



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

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September 9, 2026

Will Strand
Department of Ecology
Air Quality Program
Central Regional Office
1250 W. Alder Street
Union Gap, WA 98903-0009

**Re: Second Tier Toxics Review – PUD No. of Chelan County
Rocky Reach Dam Emergency Generator**

Dear Will:

We have completed our review of health risks from diesel engine exhaust particulate (DEEP) emissions from an emergency generator at Rocky Reach Dam operated by PUD No. 1 of Chelan County (Chelan PUD).

Chelan PUD requires the use of a Caterpillar C18 emergency generator to provide backup power at Rocky Reach Dam, north of Wenatchee, WA. The generator is powered by a 1,112-bhp diesel engine. The engine will be used for routine maintenance and readiness testing and to provide emergency backup power. Although the engine will be limited to 110 hours of operation per year, its estimated emissions and impacts exceed regulatory thresholds that require a second tier toxics review under WAC 173-460-090.

Ecology used a streamlined process to evaluate whether emissions from an emergency engine with a rating of 2,000 bhp or less meet the acceptability criteria for a second tier toxics review. We determined that the increase in DEEP emissions from this engine could result in an increased cancer risk of up to nine in one million (9×10^{-6}) at the location with the highest modeled impact. This location is approximately 500 meters southwest of the engine exhaust.

We find that the health risks from Chelan PUD's project are permissible under WAC 173-460-090 because:

- The increase in TAP emissions is not likely to increase cancer risk by more than one in one hundred thousand (10 in one million), which is the maximum risk allowed under a second tier review.

- The non-cancer health hazard is acceptable.

The applicant has satisfied all requirements of a second tier analysis.

If you would like to discuss this project further, please contact Gary Palcisko at gary.palcisko@ecy.wa.gov or 360-995-3447.

Sincerely,

A handwritten signature in blue ink, appearing to read "Chris Atherly", with a long horizontal flourish extending to the right.

Chris Atherly
Science and Analysis Section Manager
Air Quality Program

gp/tm

Enclosure



**Second Tier Review
Recommendation for:**

**Chelan PUD Rocky Reach Dam
Emergency Generator
Chelan County, WA**

**Air Quality Program
Washington Department of Ecology
Olympia, Washington**

September 2026

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Second Tier Review Recommendation for:
Chelan PUD Rocky Reach Dam
Emergency Generator
Chelan County, Washington

Air Quality Program
Washington Department of Ecology
Olympia, WA



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Executive Summary

This document summarizes a streamlined review of health risks from increased toxic air pollutant emissions from an emergency diesel generator at Public Utility District No. 1 of Chelan County (Chelan PUD) at Rocky Reach Dam, north of Wenatchee, Washington.

Overall, the increase in toxic air pollutants near Rocky Reach Dam is not expected to result in excessive cancer risk or cause serious short- or long-term health effects. Ecology concludes that the health risk is acceptable and recommends approval of the project.

Chelan PUD requires the use of a Cummins C18 emergency generator to provide backup power at Rocky Reach Dam. The generator is powered by a 1,112-brake-horsepower diesel engine. The engine will operate for routine maintenance and readiness testing and when emergency backup power is needed. Although the engine will be limited to 110 hours of operation per year, its estimated emissions and ambient impacts exceed regulatory criteria that require a second tier toxics review under WAC 173-460-090.

Ecology's Air Quality Program developed a streamlined second tier review process for emergency engine projects with less than 2,000 cumulative brake horsepower. The process uses a screening dispersion model to determine whether emissions from a qualifying emergency engine project meet health risk criteria. The streamlined process is intended to avoid significant costs for applicants, including the cost of hiring consultants to prepare a health impacts assessment and paying Ecology's standard second-tier review fee, while still ensuring that any increase in health risks is acceptable.

Chelan PUD's emergency engine project qualifies for the streamlined second tier review because its total engine capacity is less than 2,000 brake horsepower.

Conclusions

Ecology used engine-specific information and a dispersion model to estimate ambient impacts associated with diesel particulate emissions.

The increased diesel particulate emissions from the emergency generator are estimated to result in a maximum additional lifetime cancer risk of less than 10 in one million for residents, workers, and other receptors near Rocky Reach Dam. The highest estimated risk, about nine in one million, would occur for residents living about 500 meters southwest of the emergency generator.

