

Memorandum

To: Ace Malisos, Kimley-Horn

From: James A. Westbrook, BlueScape Environmental

Date: June 1, 2026

Subject: Supplement to the Regional Air Quality Modeling and Health Impact Analysis for BIG: Modeling Update for On-road Emissions

This memorandum presents updated photochemical modeling results for the Barstow International Gateway Specific Plan Project (BIG, or Project) and supplements the *Regional Air Quality Modeling and Health Impact Analysis for the Barstow International Gateway* (HIA Report) (BlueScape, April 2026). The HIA Report conducted regional photochemical modeling and evaluated potential regional air quality and health impacts associated with Project construction and operations, focusing on 2026 year construction-related emissions and the 2033 and 2048 year operational emissions. Specifically, the prior modeling included all rail emissions along the corridor between Needles and the Ports of Los Angeles and Long Beach, together with stationary, area, and mobile-source emissions associated with the Project within the Project Railyard area located near Barstow. Given time constraints, the HIA Report did not include the modeling of regional decreases in emissions associated with BIG's reduction of thousands of truck miles traveled per day throughout the area studied in the HIA Report, although the emissions reductions were considered qualitatively. As the HIA Report stated, "...significant net emissions reductions associated with the reduced truck miles traveled in both the South Coast and Mojave Desert air basins were not credited quantitatively in the modeling conducted for this study. Given the number of truck trips reduced, the approach gives a *conservative* estimate of the potential health risk impacts..."

Subsequent to the April 2026 HIA Report, additional information regarding the expected location and distribution of Project-related on-road emissions (i.e., net reductions in truck-related emissions) was included in the modeling conducted for the HIA. In particular, updated information regarding on-road vehicle travel routes and associated spatial allocation of emissions was provided to BlueScape by Kimley-Horn for operational years 2033 and 2048.

The updated modeling incorporates on-road vehicle operational net emissions occurring outside the Project Railyard area and allocates those emissions to expected

travel locations. Because truck miles traveled reductions would only occur during Project operations, construction-year results were not remodeled and are expected to remain materially consistent with those presented in the April 2026 HIA Report.

Consistent with expectations stated in the April 2026 HIA Report, the updated modeling results indicate lower projected concentration changes of ozone and PM_{2.5} relative to the prior analysis. Correspondingly, estimated health incidences associated with Project emissions are also lower than previously reported. As with the prior analysis, the modeled ozone and PM_{2.5} concentration changes attributable to the Project show the "Project's individual and cumulative concentration impacts on regional public health are not discernible as different than zero ..." "...and therefore are not statistically meaningful and not expected to have a perceptible health impact." This supplemental analysis quantitatively confirms that Project-related operational activity would contribute *even less* to regional air quality and health impacts than estimated in the prior HIA Report, moving toward net zero health impacts. The supplemental modeling concentrations are between 28% and 73% less than in the prior HIA Report, and health incidences are between 29% and 78% less than in the April HIA Report.

This supplement to the HIA Report summarizes the updated modeling methodology, revised emissions estimates, resulting pollutant concentration changes, and corresponding HIA results.

Updated HIA Modeling Methodology

Because the most substantial changes in emissions were associated with operational years 2033 and 2048, those years were re-modeled using the Comprehensive Air Quality Model with Extensions (CAMx) photochemical grid model consistent with the methodology described in the April HIA Report. Changes associated with the 2026 construction year were minimal and did not warrant additional modeling.

Background air concentrations used in the updated analysis were unchanged from the prior analysis. Similarly, the following baseline scenarios remain unchanged:

- 2030 Base Case model year without Project emissions;
- 2033 baseline year without Project emissions; and
- 2048 baseline year without Project emissions.

Accordingly, the updated modeling analyses were limited to the following operational scenarios:

- 2033 baseline year plus unmitigated Project emissions;
- 2033 baseline year plus mitigated Project emissions;
- 2048 baseline year plus unmitigated Project emissions; and
- 2048 baseline year plus mitigated Project emissions.

Net Project-Related Emissions

To support these runs, the net emissions associated with Project implementation, unmitigated and mitigated, for years 2033 and 2048, in pounds per day (lb/day) were calculated. As mentioned, the previous analysis did not include modeling for on-road vehicles traveling off-site, as their travel locations were unknown at the time, though some on-road vehicle emissions were allocated to the Railyard area to be conservative.

Tables 1 through 4 show the updated emissions; these now include net emissions from vehicles operated outside the Railyard and have been modeled at expected locations. As stated below, "Onroad Mobile" emissions include combustion from cars and trucks associated with the Project; emissions in this category are primarily from trucks. "Offroad Mobile" emissions include combustion from both rail and off-road equipment associated with the Project; emissions in this category are primarily from rail. Thus, the updated modeling presented in this supplement includes all of BIG's emissions within the modeling domain, as presented in the tables below and shown in Figure 1.

TABLE 1 2033 UPDATED OPERATIONAL UNMITIGATED EMISSIONS (LB/DAY)						
Category	ROG	NO_x	CO	SO_x	PM₁₀	PM_{2.5}
Onroad Mobile	37.3	-399	645	-1.66	-60.8	-26.4
Offroad Mobile	53.3	2,640	3,332	7.88	20.9	20.4
Area/Energy	256	0.62	71.8	0.003	-119	-25.6
Stationary	90.2	372	233	0.44	13.3	13.3
Total	437	2,614	4,282	6.66	-146	-18.4

TABLE 2 2033 UPDATED OPERATIONAL MITIGATED EMISSIONS (LB/DAY)						
Category	ROG	NO_x	CO	SO_x	PM₁₀	PM_{2.5}
Onroad Mobile	37.3	-399	645	-1.66	-60.8	-26.4
Offroad Mobile	24.8	2,492	1,298	5.03	15.1	14.6
Area/Energy	207	0	0	0	-121	-26.1
Stationary	12.4	44.2	230	0.44	1.77	1.77
Total	282	2,137	2,173	3.82	-165	-36.1

TABLE 3 2048 UPDATED OPERATIONAL UNMITIGATED EMISSIONS (LB/DAY)						
Category	ROG	NO_x	CO	SO_x	PM₁₀	PM_{2.5}
Onroad Mobile	27.6	-383	624	-1.48	-69.6	-29.5
Offroad Mobile	60.4	2,746	3,524	8.69	19.4	18.9
Area/Energy	256	0.62	71.8	0.003	-138	-29.9
Stationary	90.2	372	233	0.44	13.3	13.3
Total	434	2,736	4,452	7.66	-175	-27.3

