AIR QUALITY PROGRAM
VANDENBERG SPACE FORCE BASE

2018 AB2588 AIR TOXICS EMISSION INVENTORY PLAN - REVISION 2

Contract No. W91278-16-D-0006
Task Order W9127820F0122
11 June 2021

Prepared for:

30 CES/CEIEC
Air Quality Program
1028 Iceland Avenue
Vandenberg Space Force Base, CA 93437-6010

U.S. Army Corps of Engineers
CESAM-EN-GE
Attn: Shari Kennedy
Mobile, AL 36628-0001

Prepared by:

AECOM Technical Services,
2400 Professional Parkway, Suite 100
Santa Maria, CA 93455

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

1.0 GENERAL INFORMATION

The California Air Toxic "Hot Spots" Information and Assessment Act of 1987, Assembly Bill 2588 (AB2588), requires that facilities emitting more than 10 tons per year of criteria pollutants submit emissions inventory information to the local Air Pollution Control District (APCD). The APCD assigns priorities to the facilities based on their emissions. Facilities in the "high and intermediate priority" categories must conduct risk assessments and then may be required to report potential risk to the public.

Vandenberg Space Force Base (SFB)[1], being a California facility emitting more than 10 tons per year of a criteria pollutant, must comply with AB2588. To demonstrate compliance, Vandenberg SFB has submitted Air Toxics Emission Inventory Plans (ATEIP) and Air Toxics Emission Inventory Reports (ATEIR) to the Santa Barbara County Air Pollution Control District (SBCAPCD) since 1989, as required.

On March 13, 2019 Vandenberg SFB received a letter from the SBCAPCD concerning the Health Risk Assessment (HRA) for inventory year 2008. The California Office of Environmental Health Hazard Assessment (OEHHA) had rejected the HRA for Vandenberg SFB. OEHHA provided two reasons for their decision: (1) the emission inventory used is out of date and (2) the risk assessment guidelines used (Hotspots Analysis and Reporting Program [HARP], Version 1 [HARP 1]) is outdated. The SBCAPCD requested a new inventory year of 2018 along with updated ATEIP and ATEIR documents. Once completed, a new HRA, using HARP, Version 2 (HARP 2), will be required.

In December 2019, a draft ATEIP was submitted to the SBCAPCD. Comments were received from the SBCAPCD in March 2020 and Vandenberg SFB submitted a revised ATEIP in July 2020 along with responses to SBCAPCD comments. In December 2020, SBCAPCD sent a conditional approval letter that contained various issues for Vandenberg SFB to address in order to gain approval of the ATEIP. The letter also requested the submittal of a response to their conditional approval comments, a final ATEIP, and ATEIR by 15 June 2021.

1.1 OBJECTIVE

The objective of this ATEIP is to present a methodology for completion of the emissions inventory as regulated by California Title 22, AB2588. The ATEIP lists devices, sources, processes, and pollutants; proposes calculation methods for emission quantification; and presents a general methodology for HARP modeling.

1.2 DOCUMENT ORGANIZATION

The ATEIP is organized into the following sections:

Section 1.0 Provides a brief introduction to this plan.
Section 2.0 Lists sources and pollutants that existed at Vandenberg SFB in 2018.
Section 3.0 Describes the processes and calculations that are proposed for 2018 activities.
Section 4.0 Discusses the methodology for HARP modeling.
Section 5.0 Provides a list of references.
Section 6.0 Provides a list of acronyms and abbreviations.

[1] On 14 May 2021, Vandenberg Air Force Base (AFB) was renamed Vandenberg Space Force Base (SFB).

This page intentionally left blank.

2.0 FACILITY DESCRIPTION

Vandenberg SFB occupies 99,604 acres along the central coast of California and includes approximately 612 buildings, 999 privatized housing units, 520 miles of roads, 80 miles of natural gas pipelines, 17 miles of railroad track, and a 15,000-foot concrete runway. Vandenberg SFB is located in Santa Barbara County within 10 miles of Lompoc and approximately 50 miles north of Santa Barbara. State Highway 246 divides Vandenberg SFB into North Base and South Base with the main cantonment area sited on North Base. The location of the base is shown in Figure 2.0-1.