The property where this potential exposure occurs is classified as "open land" for tax purposes, but a mobile home is located on the property. Because Ecology used AERMOD in screen mode to estimate air impacts, the estimated impacts and health risks are likely higher than actual impacts and risks.

- Ecology assumes that residents are continuously exposed to project-related diesel exhaust particulate for 70 years when assessing lifetime cancer risk.
- Cancer risk can be described as the increase in an individual's chance of developing cancer or as the additional number of cancer cases expected in a population of one million people. For this review, Ecology assessed the increased risk for people who could have the highest exposure near the facility.
 - The estimated cancer risk from diesel exhaust particulate represents an increase above the baseline lifetime cancer risk, which is about 40 percent in the United States.
- Lifetime exposure to “background” levels of diesel particles in the area results in a risk of about 9 in one million.
- Exposure to diesel particles from the project is not expected to cause long-term non-cancer health effects.

Ecology’s recommendation

Ecology recommends approval of the project because:

- Emission controls for the new and modified emission units represent best available control technology for toxics.
- The increase in toxic air pollutant emissions is not expected to increase cancer risk by more than one in one hundred thousand (10 in one million), which is the maximum risk allowed under a second tier review.
- The estimated non-cancer health hazard is acceptable.

Streamlined Second Tier Review Processing and Approval Criteria

Ecology used a streamlined second tier review process to evaluate the proposed increase in diesel particulate emissions from Chelan PUD's emergency generator. This process is limited to a narrow set of circumstances and is based on Ecology's experience reviewing projects that require a second tier review for diesel particulate emissions.

Streamlined second tier review processing requirements

Ecology agreed to use the streamlined review process for Chelan PUD's proposed emergency generator because the engine at Rocky Reach Dam is rated at less than 2,000 brake horsepower (bhp).

Under a streamlined second tier review, the project must meet the following requirements under WAC 173-460-090:

- (a) The permitting authority must determine that all other requirements for processing the Notice of Construction (NOC) Order of Approval have been met and must issue a preliminary approval order.
- (b) The emission controls included in the preliminary NOC approval order must represent at least best available control technology for toxics (tBACT).
- (c) The ambient impact of increased emissions of each toxic air pollutant (TAP) that exceeds its acceptable source impact level (ASIL) must be quantified.

Acting as the "permitting authority" for this project, Ecology's project permit engineer satisfied item (a) and verified item (b) above on August 28, 2026.¹ To satisfy item (c), Ecology used AERMOD in screen mode to conservatively estimate ambient impacts in the area around Rocky Reach Dam.

All streamlined second tier review processing requirements have been met.

Second tier review approval criteria

Under WAC 173-460-090(7), Ecology may recommend approval of a project that is likely to exceed the ASIL for one or more TAPs only if:

- (a) Ecology determines that emission controls for the new and modified emission units represent tBACT.

¹ Anna Potopova, "Chelan PUD NOC and TSD for your review," email with attachments, August 28, 2026.

- (b) The applicant demonstrates that the increase in TAP emissions is not likely to result in an increased cancer risk greater than one in one hundred thousand.
- (c) Ecology determines that the non-cancer health hazard is acceptable.

tBACT determination

Ecology's permit engineer determined that the pollution controls proposed by Chelan PUD represent the BACT and tBACT requirements for diesel engines (Ecology, 2026).

For diesel particulate emissions, BACT and tBACT are met by limiting operation of EPA Tier-2 certified engines, as defined in 40 C.F.R. 60.4219, and complying with the applicable operation and maintenance requirements in 40 C.F.R. Part 60, Subpart IIII.

Streamlined Second Tier Review

This review quantifies the non-cancer health hazards and increased cancer risks associated with diesel engine exhaust particulate (DEEP) emissions from Chelan PUD's emergency diesel generator.

Diesel engine exhaust particulate toxicity values

Ecology identified toxicity values for DEEP from two agencies: the U.S. Environmental Protection Agency (EPA) (EPA, 2002; EPA, 2003) and the California EPA's Office of Environmental Health Hazard Assessment (OEHHA) (CalEPA, 1998).

