Second Tier Review Recommendation for: Group 14 Technologies Battery Active Materials Project Grant County, Washington

Air Quality Program

Washington Department of Ecology

Olympia, Washington

May 2023

DEPARTMENT OF ECOLOGY
State of Washington

Contact Information

Air Quality Program

PO Box 47600
Olympia, WA 98504-7600
360-407-6800
https://ecology.wa.gov/contact

ADA Accessibility

The Department of Ecology is committed to providing people with disabilities access to information and services by meeting or exceeding the requirements of the Americans with Disabilities Act (ADA), Section 504 and 508 of the Rehabilitation Act, and Washington State Policy #188.

To request ADA accommodation, email gary.palcisko@ecy.wa.gov or call 360-407-7338, 711 (relay service), or 877-833-6341 (TTY).

Second Tier Review Recommendation for:

Group 14 Technologies

Battery Active Materials Project

Grant County, Washington

Air Quality Program
Washington Department of Ecology
Olympia, WA

This page is purposely left blank

Table of Contents

Page

List of Tables and Figures

Page

Tables

Figures

Executive Summary

This document presents and summarizes a review of health risks from toxic air pollutants emitted by diesel-powered emergency generators and firepumps at Group 14 Technologies' proposed facility in Grant County, Washington. These engines will be used to provide backup power and fire protection. In general, toxic air pollutant impacts in the area near the proposed Group 14 facility will not 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.

Group 14 proposes to construct and operate a new facility to produce silicon-carbon material for battery anodes. Toxic air pollutants will be emitted from several processes but proposed emissions from backup diesel engines trigger second tier toxics review. The diesel-powered emergency equipment consists of:

- Three diesel-powered emergency generators to provide backup power for safe shutdown of the facility's processes. Each generator set is powered by two 768 bhp diesel engines. Each engine is certified to meet EPA Tier 2 emission standards. The engines will be allowed to operate up to 100 hours per year on average.
- Two diesel-powered fire water pumps to support fire protection. Each pump is powered by a 510 bhp diesel engine certified to meet EPA Tier 2 emission standards.

Group 14's engines may emit a toxic air pollutant—diesel engine exhaust particulate—at a rate triggering a requirement to prepare a health impact assessment (Second Tier Toxics Review). A health impact assessment describes the increased health risks from exposure to toxic air pollutants.

Group 14 hired Landau Associates to prepare a health impact assessment. Landau Associates estimated increased health risks associated with Group 14's diesel particle and other toxic air pollutant emissions.

Conclusions

Assuming Group 14's engines operate at their full allowable annual limit, 100 hours per year, diesel particle emissions result in a maximum increased lifetime cancer risk of less than one in one million. The maximum risk occurs for commercial receptors at a location south of the Group 14 facility. This location is currently agricultural land, but future land use plans are for industrial land use.

- Cancer risk can be expressed either as an increase in an individual's risk of disease or as the number of cancers that might occur in addition to those normally expected in a population of one million people. The reported estimates of diesel engine exhaust particulate-related cancer risk represent increases above a baseline lifetime cancer risk of about 40 percent in the United States.

- Lifetime exposure to “background” levels of diesel particles in the area results in a risk of about 38 in one million.

Exposure to diesel particles and other project-related toxic air pollutants in the area is not likely to result in long- or short-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 applicant demonstrated that the increase in emissions of toxic air pollutants is not likely to result in an increased 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.
- The non-cancer hazard is acceptable.

Second Tier Review Processing and Approval Criteria

The health impacts assessment (HIA) for Group 14's toxic air pollutant (TAP) emissions submitted by Landau Associates is part of the second tier toxics review process under WAC 173-460 (Landau Associates, 2023). Ecology is responsible for processing and reviewing second tier review petitions statewide.

Second tier review processing requirements

For Ecology to review the second tier petition, each of the following regulatory requirements under Chapter 173-460-090 must be satisfied:

(a) The permitting authority has determined that other conditions for processing the Notice of Construction Order of Approval (NOC) have been met and has issued a preliminary approval order.

(b) Emission controls contained in the preliminary NOC approval order represent at least best available control technology for toxics (tBACT).

(c) The applicant has developed an HIA protocol that has been approved by Ecology.

(d) The ambient impact of the emissions increases of each TAP that exceed acceptable source impact levels (ASILs) has been quantified using refined air dispersion modeling techniques as approved in the HIA protocol.

(e) The second tier review petition contains an HIA conducted in accordance with the approved HIA protocol.