Figure 2.0-1
Vandenberg SFB Site Location Map

2.1 SOURCE TYPES

Vandenberg SFB has numerous sources that emitted toxic emissions in 2018. This report identifies sources that will be inventoried under AB2588. Appendix A lists the AB2588 air toxic sources that emitted toxic pollutants at Vandenberg SFB during 2018. A map showing emission sources and receptors is provided in Appendix B. The devices have been categorized into the following source types:

- Abrasive Blasting
- Boiler
- Burner – Paint Booth Oven
- Crash Fire Rescue Training
- Explosive Ordnance Disposal
- Furnaces
- Internal Combustion Engines (ICE)
- Landfill Gas/Dust
- Motor Vehicle Fueling Facility
- Paint Spray Booth (PSB)
- Scrubber
- Solvent and Chemical Usage
- Storage Tank
- Turbine Engine

In addition to the above source types, Vandenberg SFB has sources of air toxics that are exempt from reporting under AB2588. These exemptions are either based on the definition of the facility or based on specific inventory guidelines. The following source types will not be included in the ATEIP:

- commercial space entities;
- mobile sources such as motor vehicles, launch vehicles, and small arms range;
- livestock;
- grounds maintenance such as lawn mowers, herbicides, pesticides, and vegetation management burning;
- structural maintenance such as asphalt paving, asphalt roofing, and architectural surface coatings;
- nitrogen tetroxide (N_2O_4) from the oxidizer vapor scrubbing system (N_2O_4 is not listed as a toxic substance for which emissions must be quantified); and
- use of products for minor maintenance and repair of process and industrial equipment.
- use of products for the purpose of maintaining motor vehicles.

In addition, the following sources are proposed to be excluded from the inventory on the basis of negligible risk:

- diesel fuel storage tanks; and
- emissions from rocket propellant 1 (RP-1) and jet fuel (Jet-A) loading and storage are negligible due to their very low vapor pressure.

The following methodology was utilized in assigning Device IDs to the various emission sources at Vandenberg SFB:

- Device IDs that don't start with any letters: The number is the SBCAPCD Device ID.
- Device IDs that start with AB: The number after the "AB" is Air Program Information Management System (APIMS) Unique ID.
- Device IDs that start with EE: These are Solvent and Chemical Usage sources. The number after "EE" is the building number where sources are located.
- Device IDs that start with FP: These are Food Processing sources. The number after "FP" is the building number where sources are located

This page intentionally left blank.

3.0 EMISSION QUANTIFICATION METHODS

This section provides information on how emission rates for each emission category will be estimated in the ATEIR. Emission factors will be combined with throughput rates for 2018, as previously reported to the SBCAPCD. To simplify the complexity of the large number of sources at Vandenberg SFB, they are grouped into source types with common calculation proposals. Each calculation subsection below discusses a brief source description, assumptions on operational parameters, and emission factor (EF) sources.

The following four general calculations procedures will be used:

1. source testing used if available,
2. manufacturer data used if available,
3. published EFs, and
4. mass balance.

3.1 ABRASIVE BLASTING

Abrasive blasting is performed on Vandenberg SFB with various kinds of blasting materials within controlled and uncontrolled environments. Calculating emissions from abrasive blasting was done using mass balance; and control efficiencies.

The emissions calculation proposed for abrasive blasting is provided in Appendix C, Calculation ID 1.

3.2 BOILERS AND FURNACES

Boilers and furnaces are used for heating of water, generation of steam, or comfort heating. Vandenberg SFB operates both natural gas and liquefied propane gas (LPG) boilers and furnaces. All operating boilers and furnaces are included in the emissions and fuel consumption calculations, even if they were partially operated during 2018.

Emissions for boilers and furnaces are calculated based on fuel usage. The fuel usage for some of the boilers was provided from fuel meter readings. These known usages are subtracted from the total base wide natural gas and LPG usage. The remaining natural gas and LPG totals are allocated to the unmetered boilers and furnaces based upon the ratio between individual boiler/furnace capacity. Further details are listed below in their appropriate sections.

3.2.1 Natural Gas

EFs for natural gas boilers and furnaces are listed in *SBCAPCD-Approved Toxic Air Contaminants (TAC) Emission Factors.xlsx.* The emissions calculation proposed for natural gas boilers is provided in Appendix C, Calculation ID 2a.

3.2.2 Liquefied Propane Gas

EFs for LPG boilers and furnaces are listed in *SBCAPCD-Approved TAC Emission Factors.xlsx*.

The emissions calculation proposed for LPG boilers is provided in Appendix C, Calculation ID 2b.

3.3 FOOD PREPARATION

Several restaurants and fast food establishments operate at Vandenberg SFB. Emissions from cooking of food will be calculated based on quantity of food prepared and type of facility (restaurant or fast food). EFs for cooking operations are from S*an Joaquin Valley Air Pollution Control District (SJVAPCD) Guidance for Air Dispersion Modeling*.

