REVIEW OF BAE SYSTEMS SDSR
AB2588 HEALTH RISK ASSESSMENT (HRA)

December 23, 2021

Emissions Inventory Facility ID: 478

Toxics Emissions Inventory Year: 2017

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A Health Risk Assessment (HRA) was performed for BAE Systems SDSR, 2205 East Belt Street, San Diego, California 92113 by Scientific Resources Associated for emissions in calendar year 2017 and submitted to the District for review on June 12, 2019 (Submittal HRA). The District provided District's comments on the HRA along with comments provided from the Office of Environmental Health Hazard Assessment (OEHHA) to BAE Systems SDSR on March 24, 2021. BAE Systems SDSR submitted a revised HRA (Revised HRA) to the District on May 20, 2021. Subsequently, the District completed a modified health risk assessment (District Modified HRA) on November 16, 2021. BAE Systems SDSR provided a refined acute analysis to the District on December 9, 2021 and December 17, 2021.

The following are the District's comments on the Revised HRA and BAE Systems SDSR's revised acute analysis, in addition, the results of the Amended District Modified HRA that supersede the results approved on November 16, 2021.

Approved HRA Results

Point of Maximum Impact (PMI) Cancer Risk	70.1 in one million
Maximum Exposed Individual Resident Cancer Risk	7.05 in one million
Maximum Exposed Individual Worker Cancer Risk	14.2 in one million
Maximum Non-Cancer Chronic Health Hazard Index (PMI)	0.781
Maximum Residential Non-Cancer Chronic Health Hazard Index	0.0353
Maximum Worker Non-Cancer Chronic Health Hazard Index	0.311
Maximum Worker 8-Hour Non-Cancer Chronic Health Hazard Index	0.185
Maximum Acute Health Hazard Index (PMI)	2.44
Maximum Residential Acute Health Hazard Index	0.769
Maximum Worker Acute Health Hazard Index	2.44
Population Excess Cancer Burden	0.058
Sub-Chronic Lead Exposure Risk	<0.12 ug/m3

The 30-day lead concentration at the Maximum Offsite Concentration (MOC), using EPA's AERMOD model, is estimated to be 0.0081 µg/m^3, which is below the High Exposure Scenario approval level of 0.12 µg/m^3 in the ARB Risk Management Guidelines for Lead, 2001. Lead emissions were estimated based on annual emissions being emitted in a 30-day period.

The facility's emission sources include:

- Diesel engines
- Welding
- Abrasive blasting
- Painting and coating operations
- Adhesives
- Solvents

Major Pollutant and Source Contributions for Selected Risks

Maximum Worker Excess Lifetime Cancer Risk

Pollutant	Contribution	Emission source
Hexavalent Chromium	52%	Welding
Diesel Particulate Matter	29%	Diesel engines
Cadmium	12%	Welding and abrasive blasting
Ethyl Benzene	3%	Coating operations and solvents
Nickel	2%	Welding and abrasive blasting

Maximum Worker Acute Health Hazard Index

Pollutant	Contribution	Emission source
Nickel	99%	Welding, abrasive blasting, and diesel engines
Benzene	1%	Diesel engines

The District Revised HRA concludes that the worker cancer risk and the worker acute health hazard index do exceed the public notification levels specified in District Rule 1210.

<u>Summary of Changes in District Modified HRA</u>

Air Dispersion Modeling

1. For the District Modified HRA, refined air dispersion modeling was conducted using EPA's AERMOD model (Lakes AERMOD, Version 19191), AERMET (Version 19191) Perkins Elementary School monitoring station 2010/2012 sigma theta updated meteorological data, AERMAP terrain processing, and urban dispersion coefficients. The Submittal HRAs used ustar updated meteorological data. The building downwash effects in the modeling remained unchanged from the Submittal HRAs.
2. More precise HROFDY scalars (four decimal places) were used for the variable emissions scenario in the period average model.
3. The Submittal HRAs used the centroids of census blocks rather than those of census tracks for the census receptors in the population model, which is used in the cancer burden calculation. The District Modified HRA used census receptors at the centroids of census tracks, which provides more precision in the cancer burden calculation.
4. A Cartesian receptor grid with 20-meter spacing over residential areas was used in the AERMOD model utilized in calculation of the acute health hazard index.