Acting as the "permitting authority" for this project, Ecology's project permit engineer satisfied item (a) and verified item (b) above on April 24, 2023.[1] Ecology approved an HIA protocol (item (c)), and the final HIA (item (e)) was received by Ecology on March 29, 2023. Ecology's modeler determined that Landau Associates conducted the refined modeling (item (d)) appropriately.[2]

All five processing requirements above are satisfied.

Second tier review approval criteria

As specified in WAC 173-460-090(7), Ecology may recommend approval of a project that is likely to cause an exceedance of ASILs for one or more TAPs only if it:

(f) Determines that the emission controls for the new and modified emission units represent tBACT.

---

[1] Andrew Kruse, "Group 14 – Preliminary Determination," email message with an attachment, April 24, 2023.

[2] Beth Friedman, "RE: Group 14 status update," email message, April 21, 2023.

(g) The applicant demonstrates that the increase in emissions of TAPs is not likely to result in an increased cancer risk of more than one in one hundred thousand.

(h) Ecology determines that the non-cancer hazard is acceptable.

tBACT determination

Ecology's permit engineer determined that Group 14's proposed pollution control equipment satisfies the BACT and tBACT requirements for diesel engines powering backup generators and fire pumps (Ecology, 2023). BACT and tBACT for nitrogen oxides (NO_X) and diesel particles were determined to be met through the restricted operation of EPA Tier-2 certified engines operated as emergency engines as defined in 40 C.F.R. 60.4219, and compliance with the operation and maintenance restrictions of 40 C.F.R. Part 60, Subpart IIII.

Health Impact Assessment Review

As described above, the applicant is responsible for preparing the HIA under WAC 173-460-090. Ecology's project team consisting of an engineer, a toxicologist, and a modeler review the HIA to determine if the methods and assumptions are appropriate for assessing and quantifying risks to the surrounding community from a new project.

For the Group 14 Battery Active Materials project, the HIA focused primarily on health risks attributable to diesel engine exhaust particulate (DEEP) exposure because the modeled ambient air concentrations exceeded respective ASILs. Landau Associates also described emissions and exposure to other TAPs that did not exceed ASILs, but these pollutants contributed very little to overall health risks estimated in the health impacts assessment.

DEEP health effects summary

Diesel engines emit very small fine (<2.5 micrometers [μm]) and ultrafine (<0.1 μm) particles. These particles can easily enter deep into the lung when inhaled. Mounting evidence indicates that inhaling fine particles can cause or contribute to numerous adverse health effects.

Studies of humans and animals specifically exposed to DEEP show that diesel particles can cause both acute and chronic health effects including cancer. Ecology has summarized these health effects in "Concerns about Adverse Health Effects of Diesel Engine Emissions" (Ecology, 2008).

Toxicity reference values

Agencies develop toxicity reference values for use in evaluating and characterizing exposures to chemicals in the environment. As part of the HIA, Landau Associates identified appropriate toxicity values for DEEP and other TAPs.[3]

DEEP toxicity values

Landau Associates identified toxicity values for DEEP from two agencies: the U.S. Environmental Protection Agency (EPA) (EPA, 2002; EPA, 2003), and California EPA's Office of Environmental Health Hazard Assessment (OEHHA) (CalEPA, 1998). These agencies derived toxicity values from studies of animals exposed to a known amount (concentration) of DEEP, or from epidemiological studies of exposed humans. These values represent a level at or below which we do not expect adverse non-cancer health effects and a metric by which to quantify increased risk from exposure to a carcinogen. Table 1 shows the appropriate DEEP non-cancer and cancer toxicity values identified by Landau Associates.

[3] Landau Associates also identified toxicity values for several other project-related TAPs with ambient impacts less than the ASIL. Risks from these other pollutants was also considered in the HIA, but they contributed very little to total risk.

EPA based its reference concentration (RfC) and OEHHA based its reference exposure level (REL) for diesel engine exhaust (measured as DEEP) on dose-response data on inflammation and changes in the lung from rat inhalation studies. Each agency established a level of 5 $\mu g/m^3$ as the concentration of DEEP in air at which long-term exposure is unlikely to cause adverse non-cancer health effects.

EPA promulgated National Ambient Air Quality Standards (NAAQS) and other regulatory toxicological values for short- and intermediate-term exposure to particulate matter, but values specifically for DEEP exposure at these intervals do not currently exist.