TABLE 4 2048 UPDATED OPERATIONAL MITIGATED EMISSIONS (LB/DAY)						
Category	ROG	NO_x	CO	SO_x	PM₁₀	PM_{2.5}
Onroad Mobile	27.6	-383	624	-1.48	-69.6	-29.5
Offroad Mobile	31.9	2,598	1,490	5.85	13.6	13.2
Area/Energy	207	0	0	0	-140	-30.5
Stationary	12.4	44.2	230	0.44	1.77	1.77
Total	279	2,260	2,343	4.81	-194	-45.0

For some pollutants and scenarios, the total Project emissions may be negative due to the switcher replacement at the existing BNSF Barstow Railyard and the reduction in Truck Miles Traveled (TMT). For emissions occurring within the Railyard area, both unmitigated and mitigated scenarios were assessed. For those emissions occurring outside the Railyard, mitigation is either unnecessary due to lack of impacts or determined to be infeasible, so these emissions were used for both unmitigated and mitigated scenarios.

On-road mobile emissions include combustion from cars and trucks associated with the Project; emissions in this category are primarily from trucks. As these emissions now include vehicles operated outside of the Railyard area, there will be increases in some emissions and decreases in others. Specifically, light-duty vehicles have higher grams per mile (g/mi) and/or g/trip emissions for Reactive Organic Gases (ROG) and Carbon Monoxide (CO); as these vehicles were not accounted for offsite in the previous analysis, and there is a small increase in light-duty vehicle activity, these pollutants show a small increase in the tables below versus the tables in the April 2026 HIA Report. Conversely, heavy-duty vehicles have higher g/mi and/or g/trip emissions for Oxides of Nitrogen (NO_x), Oxides of Sulfur (SO_x), and Particulate Matter 10 or 2.5 Micrometers or less in aerodynamic diameter (PM₁₀ and PM_{2.5}); as these vehicles were not accounted for offsite in the previous analysis, and there is a large decrease in heavy-duty vehicle activity, these pollutants show a large decrease in the tables below versus the tables in the April 2026 HIA Report.

Off-road mobile emissions include combustion from both rail and off-road equipment associated with the Project; emissions in this category are primarily from rail. The

off-road mobile emissions in the tables below now include both the off-road equipment operated onsite and the rail emissions onsite and through the rail corridor.

Area/Energy sources for the Project are fugitive dust, tire wear, and brake wear from vehicles; paving; architectural coating; consumer products; and landscaping equipment. Due to decreased TMT, PM₁₀ and PM_{2.5} from fugitive dust, tire wear, and brake wear have been substantially reduced since the last rounds of modeling.

The only stationary sources for the Project are emergency generators; the emissions for these remain the same as in the previous modeling.

All the emissions in Tables 1 through 4 were included in the Draft EIR.

Project Emissions Grid Allocation

As in the previous analysis, Project emissions provided to BlueScape by Kimley-Horn were used. For the updated modeling, maps were also provided by Kimley-Horn, showing expected vehicle travel routes; these were used to spatially allocate emissions to 4-km grid cells to match emissions with the locations of modeled/adjusted background values. Figure 1 shows the location of the areas used for modeling. The modeling domain, which is the same domain used in the previous modeling, is outlined in red. The rail corridor, unchanged from the previous modeling, is shown in purple. The roads where Project vehicle changes are expected are shown in green. These roads include I-5, I-10, I-15, SR-22, SR-58, SR-99, I-105, SR-/I-210, I-215, I-405, US-395, I-605, and I-710. As the modeling domain does not extend the full length of the emissions calculated for TMT reduction in the EIR (e.g., some routes may travel to Las Vegas, Chicago, or Dallas), vehicle emissions were modified by using the proportion of the total mileage traveled to the mileage traveled within the modeling domain boundary. No other assumptions were applied to the emissions provided by Kimley-Horn other than the spatial allocations described above. Note that while there is a significant overall TMT reduction associated with BIG, TMT will increase in some areas. Because these increases are in areas with low population density, there is no associated increase in regional health impacts.