Risk Assessment Calculations

1. HARP2 version 21081 was used for the cancer risk, health hazard index, and population cancer burden calculations. The Submittal HRAs used version 19044.
2. For the calculation of worker cancer risk and chronic health hazard indexes, the District Modified HRA applied a worker adjustment factor (WAF) of 3.36 for worker cancer risk for all sources, to reflect that 80% of the activity (emissions) occurs during the first shift, which is consistent with the AERMOD model (variable emissions) and the submitted revised HRA report. This is the same WAF that was suggested in OEHHA's comment letter (dated 3/5/21). The previous WAF was actually based on 65% activity during the first shift (WAF = 2.73).
3. For the dermal pathway, which applies in the calculation of cancer risk and non-cancer chronic health hazard index, the "warm" option was used for dermal climate, to reflect the warm climate of San Diego. Previously, the "mixed" option was used.
4. The revised emissions inventory dated 10/21/21 was used in the risk calculations.

<u>Summary of Changes in BAE Systems SDSR's revised acute analysis</u>

1. Two acute scenarios were evaluated to better align the emissions at the times they are emitted with the air dispersion at those times. The max hourly emissions were evaluated to have been emitted during the first shift operations from 7am-3pm. Second shift emissions were determined to be 20% of that of the first shift and can occur between 3pm-10pm. The District has reviewed and accepted the results of this methodology.

Locations of Receptors at Maximum Exposure Points

Receptor - Cancer Risk	Risk (1 in 1 million)	x (m)	y (m)
Point of Maximum Impact Cancer Risk (PMI)	70.1	486303.8	3617256.9
Maximum Exposed Individual Resident Cancer Risk (MEIR)	7.05	486650	3617700
Maximum Exposed Individual Worker Cancer Risk (MEIW)	14.2	486600	3617150

Receptor - Non-Cancer Chronic Health Hazard Index	Health Hazard Index	x (m)	y (m)
Maximum Non-Cancer Chronic Health Hazard Index (PMI)	0.781	486303.8	3617256.9
Maximum Residential Non-Cancer Chronic Health Hazard Index (MEIR)	0.0353	486650	3617700
Maximum Worker Non-Cancer Chronic Health Hazard Index (MEIW)	0.311	486300	3617300
Maximum Worker 8-Hour Non-Cancer Chronic Health Hazard Index (MEIW)	0.185	486300	3617300

Receptor - Acute Health Hazard Index	Health Hazard Index	x (m)	y (m)
Maximum Acute Health Hazard Index (PMI)	2.44	486303.8	3617256.9
Maximum Residential Acute Health Hazard Index (MEIR)	0.769	486993.71	3617491.76
Maximum Worker Acute Health Hazard Index (MEIW)	2.44	486303.8	3617256.9

The geographic coordinate system for the locations is the North American Datum of 1983.

Contours for Selected Risk and Health Hazard Index Calculations

Contours for selected risk and health hazard index calculations are on the following pages.

1. Residential cancer risk
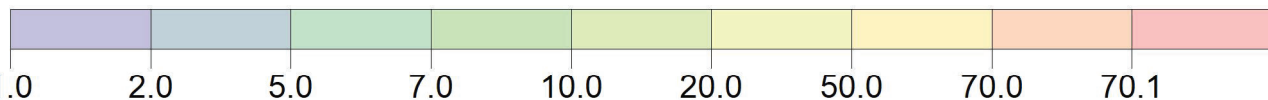2. Occupational cancer risk
3. Acute health hazard index

PROJECT TITLE:

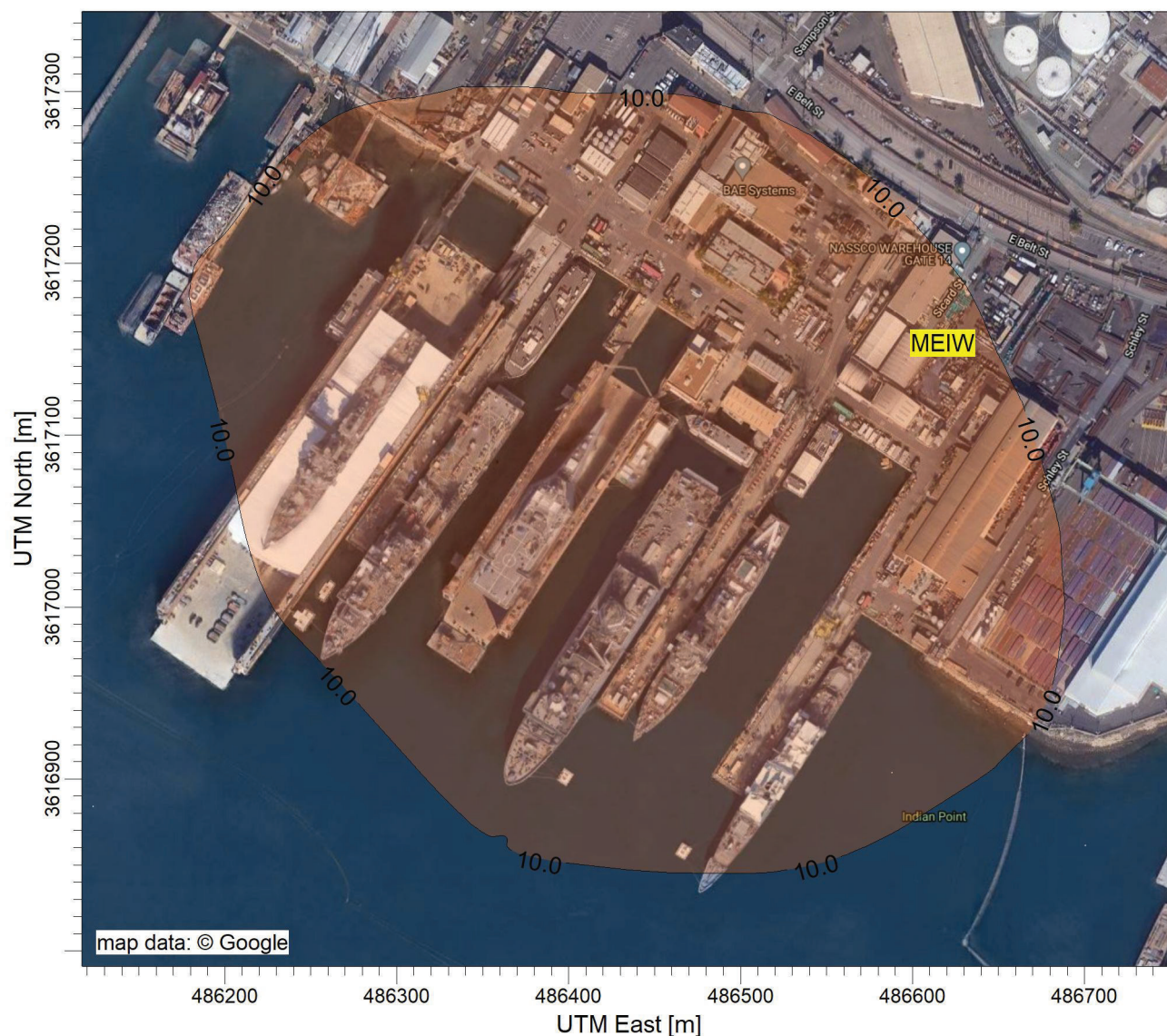**BAE, 2205 E Belt St, San Diego**
Resident cancer risk