The emissions calculations proposed for food preparation is provided in Appendix C, Calculation ID 3.

3.4 PROCESS HEATERS – PAINT BOOTH HEATER

There are three processes associated with paint booth heaters located at Vandenberg SFB. Emissions are calculated based on natural gas usage. EFs for the natural gas paint booth heaters are listed in *SBCAPCD-Approved TAC Emission Factors.xlsx (Process Heater – Natural Gas)*.

The emissions calculation proposal for the paint booth heaters are provided in Appendix C, Calculation ID 4.

3.5 CRASH FIRE RESCUE TRAINING

The crash fire rescue training facility is used to train Vandenberg SFB fire fighters and other public agencies in the techniques for extinguishing aircraft fires. Simulated fires are created by igniting LPG in a mock aircraft. An exercise may consist of one or more scenarios. In the worst-case scenario, a maximum of two internal and two ground burners are used. Safety personnel in the safety tower regulate the gas flow when the burners are in operation. The amount of gas is gradually decreased to simulate the fire being extinguished.

Emissions are based on LPG usage. EFs for the crash fire rescue training facility are listed in *SBCAPCD-Approved TAC Emission Factors.xlsx (External Combustion – Propane)*.

The emissions calculation proposal for the crash fire rescue training facility is provided in Appendix C, Calculation ID 5.

3.6 EXPLOSIVE ORDNANCE DISPOSAL

Explosive ordnance disposal is utilized at Vandenberg SFB for the safe elimination of discovered munitions, excess missile or launch vehicle remote destruction components, and ordnance that has exceeded its shelf life. Additionally, a small amount of explosive ordnance is used for training purposes and during emergencies.

Emissions are based on pounds of explosive used during 2018. EFs for explosive ordnance disposal are from the *Air Emissions Guide for Air Force Stationary Sources, June 2020*.

The emissions calculation proposed for explosive ordnance disposal is provided in Appendix C, Calculation ID 6.

3.7 INTERNAL COMBUSTION ENGINES

ICEs at Vandenberg SFB are used to power generators, pumps, air compressors, and welders. Vandenberg SFB operates diesel, gasoline, Jet-A, LPG, and natural gas ICEs. Emergency hours will not be included in annual emissions. If fuel consumption is used to calculate emissions, then fuel volume will be calculated based on the ratio of non-emergency to emergency hours. Brake horsepower (bhp) rating will be used to calculate hourly emissions.

3.7.1 Diesel

Maximum hourly speciated emissions from diesel engines will be calculated by using EFs listed in *SBCAPCD-Approved TAC Emission Factors.xlsx*. The emission calculation proposed for speciated pollutants is provided in Appendix C, Calculation ID 7a. Per SBCAPCD-Approved Emission Factors for TAC, "**Maximum hourly emissions from Tier 3 and Tier 4 engines and Tier 2 engines greater than 750 bhp are not required to be included in the HRA at this time."**

Annual emissions from diesel internal combustion engines are calculated for only diesel PM. Diesel particulate matter (PM) emissions will be quantified based on the engine-specific diesel PM emission rate, which will range from 0.01 to 0.4 grams of diesel PM per bhp-hour, depending on engine size and model year (tier). Diesel PM EFs are from SBCAPCD Emission Factors webpage (https://www.ourair.org/dice/emission-factors) and the California Air Resources Board (CARB) Airborne Toxic Control Measures (ATCM).

The emissions calculations proposed for diesel ICE PM are provided in Appendix C, Calculation ID 7b.

3.7.2 Gasoline

EFs for gasoline ICEs from *SBCAPCD-Approved TAC Emission Factors.xlsx* will be used to calculate emissions.

The emissions calculation proposed for gasoline ICEs is provided in Appendix C, Calculation ID 7c.

3.7.3 Jet Fuel

Two units that function as ground support equipment at the flight line use Jet-A fueled turbines. EFs for the Jet-A turbines were obtained from the Air Emissions Guide for Air Force Mobile Sources, August 2018.

The emissions calculation proposed for Jet-A turbines is provided in Appendix C, Calculation ID 7d.

3.7.4 Liquefied Propane Gas

EFs for LPG ICEs from *SBCAPCD-Approved TAC Emission Factors.xlsx* will be used to calculate the emissions.

The emissions calculation proposed for LPG ICEs is provided in Appendix C, Calculation ID 7e.