OEHHA derived a unit risk factor (URF) for estimating cancer risk from exposure to DEEP. They based the URF on a meta-analysis of several epidemiological studies of humans occupationally exposed to DEEP. In these studies, researchers determined exposure on measurements of elemental carbon and respirable particulate representing fresh diesel exhaust. Therefore, we define DEEP as the filterable fraction of particulate emitted by diesel engines.[4] The URF is expressed as the upper-bound probability of developing cancer, assuming continuous lifetime exposure to a substance at a concentration of one microgram per cubic meter (1 $\mu g/m^3$) and is expressed in units of inverse concentration [i.e., $(\mu g/m^3)^{-1}$]. OEHHA's URF for DEEP is 0.0003 per $\mu g/m^3$ meaning that a lifetime of exposure to one $\mu g/m^3$ of DEEP results in an increased individual cancer risk of 0.03 percent or a population cancer risk of 300 excess cancer cases per million people exposed.

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

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

[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

[4] Condensable particulate does not represent DEEP for the purposes assessing health risks from DEEP exposure; however, we consider both the filterable and condensable fractions of particulate when determining compliance with NAAQS for the purposes of the NOC application.

Community/receptors

Group 14's proposed project is in an area that is currently a mix of agriculture and industrial land uses (City of Moses Lake; 2020, Figure 1). Future land use plans show the area will primarily be an industrially zoned area surrounded by agricultural land uses (City of Moses Lake, 2022; Figure 2). Some rural residences are scattered around the facility with the nearest homes about 1 mile from the fence line. A denser residential area is located about 1.5 miles west of the facility. Air dispersion modeling indicated that proposed DEEP emissions would not result in long-term concentrations greater than the ASIL at parcels with residential land use codes (Ecology, 2022).

To assess increased cancer risk and non-cancer hazards, Landau Associates identified receptor locations where the highest exposure to project-related air pollutants could occur at or near the project boundary, nearby residences, and nearby commercial locations (Table 2, Figures 3). Landau Associates also evaluated other sensitive receptor exposures at area schools and health care centers. None of these other sensitive receptors is in the area in which Group 14's ambient impacts exceed ASILs.

Ecology's review of the HIA found that Landau Associates identified appropriate receptors to capture the highest Group 14 attributable exposures for residential, commercial, and other sensitive receptors.

Table 2: Estimated Annual Average DEEP Concentrations at Key Receptor Locations

Receptor	UTM Coordinates Zone 11N	Annual DEEP Concentration ($\mu g/m^3$)
MIRR	(331770, 5223622)	0.00093
MIBR/PMI	(332434.4, 5221825)	0.05963
MICR	(332395, 5221497)	0.02307

MIRR – Maximally impacted residential receptor

MICR – Maximally impacted commercial receptor

MIBR/PMI – Maximally impacted boundary receptor/Point of maximum impact

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 3 shows the background levels considered by Landau Associates in the HIA, Landau Associates used the 2019 AirToxScreen to determine background DEEP levels (EPA, 2022). EPA's AirToxScreen is the successor to the National Ambient Toxics Assessment.

Table 3: Estimated "Background" Concentrations near Group 14

Source	Average Annual Diesel Particulate Concentration (μg/m^3)
2019 AirToxScreen - Census Tract 53025011000	0.126

Increased cancer risk

Landau Associates assessed the increased risk of cancer from lifetime exposure to DEEP emitted from Group 14's engines. They characterized cancer risk in a manner consistent with EPA guidance for inhalation risk assessment (EPA, 2009) using the following equations:

Risk = IUR x EC

Where:

IUR (μg/m^3)$^{-1}$ = inhalation unit risk (i.e., unit risk factor); and

EC (μg/m^3) = exposure concentration

EC = (CA x ET x EF x ED)/AT

Where:

EC (μg/m^3) = exposure concentration;

CA (μg/m^3) = contaminant concentration in air;

ET (hours/day) = exposure time;

EF (days/year) = exposure frequency;

ED (years) = exposure duration; and

AT (ED in years x 365 days/year x 24 hours/day) = averaging time

Cancer risk attributable to Group 14 DEEP and other TAP emissions

Table 4, adapted from the HIA, shows the estimated Group 14-specific cancer risk per million for residential, boundary, and commercial receptors. These receptors received the highest exposure to Group 14-related diesel emissions. Figure 3 shows the location of these receptors relative to Group 14. The highest increase in risks attributable to Group 14's emissions is about 0.9 per million[5] for future commercial receptors south of Group 14. Landau Associates also calculated risks posed by other carcinogenic TAPs (i.e., benzene, formaldehyde, 1,3-butadiene, arsenic, cadmium, hexavalent chromium, naphthalene, nickel, and 7,12-dimethylbenz(a)anthracene). They estimated a negligible increased risk attributable to these other TAPs of < 0.1 per million.