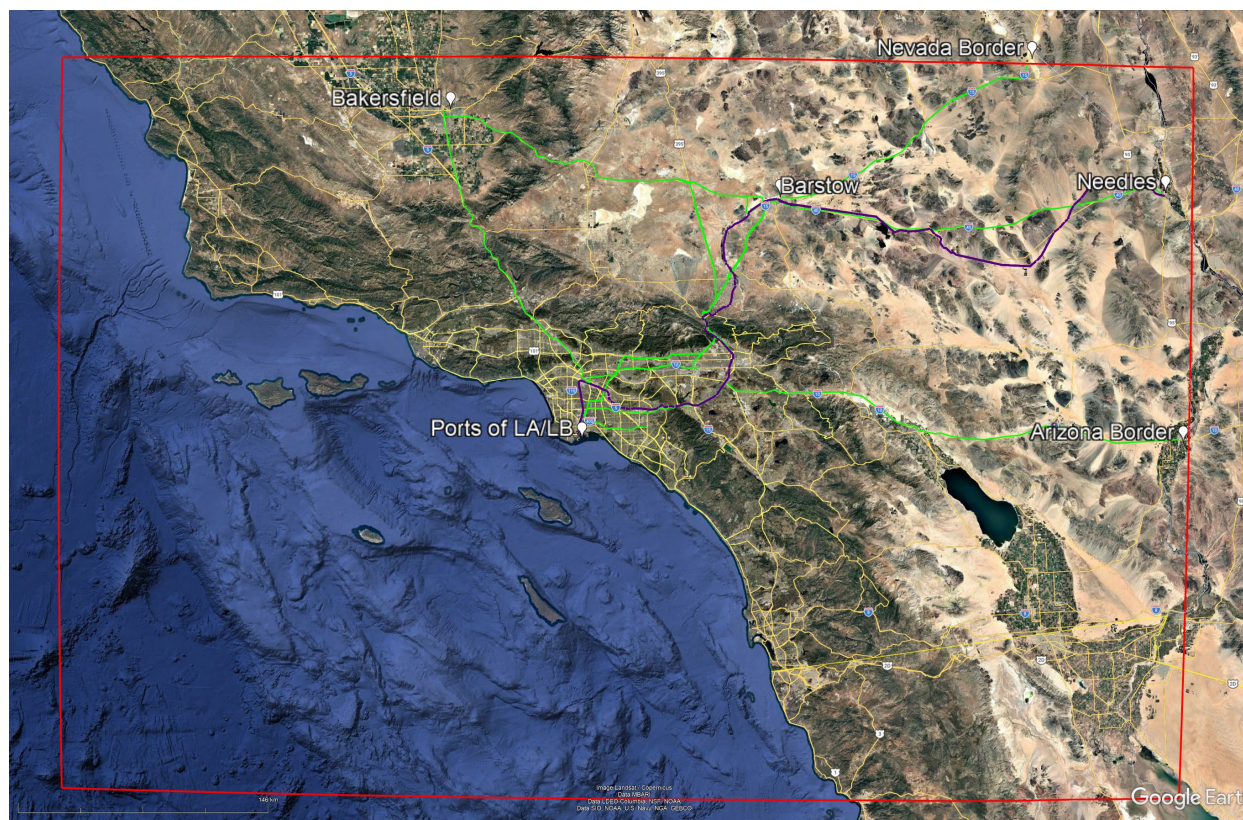


FIGURE 1 REGIONAL MODELING AREA

Updated CAMx Photochemical Modeling

The meteorological data, initial and boundary conditions, emissions speciation, and post-processing analyses remained the same as the previous analysis, along with the modeling domain and spatial location of 4-km grids.

Updated CAMx Modeling Results

Ozone modeling concentration change results are presented in Table 5 for the CAMx 4-km grid in parts per billion by volume (ppbv), for the maximum daily 8-hour average (MDA8) concentrations, at the grid with the highest change from baseline (or No Project).

For 2033, the maximum MDA8 Project concentration change is 0.00126 ppbv, or 0.00159% of baseline, for the unmitigated emissions scenario. For 2048, the maximum MDA8 Project concentration change is 0.00109 ppbv, or 0.00145% of baseline, for the unmitigated emissions scenario.

TABLE 5 UPDATED CAMX MODELING RESULTS - BASELINE (NO PROJECT) AND PROJECT SCENARIOS, MDA8 OZONE					
Year	Baseline Scenario (ppbv)	Mitigation	Project Scenario (ppbv)	Maximum Project Change (ppbv)	Maximum Project Change (%)
2033	79.26601	Unmitigated	79.26727	0.00126	0.00159%
		Mitigated	79.26687	0.00087	0.00109%
2048	75.30271	Unmitigated	75.30380	0.00109	0.00145%
		Mitigated	75.30350	0.00079	0.00105%

The PM_{2.5} modeling concentration change results are presented in Table 6 for the CAMx 4-km grid in units of micrograms per cubic meter (µg/m³), annual 24-hour average PM_{2.5} concentrations, at the grid with the highest change from baseline (or No Project).

For 2033, the maximum annual daily PM_{2.5} Project concentration change is 0.00227 µg/m³, or 0.01288% of baseline, for the unmitigated emissions scenario. For 2048, the maximum annual daily PM_{2.5} Project concentration change is 0.00160 µg/m³, or 0.00959% of baseline, for the unmitigated emissions scenario.

TABLE 6 UPDATED CAMX MODELING RESULTS - BASELINE (NO PROJECT) AND PROJECT SCENARIOS, ANNUAL AVERAGE 24-HOUR PM_{2.5}					
Year	Baseline Scenario (µg/m³)	Mitigation	Project Scenario (µg/m³)	Maximum Project Change (µg/m³)	Maximum Project Change (%)
2033	17.62070	Unmitigated	17.62297	0.00227	0.01288%
		Mitigated	17.62223	0.00153	0.00867%
2048	16.73967	Unmitigated	16.74127	0.00160	0.00959%
		Mitigated	16.74082	0.00116	0.00691%

Concentration Changes with Updated Modeling

With updated CAMx modeling, the maximum concentration changes decrease for every updated modeling scenario, as seen in Table 7 and Table 8.

TABLE 7 CAMX MODELING DIFFERENCES - MDA8 OZONE						
Year	Mitigation	Maximum Project Change (ppbv)		Maximum Project Change (%)		% Difference
		Previous Modeling	Updated Modeling	Previous Modeling	Updated Modeling	
2033	Unmitigated	0.0047	0.0013	0.0059%	0.0016%	-73.2%
	Mitigated	0.0032	0.0009	0.0041%	0.0011%	-73.2%
2048	Unmitigated	0.0039	0.0011	0.0051%	0.0014%	-71.9%
	Mitigated	0.0028	0.0008	0.0037%	0.0010%	-71.9%

TABLE 8 CAMX MODELING DIFFERENCES - ANNUAL AVERAGE 24-HOUR PM_{2.5}						
Year	Mitigation	Maximum Project Change ($\mu\text{g}/\text{m}^3$)		Maximum Project Change (%)		% Difference
		Previous Modeling	Updated Modeling	Previous Modeling	Updated Modeling	
2033	Unmitigated	0.0033	0.0023	0.0186%	0.0129%	-30.7%
	Mitigated	0.0022	0.0015	0.0125%	0.0087%	-30.7%
2048	Unmitigated	0.0023	0.0016	0.0135%	0.0096%	-28.8%
	Mitigated	0.0016	0.0012	0.0097%	0.0069%	-28.8%

Updated Project Regional Health Impacts Analysis

All populations, baseline health incidence datasets, health endpoints, and health impact functions used in the U.S. Environmental Protection Agency (USEPA) Benefits Mapping and Analysis Program – Community Edition (BenMAP-CE), for the updated analysis are the same as the previous analysis. The only changes in the BenMAP-CE modeling for this updated analysis were the concentration inputs. As seen in Table 9 through Table 16, the incremental incidences due to Project emissions are very small, and very small compared to baseline incidences.