These agencies developed toxicity values from studies of animals exposed to known concentrations of DEEP or from epidemiological studies of people exposed to DEEP. These values represent concentrations at or below which adverse non-cancer health effects are not expected. They also provide a way to estimate the increased cancer risk from exposure to a carcinogen.

Table 1 shows the DEEP non-cancer and cancer toxicity values identified by Ecology.

EPA's reference concentration (RfC) and OEHHA's reference exposure level (REL) for diesel engine exhaust, measured as DEEP, are based on dose-response data showing inflammation and changes in the lungs of rats exposed through inhalation. Both agencies established a concentration of five micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) as the level of DEEP in air at which long-term exposure is unlikely to cause adverse non-cancer health effects.

EPA has established National Ambient Air Quality Standards (NAAQS) and other regulatory toxicological values for short- and intermediate-term exposure to particulate matter. However, specific values for DEEP exposure over these time periods are not currently available.

OEHHA developed a unit risk factor (URF) to estimate cancer risk from exposure to DEEP. The URF is based on a meta-analysis of several epidemiological studies of people who were exposed to DEEP at work. In these studies, researchers estimated exposure using measurements of elemental carbon and respirable particulate matter associated with fresh diesel exhaust.

For this review, Ecology defines DEEP as the filterable fraction of particulate matter emitted by diesel engines.²

The URF represents the upper-bound probability of developing cancer from continuous lifetime exposure to a substance at a concentration of one microgram per cubic meter ($1 \mu\text{g}/\text{m}^3$). It is expressed in units of inverse concentration [i.e., $(\mu\text{g}/\text{m}^3)^{-1}$].

² Condensable particulate does not represent DEEP to assess health risks from DEEP exposure.

OEHHA's URF for DEEP is 0.0003 per $\mu\text{g}/\text{m}^3$. This means that continuous lifetime exposure to one $\mu\text{g}/\text{m}^3$ of DEEP is estimated to result in an increased individual cancer risk of 0.03 percent, or approximately 300 additional cancer cases per million people exposed.

Table 1: Toxicity Values or Comparison Values Considered in Assessing and Quantifying Non-cancer Hazard and Cancer Risk

Pollutant	Agency	Non-cancer	Cancer
DEEP	U.S. Environmental Protection Agency	RfC ¹ = 5 $\mu\text{g}/\text{m}^3$	NA ²
DEEP	California EPA–Office of Environmental Health Hazard Assessment	Chronic REL ³ = 5 $\mu\text{g}/\text{m}^3$	URF ⁴ = 0.0003 per $\mu\text{g}/\text{m}^3$

¹ RfC – Reference Concentration

² EPA considers DEEP to be a probable human carcinogen but has not established a cancer slope factor or unit risk factor.

³ REL – Reference Exposure Level

⁴ URF – Unit Risk Factor

AERMOD screen mode assessment of ambient impacts

For a streamlined assessment, Ecology uses AERMOD in screen mode with site-specific inputs to estimate the maximum 1-hour concentration at numerous receptors within a receptor grid covering the modeling area.

Ecology then applies adjustment factors of 0.6 and 0.1 to estimate 24-hour and annual concentrations, respectively, from the 1-hour concentrations.

Concentrations estimated using AERMOD in screen mode are generally considered conservative estimates of ambient impacts. In other words, the model is likely to overestimate actual concentrations around the emission source.

Particulate emissions and exhaust parameters

Ecology used potential site variation (PSV) emissions data from Caterpillar to estimate the amount of particulate matter, or DEEP, emitted by the engine at different operating loads (Geosyntec Consultants, 2026). These estimates are shown in Table 2.

Table 2: Particulate Emissions and Physical Exhaust Parameters Based on Caterpillar C18 Potential Site Variation Emissions Specifications

Load (%)	DPM Emission Rate (lb/hr)	Exhaust Exit Temp (F)	Exhaust Flow Rate (cfm)
100	0.14	847.3	2068

Load (%)	DPM Emission Rate (lb/hr)	Exhaust Exit Temp (F)	Exhaust Flow Rate (cfm)
75	0.15	765.3	1948
50	0.09	659.1	1481
25	0.11	601.4	961
10	0.32	500	665

AERMOD screen mode scenario runs – load analysis

Ecology used Lakes Environmental Software’s AERMOD View version 13.0.0 to run multiple scenarios and estimate ambient impacts at each of the five engine loads in Table 2. The model inputs are summarized in Table 3.