3.7.5 Natural Gas

EFs for natural gas ICEs from *SBCAPCD-Approved TAC Emission Factors.xlsx* will be used to calculate the emissions.

The emissions calculation proposed for natural gas ICEs is provided in Appendix C, Calculation ID 7f.

3.8 LANDFILL GAS AND FUGITIVE DUST

Landfill gas contains a small amount of non-methane organic compounds (NMOC). This NMOC fraction may contain various organic hazardous air pollutants and volatile organic compounds (VOCs). Vandenberg SFB will use the method described in Part 70/Permit to Operate 13968-R2, the United States Environmental Protection Agency (USEPA) AP-42, and Tajiguas Landfill's test results for LFG from 2009 to 2013 to calculate emissions from this source. Landfill gas emission calculation is included in Appendix C, Calculation ID 8A.

Emission calculations for fugitive dust from transport of materials over the landfill paved haul roads and unloading of trucks are provided in Appendix C, Calculation ID 8B and 8C respectively. All other activities typical to a landfill (e.g., crushing, drilling) were not performed.

3.9 MOTOR VEHICLE FUELING FACILITIES

This emission source category considers the fugitive losses of fuel that occurs during refueling at motor vehicle fueling facilities. Emissions are based on fuel usage and apply only to gasoline and E-85.

EFs for motor vehicle fueling facilities are from SBCAPCD permit to operate (PTO) 13968 and South Coast Air Quality Management District (SCAQMD), Supplemental Instructions for Liquid Organic Storage Tanks and References, Appendix 3, Default TAC Profile for Select Petroleum Products.

The emissions calculation proposed for motor vehicle fueling facilities is provided in Appendix C, Calculation ID 9.

3.10 PAINT SPRAY BOOTH

Paint spray booths (PSB) at Vandenberg SFB are equipped with various types of control equipment each having its own control efficiency. Additionally, California Air Pollution Control Officers Association (CAPCOA) *Auto Bodyshop Industrywide Risk Assessment Guidelines* were used to assign control factors to PSB emissions. Maximum hourly emissions from solvent and chemical usage will be calculated by assuming the maximum monthly usage divided by 21.7 days per month (per SBCAPCD recommendation). Safety data sheets (SDSs) for all coatings are be provided in Appendix D.

The emission calculation proposed for the PSBs are provided in Appendix C, Calculation ID 10.

3.11 PROPELLANT LOADING

Two of the four scrubbers operating at Vandenberg SFB emit toxic emissions:

- Fuel vapor scrubbing system (FVSS) for Aerozine-50 (A-50) and hydrazine at Buildings 976/977 are regulated by SBCAPCD Part 70 Permit13968-R1. EFs are based on the Source Test Report for PTO 7987 (July 2001), Table 2.1-1, FVSS Compliance Test Results.
- FVSS for A-50 is located at Space Launch Complex (SLC)-2. EFs are based on the 2018 SBCAPCD Annual Report for Part 70 Permit 13968-R1.

The emissions calculations proposed for the FVSS are provided in Appendix C, Calculation ID 11a and ID 11b.

3.12 SOLVENT AND CHEMICAL USAGE

Minor amounts of individual chemicals are used throughout Vandenberg SFB and include the following source types:

- Adhesives and Sealants
- Concrete Bonding/Curing
- Film Processing
- General Surface Coatings
- Miscellaneous Products
- Solvent – Rinse Degreasing
- Solvent – Cold Degreaser
- Solvent – Wipe Cleaning
- Solvent – Miscellaneous Use

Chemical use is tracked through the Vandenberg SFB hazardous materials pharmacy (HazMart). A barcode is issued for each product to be used at Vandenberg SFB. After a product has been used, HazMart depletes the barcode for that product. At the end of the month, HazMart runs a report of all products depleted during the month. The data contained in the monthly report is used to calculate emissions. For the few operators who do not utilize the HazMart, usage is obtained from recordkeeping logs maintained by the individual operator.

The chemical speciation and specific gravity for the products are obtained from SDSs that are provided in Appendix D. These values are used to determine the different pollutant contents in the product. To determine product density, its specific gravity is multiplied by the density of water. The chemical speciation (in percent weight) is then multiplied by the product density to obtain the pollutant's weight content. All products with VOCs are assumed to be fully emitted. Maximum hourly emissions for chemical usage will be calculated by assuming the maximum monthly usage divided by 21.7 days per month (per SBCAPCD recommendation for the 2008 ATEIP).