For the boundary area exposure scenarios, the maximally impacted commercial receptor (MIBR) may have increased risks of 0.4 per million. The maximally impacted residential receptor (MIRR) may have increased risks of 0.3 per million.

Exposure to existing "background" levels of DEEP in the area results in a risk of about 38 in one million for residential receptors.

[5] 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.

Table 4: Estimated Increased Cancer Risk for Residential and Commercial Receptors Attributable to Group 14's DEEP Emissions

Exposure Parameter	MIRR	MICR	MIBR
CA Group 14 – concentration in air from Group 14 emissions (µg/m^3)	0.00093	0.02307	0.05963
CA background – concentration in air from "background" sources (µg/m^3)	0.126	0.126	0.126
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 Group 14 – Group 14 Related Exposure Concentration (µg/$^{m3)}$	0.00093	0.00301	0.00146
EC background - Background source-related Exposure Concentration (µg/m^3)	0.126	0.016	0.003
IUR - Inhalation Unit Risk (µg/m^3)-1	3.00E-04	3.00E-04	3.00E-04
Increased cancer risk from Group 14's emissions	**2.8E-07**	**9.0E-07**	**4.4E-07**
Cancer risk from "background" sources	3.8E-05	4.9E-06	9.2E-07
Total cancer risk from diesel particle exposures near Group 14	3.8E-05	5.8E-06	1.4E-06

Note: Landau Associates estimated risks posed by other TAPs, but these chemicals contributed to an increased risk of < 1.0E-07 for the MICR

Non-cancer hazard

Landau Associates assessed the acute and chronic non-cancer hazards from exposure to DEEP and other TAP emissions from Group 14 and other local sources. They estimated non-cancer hazards consistent with EPA guidance for inhalation risk assessment (EPA, 2009) using the following equations:

HQ = EC/Toxicity Value

Where:

HQ (unitless) = hazard quotient;

EC (µg/m^3) = exposure concentration;

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

EC = CA

Where:

EC ($\mu g/m^3$) = exposure concentration;[6]

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

A hazard quotient below unity (one) means that an adverse non-cancer health effect is not likely to occur among people exposed to a given TAP. To account for the potential effects of multiple pollutants, a target organ-specific hazard index is the sum of hazard quotients for pollutants that affect similar organ systems. In general, none of the receptors' short- or long-term exposures to DEEP and other TAPs result in hazard quotients and hazard indices[7] exceeding unity. This indicates that acute and chronic noncancer hazards are not likely to occur from exposure to Group 14-related TAPs.

[6] EPA's guidance allows for exposure frequency and exposure duration to be considered when determining exposure concentrations for chronic health effects but, for simplicity, Landau Associates assumed all receptors were exposed continuously to the average annual contaminant concentration in air at the relevant receptor locations.
[7] Hazard index represents the sum of hazard quotients for similar target organ system health effects (e.g., respiratory system effects).

Uncertainty

Many factors of the HIA are prone to uncertainty. Uncertainty relates to the lack of exact knowledge regarding many of the assumptions used to estimate the human health impacts of Group 14's emissions. The assumptions used in the face of uncertainty may tend to over- or underestimate the health risks estimated in the HIA. Key aspects of uncertainty in the HIA for Group 14's proposed are exposure assumptions, emissions estimates, air dispersion modeling, and toxicity of DEEP.

Table 5: Qualitative Summary of How Uncertainty Affects the Quantitative Estimate of Risks or Hazards Attributable to Group 14 Emissions

Source of Uncertainty	How Does it Affect Estimated Risk from this Project?
Exposure assumptions	Continuous lifetime exposure is likely an overestimate of DEEP exposure.
Emissions estimates	Possible underestimate of emissions because Landau Associates used average particulate matter emission rates to estimate DEEP emissions.
Air modeling methods	Possible underestimate of average long-term ambient concentrations and overestimate of short-term ambient concentration.
Toxicity of DEEP at low concentrations	Possible overestimate of cancer risk, possible underestimate of non-cancer hazard for sensitive individuals.

Exposure uncertainty

We can only estimate the amount of time an individual will be exposed to Group 14's DEEP emissions. To ensure public health protection, Landau Associates used conservative estimates of exposure duration and frequency.