Ecology ran five AERMOD screen mode scenarios, one for each engine load. For each scenario, Ecology conservatively assumed that the engine would operate continuously for 8,760 hours per year at that load.

Table 3: AERMOD Screen Mode Model Source Parameters

Stack Parameters	Notes	Value
UTM coordinates Zone 10 N	Reported in NOC application (Geosyntec Consultants, 2026)	(703231, 5267786)
Release height (m)	Estimated release height (m)	2.68
Base elevation	Use imported DEMs and source coordinates to determine the base elevation	AERMAP-calculated 208.5 m
Emission rate (g/s)	load-specific PSV emissions rate	Load-specific – see Table 2
Gas exit temperature (C)	Load specific data from the spec sheet	Load-specific – see Table 2
Stack inside diameter (m)	Estimated based on similar engines from other applications	0.152
Gas exit velocity (m/s)	Based on flow rate and inside stack diameter	Load-specific – see Table 2
Gas exit flow rate (ft ³ /min)	Load specific from the specification sheet	Load specific

AERMOD screen mode output and concentration adjustments

Ecology used AERMOD in screen mode with site-specific model inputs to estimate 1-hour screening concentrations at distances from the source. For each scenario, Ecology assumed that the engine would operate continuously (i.e., 8,760 hours per year).

In reality, the engine will operate only for maintenance and readiness testing and during power outages. Based on reliability indices from Chelan PUD, power outages appear to be infrequent.

To estimate the annual average DEEP concentration, Ecology adjusted the 1-hour screening concentrations from AERMOD using the number of hours the engine is allowed to operate each year. The calculation uses the 110 annual operating hours allowed by the permit, divided by 8,760 hours per year, and an additional 0.1 adjustment factor for converting the 1-hour concentration to an annual concentration:

$$\text{Annual concentration} = 1\text{-hour model concentration} \times (110 \text{ hours/year} \div 8,760 \text{ hours/year}) \times 0.1$$

The 0.1 factor is the AERSCREEN 1-hour-to-annual concentration adjustment factor.

The model results showed that the highest ambient impact would occur when the engine operates at 10 percent load. To assess the worst-case ambient impact and health risk, Ecology therefore assumed that the engine would always operate at 10 percent load.

Community and receptors

The emergency generator at Rocky Reach Dam is located next to the dam in an area that is primarily rural public land owned by either Chelan PUD or the Washington Department of Fish and Wildlife. The public does not have access to the area immediately surrounding the generator. However, there is a day-use area near the dam and the Rocky Reach Dam Discovery Center, both of which provide public access.

A few isolated parcels nearby are privately owned. One of these parcels, approximately 500 meters southwest of the proposed generator, contains a mobile home.

Ecology identified residential, commercial, and boundary receptors near the facility to assess potential exposure and health risks from the project's diesel engine emissions. These receptors are listed in Table 4 and shown in Figure 1.

Table 4: Estimated Annual Average DEEP Concentrations at Key Receptor Locations

Receptor	UTM X	UTM Y	Annual AERSCREEN DEEP Concentration at Receptor ($\mu\text{g}/\text{m}^3$)
MIRR	702881	5267436	0.031
MIBR	703206	5267773.5	0.081
MICR	703193.5	5267811	0.063

MIRR – Maximally impacted residential receptor

MICR – Maximally impacted commercial receptor

MIBR – Maximally impacted boundary receptor

Background concentrations of TAPs in ambient air

When reviewing increases in TAP emissions under second tier review, WAC 173-460-090 specifies that:

Background concentrations of TAPs will be considered as part of a second tier review. Background concentrations can be estimated using:

- The latest National Ambient Toxics Assessment data for the appropriate census tracts; or
- Ambient monitoring data for the project's location; or
- Modeling of emissions of the TAPs subject to second tier review from all stationary sources within 1.5 kilometers of the source location.