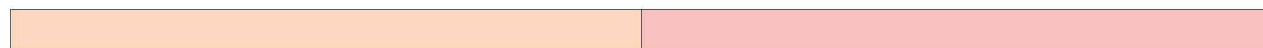PLOT FILE OF PERIOD VALUES FOR SOURCE GROUP: ALL   1/1e6

1.0	2.0	5.0	7.0	10.0	20.0	50.0	70.0	70.1
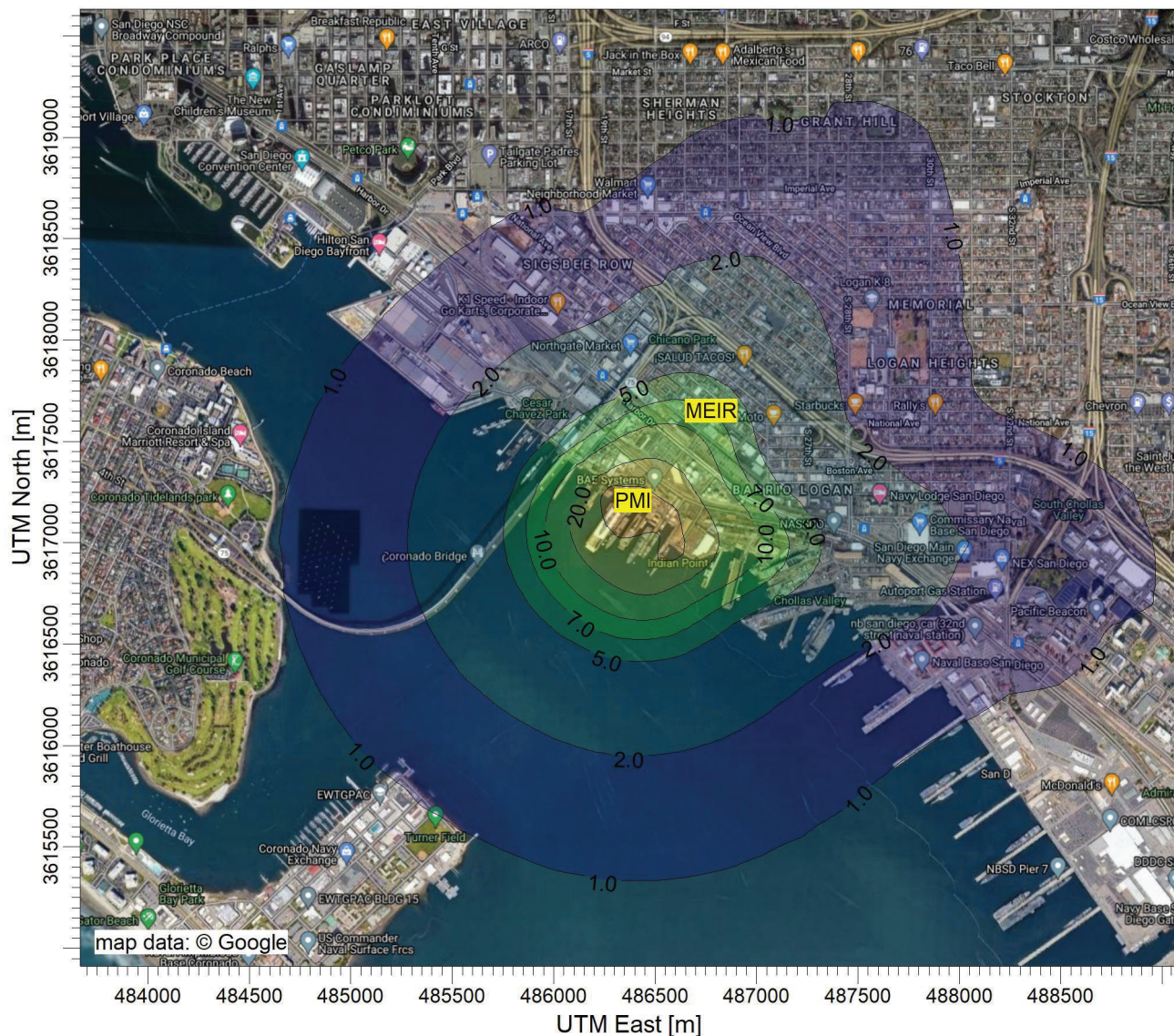
COMMENTS:	MODELING OPTIONS:	COMPANY NAME:	
Resident cancer risk calculation	**MODELING, OPTIONS, USED:, REGDFAULT, CONC, ELEV, URBAN, SIGA, DATA**		

		MODELER:	

OUTPUT TYPE:	RECEPTORS:	SCALE: 1:34,000	
Concentration	**2328**	0 ▭▬▬▬▬ 1 km	

MAX:	UNITS:	DATE:	PROJECT NO.:
70.127	**1/1e6**	**9/13/2021**	

PLOT FILE OF PERIOD VALUES FOR SOURCE GROUP: ALL   1/1e6

10.0   17.9

COMMENTS:	MODELING OPTIONS:	COMPANY NAME:	
	MODELING, OPTIONS, USED:, REGDFAULT, CONC, ELEV, URBAN, SIGA, DATA	MODELER:	
	OUTPUT TYPE:	RECEPTORS:	SCALE: 1:4,000	
	Concentration	**2328**	0 ▬▬▬ 0.1 km	
	MAX:	UNITS:	DATE:	PROJECT NO.:
	17.874	**1/1e6**	**9/13/2021**	

1.00	2.00	2.44

COMMENTS:	SOURCES:		
	88		
	OUTPUT TYPE:	SCALE: 1:4,871	
	Health Hazard Index	0 ▬▬▬ 0.1 km	
	MAX:		PROJECT NO.:
	2.44 HHI		