Emissions uncertainty

The exact amount of DEEP emitted from Group 14's diesel-powered generators is uncertain. Landau Associates relied on Tier 2 emission standards to estimate emissions from emergency generators and emission specification sheets for the firewater pumps (Landau Associates, 2022). These engines will operate at a variety of loads in which emissions may be higher or lower than assumed. Given that the estimated ambient impacts of diesel particulate were much lower than acceptable risk criteria, more conservative emissions estimates would still have resulted in estimated ambient impacts that would meet acceptability criteria. Furthermore, Group 14 will probably use the engines less frequently than allowed in the draft permit.

Air dispersion uncertainty

The transport of pollutants through the air is a complex process. Agencies develop regulatory air dispersion models to estimate the transport and dispersion of pollutants as they travel through the air. They update these models when more accurate techniques become known. Generally, agencies develop these models to avoid underestimating the modeled impacts. Even if we confidently know all the numerous input parameters to an air dispersion model, random effects found in the real atmosphere will introduce uncertainty.

Toxicity uncertainty

One of the largest sources of uncertainty in any risk evaluation is associated with the scientific community's limited understanding of the toxicity of most chemicals in humans following exposure to the low concentrations generally encountered 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. Agencies apply these uncertainty factors so that they derive a toxicity value considered protective of humans including susceptible populations. In the case of DEEP exposure, EPA and OEHHA derived non-cancer reference values used in this assessment from animal studies. These reference values are probably protective of most of the population including sensitive individuals, but in the case of EPA's DEEP RfC, EPA acknowledges (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 (DPM) in humans."

Quantifying DEEP cancer risk is also uncertain. Although EPA classifies DEEP as probably carcinogenic to humans, they have not established a URF for quantifying cancer risk. In their health assessment document, EPA determined that "human exposure-response data are too uncertain to derive a confident quantitative estimate of cancer unit risk based on existing studies." However, EPA suggested that a URF based on existing DEEP toxicity studies would range from $1x10^{-5}$ to 1×10^{-3} per $\mu g/m^3$. OEHHA's DEEP URF (3×10^{-4} per $\mu g/m^3$) 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

The project review team has reviewed the HIA and determined that:

(a) The TAP emissions estimates presented by Landau Associates represent a reasonable estimate of the project's future emissions.

(b) Emission controls for the new and modified emission units meet the tBACT requirement.

(c) The ambient impact of the emissions increases of each TAP that exceeds ASILs has been quantified using appropriate refined air dispersion modeling techniques.

(d) The HIA submitted by Landau Associates on behalf of Group 14 adequately assesses project-related increased health risks attributable to TAP emissions.

In the HIA, Landau Associates estimated lifetime increased cancer risks attributable to Group 14-related DEEP and other toxic air pollutant emissions. DEEP emissions resulted in an increase cancer risk of about 0.9 in one million at the maximally impacted commercial receptor. The maximum increased risk to residential receptors is 0.3 in one million.

Landau Associates also assessed chronic and acute non-cancer hazards attributable to the project's emissions and from background sources and determined that long-term adverse non-cancer health effects from exposure to DEEP are not likely to occur.

Finally, Landau Associates and Ecology assessed the cumulative health risk by adding estimated concentrations attributable to Group 14 emissions to an estimated background DEEP concentration. The maximum cumulative cancer risk from residents' exposure to DEEP near Group 14 is approximately 38 in one million.

Because the increase in cancer risk attributable to the new sources alone is less than the maximum risk allowed by a second tier review, which is 10 in one million, and the non-cancer hazard is acceptable, the project is approvable under WAC 173-460-090.

The project review team concludes that the HIA represents an appropriate estimate of potential increased health risks posed by Group 14 TAP emissions. The risk manager may recommend approval of the permit because:

- The cancer risk from Group 14's TAP emissions is less than the maximum risk (10 in one million) allowed by a second tier review.
- Ecology determined that the non-cancer hazard is acceptable.

References

CalEPA, California Environmental Protection Agency: Air Resources Board and Office of Environmental Health Hazard Assessment, Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant, 1998, <http://www.arb.ca.gov/toxics/dieseltac/staffrpt.pdf>.

City of Moses Lake, Existing Land Use designations of Moses Lake, WA as defined by parcel. Existing Land Use - Overview (arcgis.com). Last updated May 14, 2020.

------Future Land Use designations of Moses Lake, WA as defined by parcel. Future Land Use - Overview (arcgis.com). Last updated February 18, 2022.