In instances where transfer efficiencies are applicable, a factor based on the application method will be applied to the calculation. Table 3.12-1 lists the proposed transfer efficiencies.

Table 3.12-1
Chemical Use Transfer Efficiency

Transfer Efficiency	Transfer Efficiency Basis (Application Method)	Factor	Source Type
99%	Hand rolled or brushed	0.99	Adhesives/Sealants
99%	Hand rolled or brushed	0.99	Concrete Bonding/Curing & General Surface Coating

The emission calculations proposed for solvents and chemicals use are provided in Appendix C, Calculation ID 12.

3.13 STORAGE TANKS

This source category addresses the losses of organic products through the breather vents of organic liquid storage tanks. These losses occur when the pressure of the vapor space above the organic liquid exceeds the pressure settings of the breather vents. Diurnal changes in temperature ("breathing losses") and changes in liquid height from filling and emptying operations ("working losses") contribute to the increases or decreases in vapor pressure. Density and composition of the organic vapor depend upon the vapor pressure of the organic liquid constituents.

The Air Force Air Program Information Management System (APIMS) will be used to calculate TAC emissions from gasoline storage tanks. APIMS tank emission calculations are based on EPA's TANKS program.

The emissions calculation proposed for storage tanks is provided in Appendix C, Calculation ID 13.

3.14 TURBINE ENGINES

Vandenberg SFB has five natural-gas turbines used for electric power generation. A continuous emission monitoring system tracks emissions of nitrogen oxides and carbon monoxide. TAC Emissions are based on fuel usage. The turbines use oxidation catalysts to reduce turbine exhaust emissions of carbon monoxide and hydrocarbons. The catalysts do not use ammonia injection. EFs for turbine engines are from *SBCAPCD-Approved Emission Factors for TAC.xlsx*.

The emissions calculation proposed for turbine engines is provided in Appendix C, Calculation ID 14.

4.0 AIR DISPERSION MODELING AND RISK ANALYSES

Air dispersion modeling and health risk assessment will be completed in accordance with the SBCAPCD Modeling Guidelines for Health Risk Assessments (Form-15i, July 2019). The following programs will be used to complete the modeling and calculate risk at key receptors:

- USEPA's Atmospheric Dispersion Modeling System (AERMOD) (version 19191 or currently available version at the time of modeling);
- Lakes Environmental AERMOD View; and
- CARB's HARP 2 (version 19121 or currently available version at the time of modeling).

Modeling parameters are listed in *VSFB Modeling-Protocol-Tables-for-ATEIP.xlsx* which is provided in Appendix A. Rural dispersion coefficients are proposed since much of the base is either undeveloped or developed in a manner with few structures. Only the cantonment section, where housing and offices are concentrated is considered urban under USEPA's method for distinguishing urban and rural areas.

To reduce the model run time, natural gas boilers and furnaces within 100 meters were grouped unless they are within 10 meters of an acute receptor, in which case grouping was done within 10 meters. A representative stack was assigned to each group.

Initially, Vandenberg SFB plans to model chemical usage as volume sources at the buildings that chemicals were checked out to. If a significant risk is caused by any single source, then actual locations where chemicals were used will be investigated. Risk will then be remodeled using the new locations. If usage is too dispersed, then the single source will be modeled as an area source.

The air emissions database, APIMS, utilized by Vandenberg SFB to track emission sources, and information collected for the 2018 ATEIP are the source of release parameters for stationary sources. Release parameters for portable engines are based on similar engines with known parameters and SBCAPCD default values. Volume source release parameters were based on Geographic Information System (GIS) data for Vandenberg SFB.

Placement of receptors within and around Vandenberg SFB and the method for analyzing risk will be conducted as described in this section. Map of Vandenberg SFB showing sources and some receptors are provided in Appendix B.

With the exception of graded landfill locations, base elevations for sources and receptors will be developed with USEPA's AERMAP (version 18081) terrain processor using 10-meter resolution National Elevation Dataset (NED) data from the United States Geological Survey.[2] The proposed NED data have a higher resolution (10 meters) than Digital Elevation Model (DEM) data that has been used in the past (30 meters); therefore, the NED data can more accurately reflect the terrain in the region. The NED file that will be used is included in Appendix A. Elevations for sources and receptors located at the landfill will be based on graded elevations provided by Vandenberg SFB.