**TABLE 9
UPDATED BENMAP-CE MODELING RESULTS FOR MAXIMUM DAILY 8-HOUR (MDA8) AVERAGE OZONE,
2033, UNMITIGATED**

Human Health Endpoints		Aggregated Regional Results			Incremental Incidence / Existing Baseline Incidence (%)
Health Endpoint Group	Health Endpoint	Project Incremental Incidence (# per year)		Baseline Incidence (# per year)	
		Mean	95% Confidence Interval		
Mortality	Mortality, Non-Accidental [0 - 99]	0.00069	0.0003 - 0.001	103,493.7	0.000001%
	Mortality, Cardiopulmonary [0 - 99]	0.00083	0.0003 - 0.0013	48,637.8	0.000002%
	Mortality, All Cause [0 - 99]	0.00178	0.0008 - 0.0027	108,717.1	0.000002%
	Premature mortality — respiratory, long-term exposure [30 - 99]	0.00212	0.0007 - 0.0035	21,918.0	0.000010%
Emergency Department	Emergency Room Visits, Asthma [0 - 17]	0.00592	0.001 - 0.0107	22,379.6	0.000026%
	Emergency Room Visits, Asthma [18 - 99]	0.00705	0.002 - 0.012	37,438.6	0.000019%
Hospital Admissions	Hospital Admissions, All Respiratory [65 - 99]	0.00114	-0.0004 - 0.0026	86,826.4	0.000001%
Other	Asthma Exacerbation, One or more symptoms [0 - 99]	0.48281	-2.52 - 3.38	23,296,474.3	0.000002%
	Minor Restricted Activity Days [18 - 64]	3.35365	1.34 - 5.29	62,537,397.7	0.000005%
	School Loss Days [5 - 17]	2.63349	-0.372 - 5.529	15,147,795.1	0.000017%

**TABLE 10
UPDATED BENMAP-CE MODELING RESULTS FOR MAXIMUM DAILY 8-HOUR (MDA8) AVERAGE OZONE,
2033, MITIGATED**

Human Health Endpoints		Aggregated Regional Results			Incremental Incidence / Existing Baseline Incidence (%)
Health Endpoint Group	Health Endpoint	Project Incremental Incidence (# per year)		Baseline Incidence (# per year)	
		Mean	95% Confidence Interval		
Mortality	Mortality, Non-Accidental [0 - 99]	0.00042	0.0002 - 0.0006	103,493.7	0.000000%
	Mortality, Cardiopulmonary [0 - 99]	0.00050	0.0002 - 0.0008	48,637.8	0.000001%
	Mortality, All Cause [0 - 99]	0.00108	0.0005 - 0.0016	108,717.1	0.000001%
	Premature mortality — respiratory, long-term exposure [30 - 99]	0.00129	0.0004 - 0.0021	21,918.0	0.000006%
Emergency Department	Emergency Room Visits, Asthma [0 - 17]	0.00360	0.0006 - 0.0065	22,379.6	0.000016%
	Emergency Room Visits, Asthma [18 - 99]	0.00427	0.001 - 0.007	37,438.6	0.000011%
Hospital Admissions	Hospital Admissions, All Respiratory [65 - 99]	0.00069	-0.0002 - 0.0016	86,826.4	0.000001%
Other	Asthma Exacerbation, One or more symptoms [0 - 99]	0.29341	-1.53 - 2.05	23,296,474.3	0.000001%
	Minor Restricted Activity Days [18 - 64]	2.03379	0.81 - 3.21	62,537,397.2	0.000003%
	School Loss Days [5 - 17]	1.59705	-0.225 - 3.353	15,147,794.8	0.000011%

**TABLE 11
UPDATED BENMAP-CE MODELING RESULTS FOR MAXIMUM DAILY 8-HOUR (MDA8) AVERAGE OZONE,
2048, UNMITIGATED**

Human Health Endpoints		Aggregated Regional Results			Incremental Incidence / Existing Baseline Incidence (%)
Health Endpoint Group	Health Endpoint	Project Incremental Incidence (# per year)		Baseline Incidence (# per year)	
		Mean	95% Confidence Interval		
Mortality	Mortality, Non-Accidental [0 - 99]	0.00133	0.0006 - 0.002	150,242.0	0.000001%
	Mortality, Cardiopulmonary [0 - 99]	0.00161	0.0006 - 0.0026	72,917.8	0.000002%
	Mortality, All Cause [0 - 99]	0.00334	0.0016 - 0.0051	156,728.2	0.000002%
	Premature mortality — respiratory, long-term exposure [30 - 99]	0.00419	0.0013 - 0.0069	32,129.8	0.000013%
Emergency Department	Emergency Room Visits, Asthma [0 - 17]	0.00781	0.0013 - 0.0141	23,226.1	0.000034%
	Emergency Room Visits, Asthma [18 - 99]	0.01032	0.003 - 0.018	43,147.6	0.000024%
Hospital Admissions	Hospital Admissions, All Respiratory [65 - 99]	0.00201	-0.0007 - 0.0046	117,909.3	0.000002%
Other	Asthma Exacerbation, One or more symptoms [0 - 99]	0.68431	-3.57 - 4.78	24,725,598.6	0.000003%
	Minor Restricted Activity Days [18 - 64]	4.89574	1.95 - 7.73	69,531,201.8	0.000007%
	School Loss Days [5 - 17]	3.52420	-0.497 - 7.399	16,002,978.8	0.000022%

**TABLE 12
UPDATED BENMAP-CE MODELING RESULTS FOR MAXIMUM DAILY 8-HOUR (MDA8) AVERAGE OZONE,
2048, MITIGATED**

Human Health Endpoints		Aggregated Regional Results			Incremental Incidence / Existing Baseline Incidence (%)
Health Endpoint Group	Health Endpoint	Project Incremental Incidence (# per year)		Baseline Incidence (# per year)	
		Mean	95% Confidence Interval		
Mortality	Mortality, Non-Accidental [0 - 99]	0.00081	0.0004 - 0.0012	150,242.0	0.000001%
	Mortality, Cardiopulmonary [0 - 99]	0.00099	0.0004 - 0.0016	72,917.8	0.000001%
	Mortality, All Cause [0 - 99]	0.00205	0.0009 - 0.0031	156,728.2	0.000001%
	Premature mortality — respiratory, long-term exposure [30 - 99]	0.00257	0.0008 - 0.0042	32,129.8	0.000008%
Emergency Department	Emergency Room Visits, Asthma [0 - 17]	0.00478	0.0008 - 0.0086	23,226.1	0.000021%
	Emergency Room Visits, Asthma [18 - 99]	0.00632	0.002 - 0.011	43,147.6	0.000015%
Hospital Admissions	Hospital Admissions, All Respiratory [65 - 99]	0.00123	-0.0004 - 0.0028	117,909.3	0.000001%
Other	Asthma Exacerbation, One or more symptoms [0 - 99]	0.41921	-2.19 - 2.93	24,725,598.3	0.000002%
	Minor Restricted Activity Days [18 - 64]	2.99914	1.2 - 4.73	69,531,201.5	0.000004%
	School Loss Days [5 - 17]	2.15893	-0.305 - 4.532	16,002,978.8	0.000013%

