best available control technology.
- The health impact analyses that data centers perform and we evaluate are required under the Washington State's Clean Air Act (Chapter 70.94 RCW) and the toxics rule (Chapter 173-460). Our rule builds on EPA's rules to provide increased stringency and a more thorough review of new sources of toxic air pollutants. Our regulation of toxic air pollutants, such as diesel engine exhaust particulate, limits the risk posed by hazardous air pollutants emitted by emergency engines. Whereas EPA's rules rely on available technological controls to minimize health risks. Our toxics rule's increased stringency results in permit requirements, such as:
- Exhaust stack location, height, dimension, etc. (Some data centers in other states have engines with horizontal exhausts at only a few meters height.)
- Routine maintenance and testing of emergency engines only during daytime hours to ensure enhanced pollutant dispersion.
- Lower limits on hours of emergency engine use. (NSPS allows up to 100 hours for routine maintenance and testing of emergency engines.)Restricting how facilities use emergency engines. For example, we do not allow engines to be used for non-emergency situations to supply power as part of a financial arrangement with another entity. EPA's NSPS allows emergency engines to be used for up to 50 hours per year for this purpose.

SPECIFIC COMMENTS AND QUESTIONS

Comment 25 -

I appreciate the inclusion of the map with the entire distribution of data centers and their diesel engines presented by Gary Palcisko. ("Background Sources of Diesel Particulates in Quincy")

I intensely dislike like the maps presented in the Sabey documents that utilize "dots" for information on emissions. The "dots" blur the landforms and structures under the "dots" and make the maps less than useful, actually make the information unusable: Figure 4-1 DPM First Tier Model Results, Figure 4-2 No2 First Tier Modeling Results. The maps prepared by Mr. Palcisko are informative and allow for reader understanding of the landforms and structures under emission spread. Mr. Palcisko makes good maps.

> **Response to Comment 25** – Thank you for your feedback. We appreciate the compliment. We review the modeling information and make our own maps to verify that the applicant identifies the key receptors impacted by project-related emissions.

Comment 26 - I object to the use of meteorological data from the airport in Moses Lake and Spokane. I would like weather data to be local, not 50 to 150 miles away. Please comment.

Response to Comment 26 – Ecology has been collecting meteorological data at the Quincy air quality monitoring site since August 2017. When three full calendar years of data are available, we will require those data to be used in future permit applications.

Comment 27 - Does Quincy still have an air monitoring station? How do I access that information? Please comment.

Response to Comment 27 – Yes, $PM_{2.5}$ and meteorological parameters are still measured continuously in Quincy. The monitor is located at 330 3rd Avenue NE. All our air quality monitoring data are available on our website at https://enviwa.ecology.wa.gov.

Comment 28 - I could not read the Trinity Consultant posting online. The format was not possible to read. Please comment.

Response to Comment 28 – The documents for this project were posted in PDF format. If you'd like to try again, the permit documents are available on our webpage, www.ecology.wa.gov/datacenters in the "Quincy - Sabey Intergate" folder. If it still doesn't work for you, feel free to make a public records request at www.ecology.wa.gov/publicrecords .

Comment 29 - I want to know if Ecology is still going to allow expense to drive the selection of emission controls. Please comment.

Response to Comment 29 – All new projects that trigger New Source Review will require a Best Available Control Technology (BACT) analysis. BACT does include a cost evaluation as well as environmental and energy impacts.

BACT as defined in WAC 173-400-030: "Best available control technology (BACT)" means 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 C.F.R. Part 60 and Part 61….

Comment 30 - I am looking forward to hearing from Laura Watson regarding her Seattle Times Opinion piece and my observations about the lack of environmental protection for Quincy residents. Please comment.

Response to Comment 30 – Ecology believes we are following through on our commitment to not disproportionately burden communities for the reasons listed in our Response to Comment number 24.

Comment 31 - As I guessed at the total tons of toxic emissions based on an average of Sabey's emission tons, I want Ecology to give me a break down of yearly emission tons for NOX, PM10, and DEEP from each of the data centers located in Quincy. Please respond.

Response to Comment 31 – Please see the following table of potential emissions of NOx, PM10, and DEEP for all data centers in Quincy. Please note that NOx emissions in 2018 were only 3% of what was permitted and that is reflected in the projected emissions. PM10 and NOx are not toxic air pollutants, NO2 is a TAP and it is estimated to be 10% of NOx.

Source	**Pollutant**	**Emissions in 2016 (tons/yr)**	**Projected Actual Emissions (tons/yr)**	**Potential to Emit (tons/yr)**
All Quincy Data Centers	DEEP	0.59	1.25	5.01
	PM10			54.48
	NOx		12.76	425.43
CyrusOne	DEEP			0.62
	PM10			2.30
	NOx			36.00
H5 Data Center	DEEP	0.05	0.07	0.60
	PM10			0.60
	NOx		2.07	69.00
Microsoft Columbia Data Center	DEEP	0.08	0.08	1.03
	PM10			14.23
	NOx		1.17	39.00
Microsoft MWH Data Center	DEEP	0.31	0.69	1.10
	PM10			25.00
	NOx		1.92	64.00
NTT	DEEP	0.02	0.02	0.13
	PM10			0.13
	NOx		0.11	3.55
Sabey	DEEP	0.04	0.11	2.12
	PM10			5.92
	NOx		2.85	94.88
Vantage	DEEP	0.06	0.21	0.20
	PM10			0.80
	NOx		0.72	24.00
Oath (fka Yahoo)	DEEP	0.03	0.06	1.80
	PM10			5.50
	NOx		2.85	95.00
SR 28	DEEP	0.60	0.60	0.60
SR 281	DEEP	0.16	0.16	0.16
BNSF - locomotive	DEEP	1.23	1.23	1.23

Source	Pollutant	Emissions in 2016 (tons/yr)	Projected Actual Emissions (tons/yr)	Potential to Emit (tons/yr)
Other sources, agricultural equipment, local road traffic, construction and other diesel equipment	DEEP	2.10	2.10	2.10
Total for DEEP	DEEP	4.66	5.32	9.09
SR 28 and SR 281 emissions based on 2019 vehicle miles traveled. Locomotive emissions based on 2015 data. Other (area) source emissions based on 2014 county-wide totals adjusted by spatial surrogates such as land use and population.				