Table 5 shows the background DEEP concentration identified near the facility using EPA's 2021 air toxics data³ (EPA, 2026).

Table 5: Estimated "Background" Annual Average DEEP Concentration near Chelan PUD's Rocky Reach Dam

Source	Average Annual Diesel Particulate Concentration ($\mu\text{g}/\text{m}^3$)
2021 – EPA Air Toxics Data for Census Block 530079607003017	0.030

³ This data are similar to the National Ambient Toxics Assessment which EPA no longer produces.

Increased cancer risk

Ecology assessed the increased risk of cancer from lifetime exposure to DEEP emitted by Chelan PUD's emergency engine. Ecology characterized cancer risk consistent with EPA guidance for inhalation risk assessment (EPA, 2009), using the following equations:

$$\text{Risk} = \text{IUR} \times \text{EC}$$

Where:

IUR ($\mu\text{g}/\text{m}^3$)⁻¹ = inhalation unit risk (i.e., unit risk factor); and

EC ($\mu\text{g}/\text{m}^3$) = exposure concentration

$$\text{EC} = (\text{CA} \times \text{ET} \times \text{EF} \times \text{ED})/\text{AT}$$

Where:

EC ($\mu\text{g}/\text{m}^3$) = exposure concentration;

CA ($\mu\text{g}/\text{m}^3$) = contaminant concentration in air;

ET (hours/day) = exposure time;

EF (days/year) = exposure frequency;

ED (years) = exposure duration; and

AT (70-year lifetime x 365 days/year x 24 hours/day) = averaging time

Cancer risk attributable to Chelan PUD's increased DEEP emissions

Table 6 shows the estimated cancer risk from Chelan PUD's DEEP emissions for residential, commercial, and boundary receptors. These receptors have the highest estimated exposure to diesel emissions from the project. Figure 1 shows the locations of these receptors relative to the emergency generator at Rocky Reach Dam.

The highest estimated increase in cancer risk from Chelan PUD's emissions is about nine in one million⁴ for residents of a home located 500 meters southwest of the emergency generator.

Commercial workers and boundary receptors have lower estimated risks, mainly because Ecology assumes they are exposed less frequently than residential receptors.

⁴ The number per million represents an upper-bound theoretical estimate of the number of excess cancers that might result in an exposed population of one million people compared to an unexposed population of one million people. Alternatively, an individual's increase in risk of one in one million means a person's chance of getting cancer in their lifetime increases by one in one million or 0.0001 percent.

Exposure to existing “background” levels of DEEP in the area results in an estimated cancer risk of about nine in one million for residential receptors.

Table 6: Estimated Increased Cancer Risk for Residential and Commercial Receptors Attributable to Chelan PUD’s DEEP Emissions

Exposure Parameter	MIRR	MICR	MIBR
CA – Rocky Reach generator- related concentration in air ($\mu\text{g}/\text{m}^3$)	0.031	0.063	0.081
CA background – concentration in air from "background" sources ($\mu\text{g}/\text{m}^3$)	0.030	0.030	0.030
ET - Exposure Time (hours per day)	24	8	2
EF - Exposure Frequency (days per year)	365	250	250
ED - Exposure Duration (years)	70	40	30
AT - Averaging Time (hours)	613200	613200	613200
EC Rocky Reach – Rocky Reach - Related Exposure Concentration ($\mu\text{g}/\text{m}^3$)	0.031	0.0082	0.0020
EC background - Background source-related Exposure Concentration ($\mu\text{g}/\text{m}^3$)	0.030	0.0039	0.00073
IUR - Inhalation Unit Risk ($\mu\text{g}/\text{m}^3$)-1	0.0003	0.0003	0.0003
Increased cancer risk from Rocky Reach generator emissions	9.3E-06	2.5E-06	5.9E-07
Cancer risk from “background” sources	9.0E-06	1.2E-06	2.2E-07
Total cancer risk from diesel particle exposures near Rocky Reach Dam	1.8E-05	3.6E-06	8.1E-07

Non-cancer hazard

Ecology assessed the chronic non-cancer hazards from exposure to diesel engine emissions from Chelan PUD and other “background” sources. Ecology estimated non-cancer hazards consistent with EPA guidance for inhalation risk assessment (EPA, 2009), using the following equations:

$$\text{HQ} = \text{EC}/\text{Toxicity Value}$$

Where:

HQ (unitless) = hazard quotient;

EC ($\mu\text{g}/\text{m}^3$) = exposure concentration;

Toxicity Value ($\mu\text{g}/\text{m}^3$) = inhalation toxicity value (e.g., RfC, REL) that is appropriate for the exposure scenario (acute, subchronic, or chronic).

$$\text{EC} = \text{CA}$$

Where:

EC ($\mu\text{g}/\text{m}^3$) = exposure concentration;⁵

CA ($\mu\text{g}/\text{m}^3$) = contaminant concentration in air.

Long-term exposure to project-related and existing background levels of DEEP results in hazard quotients much lower than unity (Table 7). This indicates that chronic non-cancer health effects from diesel engine emissions near Rocky Reach Dam are not expected.

Table 7: Estimated Long-term Non-cancer Hazards Attributable to Chelan PUD's DEEP Emissions

Receptor	Project-related Annual Avg. DEEP Level ($\mu\text{g}/\text{m}^3$)	Existing Background DEEP Level ($\mu\text{g}/\text{m}^3$)	Cumulative Avg. DEEP Level ($\mu\text{g}/\text{m}^3$)	Chronic REL ($\mu\text{g}/\text{m}^3$)	HQ
MIRR	0.031	0.030	0.061	5	0.01
MIBR	0.081	0.030	0.11	5	0.02
MICR	0.063	0.030	0.093	5	0.02

⁵ EPA's guidance allows for exposure frequency and exposure duration to be considered when determining exposure concentrations for chronic health effects, but for simplicity, Ecology assumed all receptors were exposed continuously to the average annual contaminant concentration in air at the relevant receptor locations.

Other Considerations

Short-term exposures to DEEP

Exposure to DEEP can cause both short- and long-term health effects. However, as discussed above, reference toxicity values specifically for short-term or intermediate-term DEEP exposure are not currently available. Therefore, Ecology did not quantify short-term cancer risks or non-cancer hazards from DEEP exposure.

For air permitting purposes, Ecology assumes that compliance with the 24-hour PM_{2.5} NAAQS indicates that short-term health effects from DEEP exposure are acceptable.

Chelan PUD's overall PM_{2.5} emissions are below the exemption thresholds established in WAC 173-400-110. Therefore, the project's PM_{2.5} emissions are not expected to cause or contribute to an exceedance of the NAAQS (Ecology, 2026).

Uncertainty

Many parts of this second tier review involve uncertainty because we do not have exact information about all the factors used to estimate the health effects of Chelan PUD's emissions. Depending on the assumption, this uncertainty may result in health risks being over- or underestimated.

The key sources of uncertainty for Chelan PUD's proposed increase in diesel emissions are exposure assumptions, emissions estimates, air dispersion modeling, and the toxicity of DEEP.

Table 8: Qualitative Summary of How Uncertainty Affects Estimated Risks and Hazards from Chelan PUD's DEEP Emissions

Source of Uncertainty	How Does it Affect Estimated Risk from this Project?
Exposure assumptions	Assuming continuous lifetime exposure likely overestimates DEEP exposure.
Emissions estimates	May overestimate emissions because Ecology used the emission rates and physical parameters that produced the highest ambient impacts. Actual engine operation may result in lower emissions and ambient impacts.
Air modeling methods	AERMOD may under- or over-estimate ambient impacts. EPA developed AERMOD using methods to avoid underestimating ambient impacts.
Toxicity of DEEP at low concentrations	May overestimate cancer risk and may underestimate non-cancer hazards for sensitive individuals.

Exposure uncertainty

Ecology can only estimate how long an individual will be exposed to Chelan PUD's DEEP emissions. To protect public health, Ecology used conservative estimates for exposure duration and frequency.

For example, Ecology assumes that nearby residents will be exposed to Chelan PUD's diesel emissions continuously for 70 years. These assumptions are likely to overestimate actual exposure and risk.

Emissions uncertainty

The exact amount of DEEP emitted by Chelan PUD's diesel-powered generator is uncertain. Ecology relied on emission estimates from the manufacturer's specification sheets and selected the engine-specific emission rates and physical parameters that resulted in the highest estimated ambient impacts.