**TABLE 13
UPDATED BENMAP-CE MODELING RESULTS FOR MAXIMUM ANNUAL 24-HOUR AVERAGE PM_{2.5},
2033, UNMITIGATED**

Human Health Endpoints		Aggregated Regional Results			Incremental Incidence / Existing Baseline Incidence (%)
Health Endpoint Group	Health Endpoint	Project Incremental Incidence (# per year)		Baseline Incidence (# per year)	
		Mean	95% Confidence Interval		
Mortality	Mortality, All Cause [30 - 99]	0.17860	0.119 - 0.236	213,818.3	0.000084%
Emergency Department	Emergency Room Visits, Asthma [0 - 99]	0.10995	0.027 - 0.19	119,309.6	0.000092%
Hospital Admissions	HA, All Cardiovascular (less Myocardial Infarctions) [65 - 99]	0.02509	0.018 - 0.032	201,776.3	0.000012%
	HA, All Respiratory [65 - 99]	0.05576	0.032 - 0.079	173,178.4	0.000032%
	HA, Asthma [0 - 64]	0.00888	0.003 - 0.014	16,260.2	0.000055%
Other	Acute Myocardial Infarction, Nonfatal [18 - 24]	0.00001	0.00001 - 0.00002	34.7	0.000034%
	Acute Myocardial Infarction, Nonfatal [25 - 44]	0.00066	0.0003 - 0.001	1,804.8	0.000037%
	Acute Myocardial Infarction, Nonfatal [45 - 54]	0.00170	0.0008 - 0.0026	4,780.3	0.000036%
	Acute Myocardial Infarction, Nonfatal [55 - 64]	0.00325	0.0015 - 0.0049	8,993.2	0.000036%
	Acute Myocardial Infarction, Nonfatal [65 - 99]	0.01320	0.0062 - 0.0199	36,958.1	0.000036%

**TABLE 14
UPDATED BENMAP-CE MODELING RESULTS FOR MAXIMUM ANNUAL 24-HOUR AVERAGE PM_{2.5},
2033, MITIGATED**

Human Health Endpoints		Aggregated Regional Results			Incremental Incidence / Existing Baseline Incidence (%)
Health Endpoint Group	Health Endpoint	Project Incremental Incidence (# per year)		Baseline Incidence (# per year)	
		Mean	95% Confidence Interval		
Mortality	Mortality, All Cause [30 - 99]	0.12178	0.081 - 0.161	213,818.3	0.000057%
Emergency Department	Emergency Room Visits, Asthma [0 - 99]	0.07498	0.018 - 0.129	119,309.6	0.000063%
Hospital Admissions	HA, All Cardiovascular (less Myocardial Infarctions) [65 - 99]	0.01711	0.013 - 0.022	201,776.3	0.000008%
	HA, All Respiratory [65 - 99]	0.03802	0.022 - 0.054	173,178.4	0.000022%
	HA, Asthma [0 - 64]	0.00606	0.002 - 0.01	16,260.2	0.000037%
Other	Acute Myocardial Infarction, Nonfatal [18 - 24]	0.00001	0.000004 - 0.000012	34.7	0.000023%
	Acute Myocardial Infarction, Nonfatal [25 - 44]	0.00045	0.0002 - 0.0007	1,804.8	0.000025%
	Acute Myocardial Infarction, Nonfatal [45 - 54]	0.00116	0.0005 - 0.0017	4,780.3	0.000024%
	Acute Myocardial Infarction, Nonfatal [55 - 64]	0.00222	0.001 - 0.0033	8,993.2	0.000025%
	Acute Myocardial Infarction, Nonfatal [65 - 99]	0.00900	0.0042 - 0.0136	36,958.1	0.000024%

**TABLE 15
UPDATED BENMAP-CE MODELING RESULTS FOR MAXIMUM ANNUAL 24-HOUR AVERAGE PM_{2.5},
2048, UNMITIGATED**

Human Health Endpoints		Aggregated Regional Results			Incremental Incidence / Existing Baseline Incidence (%)
Health Endpoint Group	Health Endpoint	Project Incremental Incidence (# per year)		Baseline Incidence (# per year)	
		Mean	95% Confidence Interval		
Mortality	Mortality, All Cause [30 - 99]	0.24859	0.166 - 0.328	309,206.8	0.000080%
Emergency Department	Emergency Room Visits, Asthma [0 - 99]	0.11787	0.029 - 0.203	132,384.7	0.000089%
Hospital Admissions	HA, All Cardiovascular (less Myocardial Infarctions) [65 - 99]	0.03197	0.023 - 0.04	269,223.1	0.000012%
	HA, All Respiratory [65 - 99]	0.07477	0.042 - 0.106	235,174.2	0.000032%
	HA, Asthma [0 - 64]	0.00942	0.003 - 0.015	17,788.2	0.000053%
Other	Acute Myocardial Infarction, Nonfatal [18 - 24]	0.00001	0.00001 - 0.00002	40.3	0.000032%
	Acute Myocardial Infarction, Nonfatal [25 - 44]	0.00061	0.0003 - 0.0009	1,791.0	0.000034%
	Acute Myocardial Infarction, Nonfatal [45 - 54]	0.00180	0.0009 - 0.0027	5,270.7	0.000034%
	Acute Myocardial Infarction, Nonfatal [55 - 64]	0.00407	0.0019 - 0.0061	11,293.5	0.000036%
	Acute Myocardial Infarction, Nonfatal [65 - 99]	0.01759	0.0083 - 0.0265	49,304.0	0.000036%