[2] https://catalog.data.gov/dataset/usgs-national-elevation-dataset-ned

4.1 ON-SITE RECEPTORS

All receptors will be modeled with a flagpole height of 1.5 meters above ground level. Comma-Separated Values (CSV) files containing the Universal Transverse Mercator (UTM) coordinates and description for each of the on-site receptors to be modeled are included in Appendix A.

4.1.1 Within Cantonment

4.1.1.1 Acute Receptors

Acute receptors will be placed at all locations that the public[3] is likely to be for an hour or more. This includes schools, day care centers, adult education facility, parks, playgrounds, sports fields, restaurants, shopping centers, gym, movie theater, bowling alley, etc. It would not include streets, parking lots, industrial areas, and areas that are inaccessible to the public (posted or fenced). Furthermore, lawn/picnic areas surrounding industrial buildings are not required to be included in the acute analysis.

4.1.1.2 8-hour Hazard Index

The 8-hour hazard index (chronic non-cancer risk) will be evaluated at on-base housing, schools, daycare centers, and worker receptors.

4.1.1.3 Cancer and Chronic Non-Cancer

Residential Receptors

Residential on-site cancer and chronic non-cancer risks will be evaluated at on-base housing, schools, and day care centers. A multi-pathway analysis is required. The cancer analyses methods and required pathways (in addition to inhalation) are shown below in Table 4.1-1. Risk management decisions will be based on the 30-year exposure duration for the schools, daycare centers, and on-base housing.

Table 4.1-1
Required On-site Residential Cancer Analyses Methods and Pathways

Pathways	On-Base Housing	School and Daycare
30 year (adult resident) RMP using the Derived Method	✓	✓
Soil pathway	✓	✓
Dermal pathway (“Warm” climate)	✓	✓
Mother’s milk pathway	✓	✓
Home grown produce pathway	✓	
Fish pathway (See Section 4.1.2.3)	✓	

Key: RMP = Risk Management Policy

[3] For the purpose of this document, the public is defined to be any person that is not an employee of Vandenberg SFB or an employee of a company that is part of the Vandenberg SFB stationary source (SSID 1195).

Worker Exposure

On-site cancer and chronic non-cancer risk for worker exposure will be evaluated for workers that are not employees of Vandenberg SFB or employees of a company that is part of the Vandenberg SFB stationary source (SSID 1195). For example, United Launch Alliance and Coast Hills Federal Credit Union would be included in the worker exposure analysis, but the buildings where contractors working for Vandenberg SFB work would not. Locations that a worker will occasionally visit, but is not permanently stationed (e.g., Verizon cell towers), are also not required to be evaluated.

In addition to inhalation (OEHHA Derived Method), the dermal and soil pathways will be evaluated for the worker exposure analysis.

4.1.2 Outside of Cantonment

4.1.2.1 Acute Receptors

Acute receptors will be placed at all locations that the public is likely to be for an hour or more. This includes the boat house, publicly accessible beaches (accessible during any part of the year), rocket viewing areas, cave with Chumash paintings, known hiking trails, and hunting areas which the hunters are not required to sign a waiver. The hiking trails that will be included are the ones with posted trailheads that are mapped/documented in writing, or are generally well known (e.g., Brown Road to beach). Roadways are not included in the acute analysis.

4.1.2.2 8-hour Hazard Index

The 8-hour hazard index (chronic non-cancer risk) will be evaluated at residences, schools, daycare centers, and worker receptors.

4.1.2.3 Cancer and Chronic Non-Cancer

Outside the cantonment area, cancer and chronic non-cancer risk analyses will be evaluated at receptors placed at the train station, as described in Section 4.2.2.5.

Additionally, receptors will be placed at fishable water bodies to assess risk for on-base residents due to the fishing pathway. Section 15 of the hunting and fishing regulations in the 30th Space Wing Instruction 32-7001,[4] indicates that freshwater fishing is only permissible in the following lakes/ponds:

- Mod III Lake (adjacent to Umbra Road).
- Lake Canyon Lakes – Upper, Middle, and Lower (adjacent to Washington Ave.).
- Punchbowl Lake (adjacent to Corral Road).
- Rawlinson Pond (adjacent to the intersection of San Antonio Road West and Lompoc – Casmalia Highway).
- El Rancho Pond (adjacent to the intersection of El Rancho Road and El Rancho Lateral).

[4] https://static.e-publishing.af.mil/production/1/30sw/publication/30swi32-7001/30swi32-7001.pdf

The receptor with the highest AERMOD-modeled impacts (of each of the above water bodies) will be used in the HARP modeling for the fish pathway. The coordinates of the receptors and the associated HARP parameters for each water body are provided in Appendix A.