Ecology, Washington State Department of Ecology, Concerns about Adverse Health Effects of Diesel Engine Emissions: White Paper, December 3, 2008, <https://fortress.wa.gov/ecy/publications/publications/0802032.pdf>.

------, Washington State Parcels Project: Digital Tax Parcel Information Containing Department of Revenue Land Use Codes, 2022.

-----, Technical Support Document for NOC Approval Order Preliminary Determination. Group 14 Technologies, Inc. Moses Lake, WA (2023).

EPA, United States Environmental Protection Agency, Health Assessment Document for Diesel Exhaust, EPA/600/8-90/057F, May 2002.

------, Integrated Risk Information System record for Diesel Exhaust, last revised February 28, 2003, <http://cfpub.epa.gov/ncea/iris2/chemicalLanding.cfm?substance_nmbr=642>.

------, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), January 2009, <https://www.epa.gov/sites/production/files/2015-09/documents/partf_200901_final.pdf>.

------, United States Environmental Protection Agency, Air Toxics Screening Assessment: 2019 AirToxScreen Results, Released December 2022, <https://www.epa.gov/AirToxScreen/2019-airtoxscreen>.

Landau Associates, Second-Tier Health Impact Assessment Report: Group 14 Technologies: Battery Active Materials Project, Grant County, WA. March 29, 2023.

------, Notice of Construction Application Supporting Information Report: Group 14 Technologies: Battery Active Materials Project, Grant County, WA., December 20, 2022.