Ecology also assumed that the emergency generator will operate for the full 110 hours per year allowed by the permit. The generator is likely to operate fewer hours than this. Therefore, actual emissions and ambient impacts may be lower than estimated.

Air dispersion uncertainty

For this streamlined analysis, Ecology used AERMOD in screen mode to estimate ambient impacts. AERMOD in screen mode tends to produce higher estimates of ambient concentrations than more refined modeling methods. Therefore, the modeled concentrations are likely to be conservative.

Toxicity uncertainty

One of the largest sources of uncertainty in any health risk assessment is the limited scientific understanding of how most chemicals affect people at the low concentrations typically found in the environment.

To account for uncertainty when developing toxicity values (e.g., RfCs), EPA and other agencies apply “uncertainty” factors to observed doses or concentrations that cause adverse non-cancer effects in animals or humans. These factors are intended to produce toxicity values that are protective of the general population, including susceptible individuals.

For DEEP, EPA and OEHHA based the non-cancer reference values used in this assessment on animal studies. These values are likely protective of most people, including sensitive individuals. However, EPA acknowledges that the population groups that may be more susceptible to diesel exhaust are not well understood (EPA, 2002):

“...the actual spectrum of the population that may have a greater susceptibility to diesel exhaust (DE) is unknown and cannot be better characterized until more information is available regarding the adverse effects of diesel particulate matter (DEEP) in humans.”

Quantifying cancer risk from DEEP exposure also involves uncertainty. Although EPA classifies DEEP as probably carcinogenic to humans, it has not established a URF for quantifying cancer risk. In its health assessment document, EPA concluded that “human exposure-response data are too uncertain to derive a confident quantitative estimate of cancer unit risk based on existing studies.” EPA did, however, indicate that a URF based on existing DEEP toxicity studies could range from 1×10^{-5} to 1×10^{-3} per $\mu\text{g}/\text{m}^3$. OEHHA’s DEEP URF (3×10^{-4} per $\mu\text{g}/\text{m}^3$) falls within this range. Regarding the range of URFs, EPA states in their health assessment document for diesel exhaust (EPA, 2002):

“Lower risks are possible, and one cannot rule out zero risk. The risks could be zero because (a) some individuals within the population may have a high tolerance to exposure from [diesel exhaust] and therefore not be susceptible to the cancer risk from environmental exposure, and (b) although evidence of this has not been seen, there could be a threshold of exposure below which there is no cancer risk.”

Other sources of uncertainty cited in EPA’s health assessment document for diesel exhaust are:

- Lack of knowledge about the underlying mechanisms of DEEP toxicity.
- The question of whether toxicity studies of DEEP based on older engines are relevant to current diesel engines.

Conclusions and Recommendation

Ecology conducted a streamlined review of the health risk associated with Chelan PUD's diesel-powered emergency generator at Rocky Reach Dam, north of Wenatchee, Washington.

- Ecology estimated the lifetime increase in cancer risk from Chelan PUD's DEEP emissions. The estimated increase in cancer risk is about nine in one million at the maximally impacted residential receptor.
- Ecology assessed chronic non-cancer hazards from the project's emissions and background sources. The assessment indicates that long-term adverse non-cancer health effects from DEEP exposure are not likely to occur.
- Ecology assessed cumulative health risk by adding estimated DEEP concentration from Chelan PUD's generator to the estimated background DEEP concentration. The maximum cumulative cancer risk for residents near Chelan PUD is approximately 18 in one million.

The estimated increase in cancer risk attributable solely to Chelan PUD's proposed project is less than the maximum risk allowed under a second tier review, which is 10 in one million. The non-cancer hazard is also acceptable. Therefore, the project meets the health risk criteria for approval under WAC 173-460-090.

The risk manager may recommend approval of the permit because:

- Ecology determined that the emission controls for the new and modified emission units represent tBACT.
- The cancer risk from Chelan PUD's increased TAP emissions is below the maximum risk of 10 in one million allowed under a second tier review.
- Ecology determined that the non-cancer hazard is acceptable.

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Figure 1: Estimated average diesel particulate concentration from emergency generator operation