**TABLE 16
UPDATED BENMAP-CE MODELING RESULTS FOR MAXIMUM ANNUAL 24-HOUR AVERAGE PM_{2.5},
2048, MITIGATED**

Human Health Endpoints		Aggregated Regional Results			Incremental Incidence / Existing Baseline Incidence (%)
Health Endpoint Group	Health Endpoint	Project Incremental Incidence (# per year)		Baseline Incidence (# per year)	
		Mean	95% Confidence Interval		
Mortality	Mortality, All Cause [30 - 99]	0.17751	0.119 - 0.234	309,206.8	0.000057%
Emergency Department	Emergency Room Visits, Asthma [0 - 99]	0.08416	0.021 - 0.145	132,384.7	0.000064%
Hospital Admissions	HA, All Cardiovascular (less Myocardial Infarctions) [65 - 99]	0.02283	0.017 - 0.029	269,223.1	0.000008%
	HA, All Respiratory [65 - 99]	0.05339	0.03 - 0.076	235,174.2	0.000023%
	HA, Asthma [0 - 64]	0.00672	0.002 - 0.011	17,788.2	0.000038%
Other	Acute Myocardial Infarction, Nonfatal [18 - 24]	0.00001	0.000004 - 0.000014	40.3	0.000023%
	Acute Myocardial Infarction, Nonfatal [25 - 44]	0.00044	0.0002 - 0.0007	1,791.0	0.000024%
	Acute Myocardial Infarction, Nonfatal [45 - 54]	0.00129	0.0006 - 0.0019	5,270.7	0.000024%
	Acute Myocardial Infarction, Nonfatal [55 - 64]	0.00290	0.0014 - 0.0044	11,293.5	0.000026%
	Acute Myocardial Infarction, Nonfatal [65 - 99]	0.01256	0.0059 - 0.019	49,304.0	0.000025%

Health Incidence Changes with Updated Modeling

As BenMAP-CE uses concentrations as an input for health incidences, these updated concentrations result in different health impact incidences. As seen in Table 17 through Table 24, mean regional incremental incidences for every health endpoint are lower with the updated modeling.

**TABLE 17
BENMAP-CE MODELING DIFFERENCES FOR MAXIMUM DAILY 8-HOUR (MDA8) AVERAGE OZONE,
2033, UNMITIGATED**

Human Health Endpoints		Mean Project Incremental Incidence (# per year)		Incremental Incidence / Existing Baseline Incidence		% Difference
Health Endpoint Group	Health Endpoint	Previous Modeling	Updated Modeling	Previous Modeling	Updated Modeling	
Mortality	Mortality, Non-Accidental [0 - 99]	0.0029	0.0007	0.000003%	0.000001%	-75.9%
	Mortality, Cardiopulmonary [0 - 99]	0.0034	0.0008	0.000007%	0.000002%	-75.9%
	Mortality, All Cause [0 - 99]	0.0074	0.0018	0.000007%	0.000002%	-75.9%
	Premature mortality — respiratory, long-term exposure [30 - 99]	0.0088	0.0021	0.000040%	0.000010%	-75.9%
Emergency Department	Emergency Room Visits, Asthma [0 - 17]	0.0231	0.0059	0.000103%	0.000026%	-74.4%
	Emergency Room Visits, Asthma [18 - 99]	0.0275	0.0070	0.000073%	0.000019%	-74.4%
Hospital Admissions	Hospital Admissions, All Respiratory [65 - 99]	0.0046	0.0011	0.000005%	0.000001%	-75.4%
Other	Asthma Exacerbation, One or more symptoms [0 - 99]	2.02	0.48	0.000009%	0.000002%	-76.1%
	Minor Restricted Activity Days [18 - 64]	13.5	3.35	0.000022%	0.000005%	-75.1%
	School Loss Days [5 - 17]	10.7	2.63	0.000071%	0.000017%	-75.4%

**TABLE 18
BENMAP-CE MODELING DIFFERENCES FOR MAXIMUM DAILY 8-HOUR (MDA8) AVERAGE OZONE,
2033, MITIGATED**

Human Health Endpoints		Mean Project Incremental Incidence (# per year)		Incremental Incidence / Existing Baseline Incidence		% Difference
Health Endpoint Group	Health Endpoint	Previous Modeling	Updated Modeling	Previous Modeling	Updated Modeling	
Mortality	Mortality, Non-Accidental [0 - 99]	0.0019	0.0004	0.000002%	0.000000%	-77.8%
	Mortality, Cardiopulmonary [0 - 99]	0.0023	0.0005	0.000005%	0.000001%	-77.7%
	Mortality, All Cause [0 - 99]	0.0049	0.0011	0.000004%	0.000001%	-77.7%
	Premature mortality — respiratory, long-term exposure [30 - 99]	0.0058	0.0013	0.000026%	0.000006%	-77.7%
Emergency Department	Emergency Room Visits, Asthma [0 - 17]	0.0152	0.0036	0.000068%	0.000016%	-76.3%
	Emergency Room Visits, Asthma [18 - 99]	0.0181	0.0043	0.000048%	0.000011%	-76.4%
Hospital Admissions	Hospital Admissions, All Respiratory [65 - 99]	0.0030	0.0007	0.000004%	0.000001%	-77.3%
Other	Asthma Exacerbation, One or more symptoms [0 - 99]	1.33	0.29	0.000006%	0.000001%	-78.0%
	Minor Restricted Activity Days [18 - 64]	8.88	2.03	0.000014%	0.000003%	-77.1%
	School Loss Days [5 - 17]	7.04	1.60	0.000046%	0.000011%	-77.3%

**TABLE 19
BENMAP-CE MODELING DIFFERENCES FOR MAXIMUM DAILY 8-HOUR (MDA8) AVERAGE OZONE,
2048, UNMITIGATED**

Human Health Endpoints		Mean Project Incremental Incidence (# per year)		Incremental Incidence / Existing Baseline Incidence		% Difference
Health Endpoint Group	Health Endpoint	Previous Modeling	Updated Modeling	Previous Modeling	Updated Modeling	
Mortality	Mortality, Non-Accidental [0 - 99]	0.0042	0.0013	0.000003%	0.000001%	-68.2%
	Mortality, Cardiopulmonary [0 - 99]	0.0052	0.0016	0.000007%	0.000002%	-69.2%
	Mortality, All Cause [0 - 99]	0.0107	0.0033	0.000007%	0.000002%	-68.9%
	Premature mortality — respiratory, long-term exposure [30 - 99]	0.0129	0.0042	0.000040%	0.000013%	-67.6%
Emergency Department	Emergency Room Visits, Asthma [0 - 17]	0.0238	0.0078	0.000103%	0.000034%	-67.3%
	Emergency Room Visits, Asthma [18 - 99]	0.0318	0.0103	0.000074%	0.000024%	-67.6%
Hospital Admissions	Hospital Admissions, All Respiratory [65 - 99]	0.0064	0.0020	0.000005%	0.000002%	-68.5%
Other	Asthma Exacerbation, One or more symptoms [0 - 99]	2.15	0.68	0.000009%	0.000003%	-68.2%
	Minor Restricted Activity Days [18 - 64]	15.3	4.90	0.000022%	0.000007%	-68.0%
	School Loss Days [5 - 17]	11.3	3.52	0.000071%	0.000022%	-68.9%