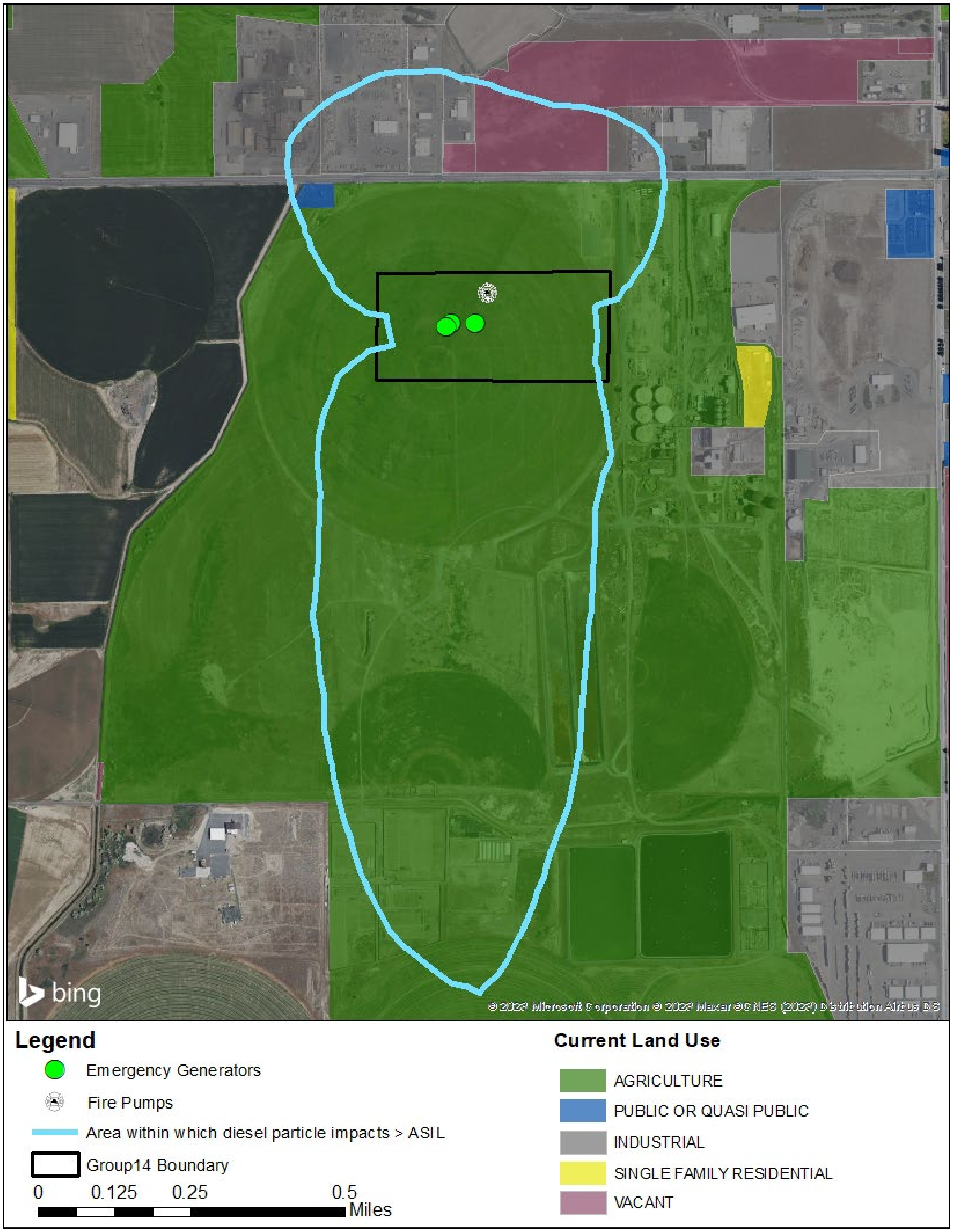

Figure 1: Current land use in the area where proposed Group 14 DEEP emissions may cause impacts that exceed the ASIL

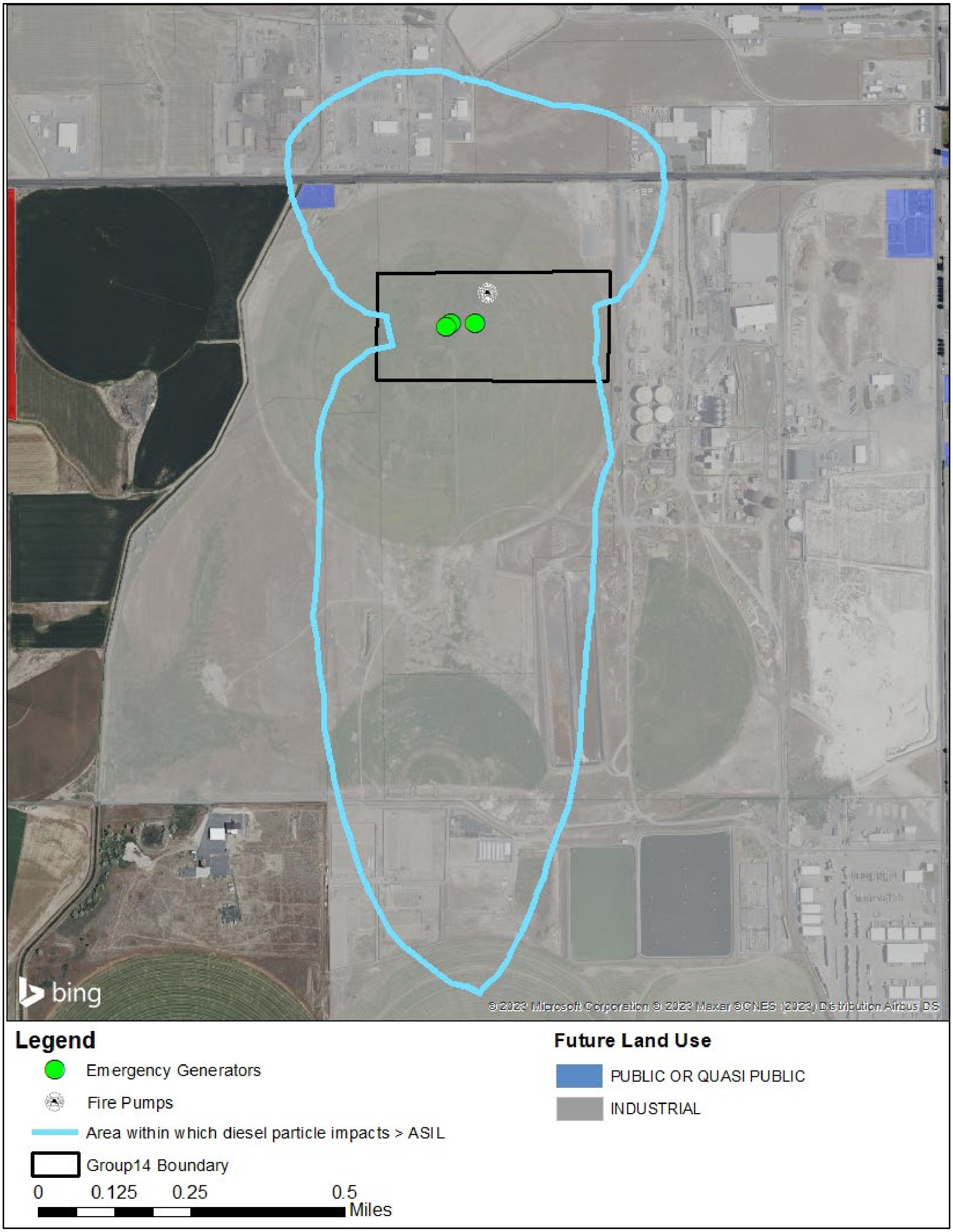

Figure 2: Future land use in the area where proposed Group 14 DEEP emissions may cause impacts that exceed the ASIL