Comment 32 - I want to know if Quincy and George are getting more data centers. I saw one newspaper article about another expansion at Microsoft but no public notice about that expansion. Is there more expansion at Microsoft? Please comment.

> **Response to Comment 32 –** After this comment period ended, Ecology's Air Quality Program received a request for a pre-application meeting for another possible data center in Quincy. This is the only possible data center project of which we are aware.

Comment 33 - I want it in the record that the City of Quincy is still working on the water recycle/reuse system. Each of these data centers uses huge amounts of water and, as of today, the City of Quincy recycle/reuse of this water is not resolved. The Sabey Project Description has a paragraph about water use. (Page 8 of 13 TSD) "Sabey will include 176 Munters Model PV-W35-PVT cooling units…Each of the units has a design recirculation rate of 80 gallons per minute (gpm) …" Simple calculations of 176 multiplied by 80 gallons per minute equal 14,080 gallons of water per minute. That is a huge amount of water and I am not clear if that water is recirculated within the Sabey facility and reused. Please provide me clarification of that important distinction on Sabey water use. I have been told in the past that the Ecology data center Public Hearing is for air quality ONLY and will not address other related issues. Perhaps it is time to look into any other environmental issues surrounding the location of industrial facilities and their affect on local communities and economies, such as water availability and water quality. If water access becomes an issue, I have on record that the regional agricultural facilities would loose water before the data centers would loose water. The resulting cascade of economic and personal loss would be huge. If the processing plants loose water, all workers, farmers and the entire economy of Quincy would be at risk. I want to know if anyone in a position of authority is considering these issues. I am asking for the name and phone number/email address of a person at Ecology to contact in order to discuss my Quincy water access issues. Please respond.

> **Response to Comment 33 –** The State Environmental Policy Act (SEPA) requires an evaluation of environmental impacts from proposed projects prior to agencies issuing permits. Sabey completed the SEPA process for this project on July 18, 2019.

Ecology's Air Quality Program only has the authority to address air emissions. Ecology's Water Resources Program manages water supply. To discuss your concerns with water availability, please call the Ecology Eastern Regional Office's main phone line at (509) 329-3400 and ask to speak with the Water Resources Program. The City of Quincy has delegated authority over industries discharging to both their municipal and industrial wastewater treatment plants. You may contact Sam Snead, Operations Manager/Pretreatment Coordinator with Woodard & Curran at (509) 855-3360. Ecology's Vijay Kubsad with the Water Quality Program manages that delegation. To contact Mr.Kubsad, you may email *vijay.kubsad@ecy.wa.gov* or call (509) 329-3473.

Comment 34 - The Sabey documents contain various numbers regarding the increased cancer risk for Quincy residents.

The May 29, 2020. Letter from Chris Hanlon-Meyer (Ecology) to David Knight (Ecology) has a bullet point that says: "The increase in emissions of TAPs is not likely to result in an increase cancer risk of more than 5 one in one hundred thousand (10 in one million) which is the maximum risk allowed by a Second Tier review."

The document "Sabey Intergate-Quincy Bldgs D & E Project: Review of Estimated Health Impacts from Sabey's Diesel Engine Exhaust, Gary Palcisko has two numbers regarding cancer. Sabey's increased emissions: Increased cancer risk of up to 5.6 in one million. Exposure to cumulative diesel emissions: Increased cancer risk of about 70 in one million.

As a reader, I cannot determine the cancer risk based on these various numbers. Please clarify the cancer risk with one determinate number. I would appreciate one number that is consistent through out the document to see how well, or how poorly, Ecology is protecting the health of Quincy residents.

Response to Comment 34 – Documents prepared by Sabey and Ecology present the risks attributable to Sabey's increased emissions (project-related risk) and risks attributable to all known sources of diesel emissions in the Quincy area (cumulative risks). To be clear, the maximum estimated risks presented in Ecology's documents are:

- Project-related risk – 5.6 in one million
- Cumulative risk- 68 in one million

The bullet point specified in the May 29, 2020 letter from Chris Hanlon-Meyer to David Knight regarding Second Tier Toxics Review Petition by Sabey Data Center Properties specifies that:

- "The increase in emissions of TAPs is not likely to result in an increase cancer risk of more than one in one hundred thousand (10 in one million) which is the maximum risk allowed by a Second Tier review. "

This bullet point describes the maximum risk allowed from a new source of toxic air pollutants according to current Washington regulations. Because the risk from Sabey's project (5.6 in one million) is less than 10 in one million, the project meets approvable risk criteria specified in WAC 173-460-090.

Finally, in Ecology's June 24th presentation, we provided an inexact estimate of cumulative risk of "about 70 in one million." We apologize for any confusion this caused as documents available for public review specified a cumulative risk of 68 in one million.