Lastly, receptors will be placed at livestock grazing areas to assess risk at the nearby federal penitentiary due to the dairy pathway. Note that no beef or dairy from this livestock is consumed on-site; it is only the penitentiary that uses the milk. The receptor with the highest AERMOD-modeled impacts (of each of the grazing areas) will be used in the HARP modeling for the dairy pathway. Appendix A provides the UTM coordinates for the grazing area receptors as well as HARP 2 model parameters. The fraction of cows feed from grazing will be set to the default value of 0.5.

4.2 OFF-SITE RECEPTORS

While acute risk must be evaluated for all off-site areas on land, chronic non-cancer and cancer risk only require evaluation at locations where an actual risk receptor (sensitive, residential, or worker) exists. However, chronic non-cancer and cancer risk will initially be evaluated at the worst-case modeled off-site location (including the property boundary and beyond), regardless of whether an actual risk receptor is present. If this conservative methodology indicates a significant risk result, the analysis will be refined to consider actual risk receptor locations. Also, depending on the land use zoning, different exposure durations and/or a ground level concentration (GLC) adjustment factor may be used. All receptors will be modeled with a flagpole height of 1.5 meters above ground level.

4.2.1 Along Property Boundary

Receptors will be placed 100 meters apart along the property boundary and analyzed for acute cancer and chronic non-cancer risk. The receptors will be evaluated using the same analysis method used for the adjacent off-site receptors. For example, when conservatively evaluating the receptors as a residential area (even if no actual residence is present) risk will be determined with the 30-year (adult resident) exposure duration with the Risk Management Policy (RMP) using the Derived Method for cancer risk. Further refinement of grid spacing may be required based on the acute risk results in accordance with Section 4.2.2 below. Appendix A contains a CSV file with the UTM coordinates of the property boundary receptors.

4.2.2 Outside of Property Boundary

4.2.2.1 Acute Receptors

Off-site acute receptors are required starting at the property boundary and extending out 500 meters, with an initial grid spacing of 100 meters. If the hazard index is less than or equal to 0.5 at the property boundary and beyond, no further refinement of grid spacing is required for the acute risk. If the hazard index is between 0.5 and 0.7 at the property boundary or beyond, the grid will be refined to 50 meters, within 250 meters of any receptor with a 0.5 hazard index or greater. If the hazard index is 0.7 or greater at the property boundary or beyond, the grid will be refined to 25 meters, within 250 meters of any receptor with a 0.7 hazard index or greater. If a receptor shows a significant risk, additional receptors will be placed 500 meters out from any significant risk receptor, with a grid spacing of 25 meters.

4.2.2.2 Multi-Pathway Analysis for Cancer and Chronic Non-Cancer Receptors

In addition to inhalation, other pathways will be included in the risk analysis. The additional pathways that will be included are shown below in Table 4.2-1.

Table 4.2-1
Multi-Pathway Analyses

Pathways	Residential	Commercial Zoning	Sensitive Receptors
Soil pathway	✓	✓	✓
Dermal pathway ("Warm" climate)	✓	✓	✓
Mother's milk pathway	✓		✓
Home grown produce pathway	✓		
Fish pathway	✓		
Dairy pathway[5]	**See Footnote 5**		
Chickens/Eggs pathway	✓		

Livestock is raised on the base; however, only the milk is consumed by residents at a nearby federal penitentiary. Therefore, the dairy pathway will only be included for the federal penitentiary.

4.2.2.3 Chronic Non-Cancer Receptors

The Derived (OEHHA) Method will be used to determine the chronic hazard index for residential areas, sensitive receptors, and for any parcels that are not zoned commercial. For parcels zoned commercial without residential or sensitive receptors, the worker scenario (Point estimate) may be used. The federal penitentiary will be evaluated with the residential RMP using the Derived Method.

Chronic non-cancer risk will initially be evaluated using the worst-case modeled receptor from a grid starting at the property boundary and extending out 500 meters, with receptors spaced 100 meters apart. This is conservative because there may not be an actual risk receptor (sensitive, residential, or worker) present at that worst-case location. If this initial evaluation results in a significant risk, the analysis will be refined to consider actual risk receptor locations.

4.2.2.4 Cancer Risk Receptors

The 30-year (adult resident) exposure duration with the RMP using the Derived Method will be used to determine the cancer risk for residential areas, sensitive receptors, and for any parcels that are not zoned commercial. For parcels zoned commercial without residential or sensitive receptors, the 25-year worker exposure scenario (point estimate) may be used. The federal penitentiary will be evaluated with the 30-year (adult resident) with the RMP using the Derived Method.