**TABLE 20
BENMAP-CE MODELING DIFFERENCES FOR MAXIMUM DAILY 8-HOUR (MDA8) AVERAGE OZONE,
2048, MITIGATED**

Human Health Endpoints		Mean Project Incremental Incidence (# per year)		Incremental Incidence / Existing Baseline Incidence		% Difference
Health Endpoint Group	Health Endpoint	Previous Modeling	Updated Modeling	Previous Modeling	Updated Modeling	
Mortality	Mortality, Non-Accidental [0 - 99]	0.0029	0.0008	0.000002%	0.000001%	-72.2%
	Mortality, Cardiopulmonary [0 - 99]	0.0037	0.0010	0.000005%	0.000001%	-73.0%
	Mortality, All Cause [0 - 99]	0.0075	0.0020	0.000005%	0.000001%	-72.7%
	Premature mortality — respiratory, long-term exposure [30 - 99]	0.0090	0.0026	0.000028%	0.000008%	-71.6%
Emergency Department	Emergency Room Visits, Asthma [0 - 17]	0.0167	0.0048	0.000072%	0.000021%	-71.3%
	Emergency Room Visits, Asthma [18 - 99]	0.0223	0.0063	0.000052%	0.000015%	-71.6%
Hospital Admissions	Hospital Admissions, All Respiratory [65 - 99]	0.0045	0.0012	0.000004%	0.000001%	-72.5%
Other	Asthma Exacerbation, One or more symptoms [0 - 99]	1.51	0.42	0.000006%	0.000002%	-72.2%
	Minor Restricted Activity Days [18 - 64]	10.7	3.00	0.000015%	0.000004%	-72.0%
	School Loss Days [5 - 17]	7.92	2.16	0.000049%	0.000013%	-72.7%

**TABLE 21
BENMAP-CE MODELING DIFFERENCES FOR MAXIMUM ANNUAL 24-HOUR AVERAGE PM_{2.5},
2033, UNMITIGATED**

Human Health Endpoints		Mean Project Incremental Incidence (# per year)		Incremental Incidence / Existing Baseline Incidence		% Difference
Health Endpoint Group	Health Endpoint	Previous Modeling	Updated Modeling	Previous Modeling	Updated Modeling	
Mortality	Mortality, All Cause [30 - 99]	0.2798	0.1786	0.000131%	0.000084%	-36.2%
Emergency Department	Emergency Room Visits, Asthma [0 - 99]	0.1704	0.1100	0.000143%	0.000092%	-35.5%
Hospital Admissions	HA, All Cardiovascular (less Myocardial Infarctions) [65 - 99]	0.0381	0.0251	0.000019%	0.000012%	-34.2%
	HA, All Respiratory [65 - 99]	0.0864	0.0558	0.000050%	0.000032%	-35.5%
	HA, Asthma [0 - 64]	0.0140	0.0089	0.000086%	0.000055%	-36.7%
Other	Acute Myocardial Infarction, Nonfatal [18 - 24]	0.00002	0.00001	0.000053%	0.000034%	-36.7%
	Acute Myocardial Infarction, Nonfatal [25 - 44]	0.0010	0.0007	0.000058%	0.000037%	-36.7%
	Acute Myocardial Infarction, Nonfatal [45 - 54]	0.0027	0.0017	0.000057%	0.000036%	-37.4%
	Acute Myocardial Infarction, Nonfatal [55 - 64]	0.0052	0.0033	0.000058%	0.000036%	-38.0%
	Acute Myocardial Infarction, Nonfatal [65 - 99]	0.0203	0.0132	0.000055%	0.000036%	-34.8%

**TABLE 22
BENMAP-CE MODELING DIFFERENCES FOR MAXIMUM ANNUAL 24-HOUR AVERAGE PM_{2.5},
2033, MITIGATED**

Human Health Endpoints		Mean Project Incremental Incidence (# per year)		Incremental Incidence / Existing Baseline Incidence		% Difference
Health Endpoint Group	Health Endpoint	Previous Modeling	Updated Modeling	Previous Modeling	Updated Modeling	
Mortality	Mortality, All Cause [30 - 99]	0.1914	0.1218	0.000090%	0.000057%	-36.4%
Emergency Department	Emergency Room Visits, Asthma [0 - 99]	0.1165	0.0750	0.000098%	0.000063%	-35.7%
Hospital Admissions	HA, All Cardiovascular (less Myocardial Infarctions) [65 - 99]	0.0261	0.0171	0.000013%	0.000008%	-34.4%
	HA, All Respiratory [65 - 99]	0.0591	0.0380	0.000034%	0.000022%	-35.7%
	HA, Asthma [0 - 64]	0.0096	0.0061	0.000059%	0.000037%	-36.9%
Other	Acute Myocardial Infarction, Nonfatal [18 - 24]	0.00001	0.00001	0.000036%	0.000023%	-36.9%
	Acute Myocardial Infarction, Nonfatal [25 - 44]	0.0007	0.0005	0.000040%	0.000025%	-36.9%
	Acute Myocardial Infarction, Nonfatal [45 - 54]	0.0019	0.0012	0.000039%	0.000024%	-37.6%
	Acute Myocardial Infarction, Nonfatal [55 - 64]	0.0036	0.0022	0.000040%	0.000025%	-38.2%
	Acute Myocardial Infarction, Nonfatal [65 - 99]	0.0139	0.0090	0.000037%	0.000024%	-35.0%