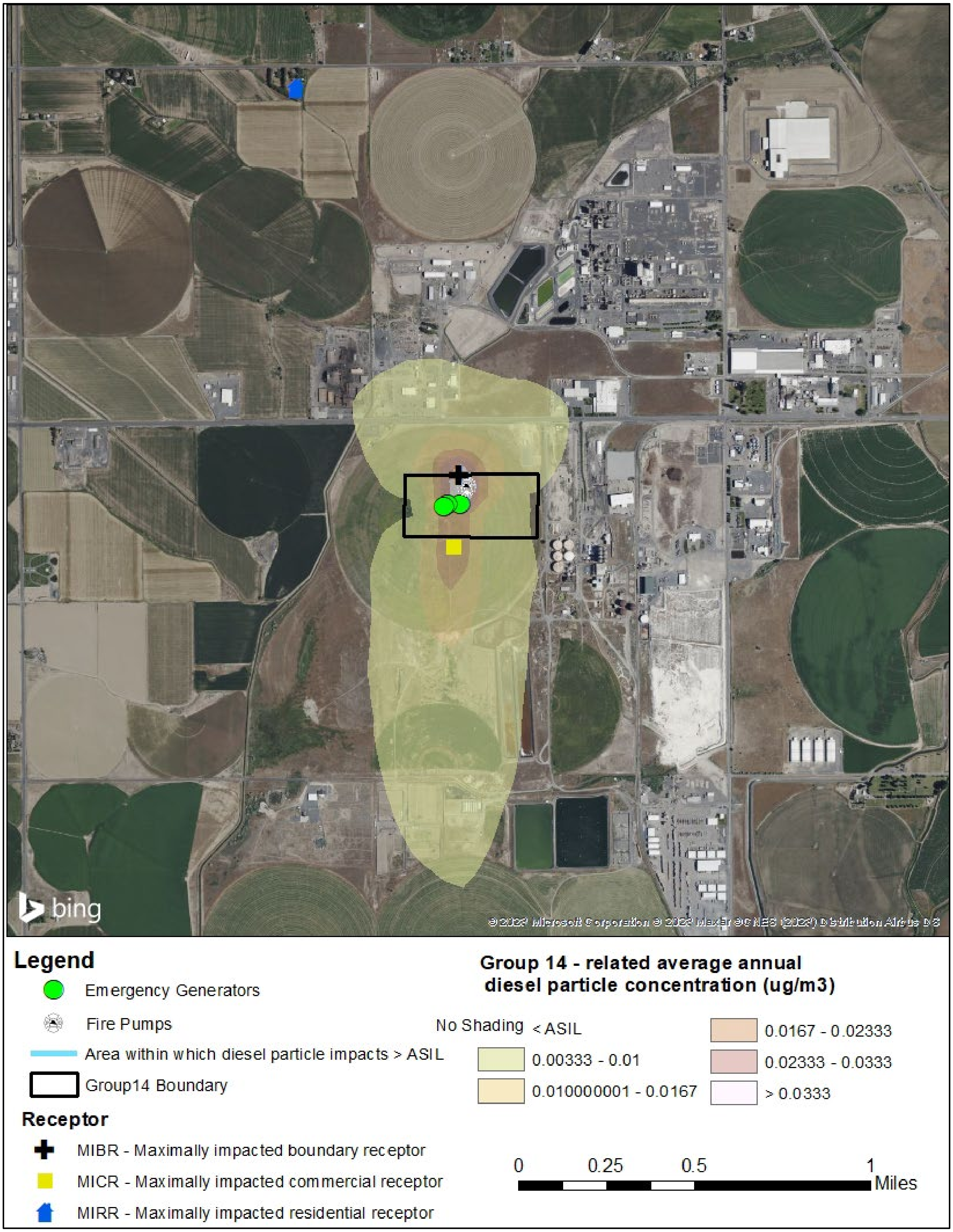

Figure 3: DEEP concentrations attributable to Group 14's engines and key receptor locations evaluated in the HIA