Cancer risk will initially be evaluated using the worst-case AERMOD-modeled receptor from a grid starting at the property boundary and extending out 500 meters, with receptors spaced 100 meters apart. This is conservative because there may not be an actual risk receptor (sensitive, residential, or worker) present at that worst-case location. If this initial evaluation results in a significant risk, the analysis will be refined to consider actual risk receptor locations.

[5] The dairy pathway will be included for the federal penitentiary.

4.2.2.5 Special Situations

Train Station

The grid spacing at the train station will be 25 meters. The receptors will be evaluated for acute, chronic non-cancer, and cancer risk. The worker exposure scenario may be used for the cancer and chronic non-cancer risk.

Ocean

Acute receptors will be placed in the ocean in accordance with Section 4.2.2.1 above. However, receptors are required to be placed 300 meters from the shoreline instead of 500 meters from the property boundary. Cancer and chronic non-cancer risk are not required to be evaluated for ocean receptors.

Worker Exposure

If the worker exposure scenario is used, it may be necessary to use a GLC adjustment factor. This GLC adjustment factor will be determined if there is a chronic hazard index above 0.2 or a cancer risk above 2.3 in a million at the worker receptor. The factor will be based on the schedule of the worker, and the schedule of the risk driving device, in accordance with OEHHA's HRA Guidelines (The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, February 2015).

4.3 AIR DISPERSION MODEL RESULTS

Air dispersion model results will be summarized for the Maximum Exposed Individual Resident, the Maximum Exposed Individual Worker, and for Sensitive Receptors.

5.0 REFERENCES

A copy of each reference listed below is provided in **Appendix E**.

- Air Emissions Guide for Air Force Mobile Sources, August 2018
- Air Emissions Guide for Air Force Stationary Sources
- Air Emissions Guide for Air Force Stationary Sources, August 2018 – Table 16-3
- CAPCOA's Auto Bodyshop Industrywide Risk Assessment Guidelines
- Determination of Thermodynamic Properties of Aerozine-50
- LFG TAC Weight Fraction_Waste in place Prior to 1992.xlsx
- SCAQMD Supplemental Instructions for Liquid Organic Storage Tanks
- Source Test Report for PTO 7987
- SBCAPCD-Approved Emission Factors for TAC
- SBCAPCD-Approved TAC Emission Factors.xlsx
- SBCAPCD GDF Memo
- Titan IV Manual, select pages
- AP-42, Municipal Solid Waste Landfill
- AP-42, Paved Roads
- AP-42, Heavy Construction Operations
- AP-42, Aggregate Handling and Storage Piles

This page intentionally left blank.

6.0 ACRONYMS AND ABBREVIATIONS

A-50	Aerozine 50
AB2588	Assembly Bill 2588
AERMOD	Atmospheric Dispersion Modeling System
AFB	Air Force Base
APCD	Air Pollution Control District
APIMS	Air Program Information Management System
ATCM	Airborne Toxic Control Measures
ATEIP	Air Toxic Emission Inventory Plan
ATEIR	Air Toxic Emission Inventory Report
bhp	brake horsepower
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CSV	Comma-Separated Values
DEM	Digital Elevation Model
EF	emission factor
FVSS	fuel vapor scrubbing system
GIS	Geographic Information System
GLC	ground level concentration
HARP	Hotspots Analysis and Reporting Program
HARP 1	Hotspots Analysis and Reporting Program, Version 1
HARP 2	Hotspots Analysis and Reporting Program, Version 2
HazMart	hazardous materials pharmacy
HRA	health risk assessment
ICE	internal combustion engine
Jet-A	aviation jet fuel
LPG	liquefied propane gas
N_2O_4	nitrogen tetroxide
NED	National Elevation Dataset
NMOC	non-methane organic compounds
OEHHA	Office of Environmental Health Hazard Assessment
PM	particulate matter
PSB	paint spray booth
PTO	permit to operate
RMP	Risk Management Policy

RP-1	rocket propellant 1
SBCAPCD	Santa Barbara County Air Pollution Control District
SCAQMD	South Coast Air Quality Management District
SDS	safety data sheet
SFB	Space Force Base
SJVAPCD	San Joaquin Valley Air Pollution Control District
SLC	Space Launch Complex
TAC	toxic air contaminants
USEPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VOC	volatile organic compound