**TABLE 23
BENMAP-CE MODELING DIFFERENCES FOR MAXIMUM ANNUAL 24-HOUR AVERAGE PM_{2.5},
2048, UNMITIGATED**

Human Health Endpoints		Mean Project Incremental Incidence (# per year)		Incremental Incidence / Existing Baseline Incidence		% Difference
Health Endpoint Group	Health Endpoint	Previous Modeling	Updated Modeling	Previous Modeling	Updated Modeling	
Mortality	Mortality, All Cause [30 - 99]	0.3691	0.2486	0.000119%	0.000080%	-32.7%
Emergency Department	Emergency Room Visits, Asthma [0 - 99]	0.1681	0.1179	0.000127%	0.000089%	-29.9%
Hospital Admissions	HA, All Cardiovascular (less Myocardial Infarctions) [65 - 99]	0.0470	0.0320	0.000017%	0.000012%	-32.0%
	HA, All Respiratory [65 - 99]	0.1088	0.0748	0.000046%	0.000032%	-31.3%
	HA, Asthma [0 - 64]	0.0136	0.0094	0.000076%	0.000053%	-30.8%
Other	Acute Myocardial Infarction, Nonfatal [18 - 24]	0.00002	0.00001	0.000047%	0.000032%	-31.3%
	Acute Myocardial Infarction, Nonfatal [25 - 44]	0.0009	0.0006	0.000051%	0.000034%	-33.3%
	Acute Myocardial Infarction, Nonfatal [45 - 54]	0.0027	0.0018	0.000051%	0.000034%	-32.7%
	Acute Myocardial Infarction, Nonfatal [55 - 64]	0.0058	0.0041	0.000051%	0.000036%	-29.9%
	Acute Myocardial Infarction, Nonfatal [65 - 99]	0.0248	0.0176	0.000050%	0.000036%	-29.2%

**TABLE 24
BENMAP-CE MODELING DIFFERENCES FOR MAXIMUM ANNUAL 24-HOUR AVERAGE PM_{2.5},
2048, MITIGATED**

Human Health Endpoints		Mean Project Incremental Incidence (# per year)		Incremental Incidence / Existing Baseline Incidence		% Difference
Health Endpoint Group	Health Endpoint	Previous Modeling	Updated Modeling	Previous Modeling	Updated Modeling	
Mortality	Mortality, All Cause [30 - 99]	0.2678	0.1775	0.000087%	0.000057%	-33.7%
Emergency Department	Emergency Room Visits, Asthma [0 - 99]	0.1219	0.0842	0.000092%	0.000064%	-31.0%
Hospital Admissions	HA, All Cardiovascular (less Myocardial Infarctions) [65 - 99]	0.0341	0.0228	0.000013%	0.000008%	-33.0%
	HA, All Respiratory [65 - 99]	0.0789	0.0534	0.000034%	0.000023%	-32.3%
	HA, Asthma [0 - 64]	0.0099	0.0067	0.000055%	0.000038%	-31.9%
Other	Acute Myocardial Infarction, Nonfatal [18 - 24]	0.00001	0.00001	0.000034%	0.000023%	-32.3%
	Acute Myocardial Infarction, Nonfatal [25 - 44]	0.0007	0.0004	0.000037%	0.000024%	-34.4%
	Acute Myocardial Infarction, Nonfatal [45 - 54]	0.0019	0.0013	0.000037%	0.000024%	-33.7%
	Acute Myocardial Infarction, Nonfatal [55 - 64]	0.0042	0.0029	0.000037%	0.000026%	-31.0%
	Acute Myocardial Infarction, Nonfatal [65 - 99]	0.0180	0.0126	0.000037%	0.000025%	-30.3%

Conclusions

This supplement to the April 2026 HIA Report evaluates potential regional ozone and PM_{2.5} concentration changes, and associated health impacts, attributable to Project operations under both mitigated and unmitigated scenarios for operational years 2033 and 2048 with all Project sources included. The updated analysis also compares the revised modeling results to those presented in the April 13, 2026 HIA Report.

The principal modification to the updated analysis was the inclusion and spatial allocation of operational on-road vehicle emissions occurring outside the Railyard area located near Barstow. Construction-year emissions and associated health impacts for 2026 were not re-modeled because changes from the prior analysis were minimal and are not expected to materially affect the prior conclusions.

The updated CAMx modeling estimates a maximum increase in regional maximum daily 8-hour (MDA8) ozone concentrations of 0.00126 parts per billion by volume (ppbv), representing approximately 0.00159% of baseline concentrations. The maximum modeled increase in regional annual average 24-hour PM_{2.5} concentrations is estimated at 0.00227 micrograms per cubic meter (µg/m³), or approximately 0.01288% of baseline concentrations. For all modeled scenarios, the updated ozone and PM_{2.5} concentration changes are lower than those reported in the April 2026 HIA Report, with ozone reductions of 72-73%, and PM_{2.5} reductions of 29-31%.

The updated BenMAP-CE analysis similarly indicates lower estimated health incidences relative to the prior report. For ozone-related impacts, the maximum modeled regional incidences associated with Project operations include respiratory-related hospital admissions, mortality-related endpoints, and asthma-related emergency room visits at 0.000027% of baseline regional incidence rates. For PM_{2.5}-related impacts, the maximum modeled regional incidences include acute myocardial infarction, mortality-related endpoints, hospital admissions, and asthma-related emergency room visits, at 0.000092% of baseline regional incidence rates. For all modeled scenarios, the health incidences are lower than those reported in the April 2026 HIA Report, with incidence reductions between 29% and 78%.

Across modeled scenarios, the estimated incremental health incidences attributable to Project-related ozone and PM_{2.5} concentrations represent extremely small fractions of existing regional baseline health incidences. The updated analysis, therefore, supports the conclusion that Project-related contributions to regional ozone and PM_{2.5} concentrations are not expected to result in meaningful or discernible individual or cumulative health impacts.

Consistent with the conclusions of the April 2026 HIA Report, the updated modeling results indicate that Project-related air quality impacts would constitute an undiscernible and statistically not meaningful contribution to regional pollutant concentrations. Based on the updated analysis, no statistically meaningful increase in regional health endpoints is anticipated as a result of Project construction or operations. The updated modeling further confirms that inclusion of on-road travel activity and reduced TMT would result in even lower modeled regional health impacts.

than previously estimated, moving further toward net zero health impacts. These supplemental results not only confirm that BIG will have no discernible regional health impacts but also demonstrate that the TMT reductions are a substantial benefit to regional health and a significant proportion of BIG's overall emissions story.

Limitations

As with any regional photochemical modeling analysis, results are dependent upon available emissions inventories, meteorological inputs, spatial allocation assumptions, and model configuration parameters. The updated analysis reflects the best available Project information provided as of May 2026.