

# **Appendix AQ-2**

---

**Analysis of Potential Health  
Effects Related to the  
Air Quality Effects of the  
Jackson Township Specific Plan**



December 18, 2020

Mr. Jim Wiley  
**Taylor & Wiley**  
500 Capital Mall, Suite 1150  
Sacramento, California 95814

**SUBJECT: Analysis of Potential Health Effects Related to the  
Air Quality Effects of the Jackson Township Specific Plan**

Dear Mr. Wiley:

Tsakopoulos Investments is proposing the Jackson Township Specific Plan (Jackson Township) encompassing approximately 1,391 acres of land located in southeastern Sacramento County, east of Excelsior Road, north of Jackson Highway, and west of Eagles Nest Road. The Jackson Township project is a mixed-use development that includes a mix of different housing types and commercial and retail land uses. One of the project alternatives is evaluated in this report: the California Environmental Quality Act (CEQA) Alternative 2. There are two scenarios for Alternative 2: one with Project-Related vehicle miles traveled (VMT) and one with Cumulative VMT, as explained further below.

In October 2020, the Sacramento Metropolitan Air Quality Management District (SMAQMD or District) published final Guidance<sup>1</sup> for applicants to use in addressing an issue raised by the California Supreme Court in the case of *Sierra Club v. County of Fresno* (2018) 6 Cal. 5th 502 regarding the proposed Friant Ranch Project where the Court determined that a CEQA air quality analysis must “make a reasonable effort to substantively connect the Project’s air quality effects to the likely health consequences”. The SMAQMD October 2020 Final Guidance is the best currently available methodology to estimate potential health effects.

This letter report implements the SMAQMD October 2020 Final Guidance for the proposed Jackson Township Specific Plan.

## **1.0 SUMMARY**

The District’s October 2020 Final Guidance is based on extensive air quality effect and health effects modeling that yields an estimate of incremental health effects as the result of a proposed project’s emissions of criteria air pollutants: oxides of nitrogen (NO<sub>x</sub>), volatile organic compounds (VOCs, also termed reactive organic gases, ROG), particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), carbon monoxide (CO), and oxides of sulfur (SO<sub>x</sub>). The health effect modeling is based on a

---

<sup>1</sup> *Guidance to Address the Friant Ranch Ruling for CEQA Projects in the Sac Metro Air District*, Final October 2020. Available at [www.airquality.org/Businesses/CEQA-Land-Use-Planning/SMAQMDFriantRanchFinalOct2020.pdf](http://www.airquality.org/Businesses/CEQA-Land-Use-Planning/SMAQMDFriantRanchFinalOct2020.pdf). Accessed November 22, 2020.

photochemical grid model (PGM) that accounts for reactions in the atmosphere of NO<sub>x</sub> and ROG (and to a much lesser extent, CO) to create ozone; and conversion in the atmosphere of NO<sub>x</sub> and SO<sub>x</sub> into PM<sub>2.5</sub>. The PGM model calculates concentrations of ozone and PM<sub>2.5</sub> and the concentrations are then input into the United States Environmental Protection Agency (USEPA) BenMAP health effects model. The BenMAP model relates ozone and PM<sub>2.5</sub> concentrations to incremental health effects: mortality (all causes), hospital admissions (respiratory, asthma, cardiovascular), emergency room visits (asthma), and acute myocardial infarction (non-fatal) for PM<sub>2.5</sub>; and mortality, emergency room visits (respiratory) and hospital admissions (respiratory) for ozone. The BenMAP model accounts for PM<sub>10</sub> health effects by using PM<sub>2.5</sub> as a surrogate. Thus, all of the criteria pollutant emissions are accounted for in the Final Guidance methodology. The BenMAP model is used by the USEPA in evaluating health effects and establishing the National Ambient Air Quality Standards (NAAQS) that are set to protect the public health and safety<sup>2</sup>.

The District Final Guidance includes screening tools that use proposed project emissions of NO<sub>x</sub>, ROG, and PM<sub>2.5</sub> to estimate potential health effects based on those emissions. Although only three of the criteria pollutant emissions are entered into the screening tool, the tool accounts for the remaining criteria pollutant emissions through surrogates. Two screening tools were published: Minor Projects and Strategic Area Projects. Strategic Area Projects have emissions from 2 to 8 times greater than the maximum Thresholds of Significance (TOS) from the five air districts in the Sacramento region, while Minor Projects have emissions less than the TOS. The TOS were adopted by the SMAQMD as a single set of thresholds triggering additional analyses. Any relatively large project will exceed the TOS and require additional analyses such as conducted herein.

Potential emissions from the proposed Jackson Township Project were estimated in the Air Quality Mitigation Plan (AQMP)<sup>3</sup> completed in May 2019 and Revision 3 to the Greenhouse Gas Reduction Plan (GHGRP) completed in November 2020<sup>4</sup>. The AQMP evaluated eight different emissions scenarios. The different scenarios are a function of project design (Proposed Project or Alternative 2), associated vehicle travel [Business as Usual (BAU), Project-Related VMT, or Cumulative VMT], additional mitigation for NO<sub>x</sub> and ROG to achieve SMAQMD emission reduction targets for Alternative 2, and additional mitigation for greenhouse gases (GHG) that also result in reductions of NO<sub>x</sub> and ROG. The GHG reduction measures in the November 2020 GHGRP were aimed at meeting SB 743 targets for Alternative 2. BAU VMT is a default VMT based solely on land uses and does not incorporate any of the project design elements that reduce VMT. Project-Related VMT is the amount of vehicle travel expected for the Jackson Township as if it were the

---

<sup>2</sup> PGM models and the BenMAP health effects model are the most sophisticated models currently available for conducting air quality effect studies. PGM models are specified by the USEPA for regional modeling of ozone (40 CFR Part 51 Appendix W) and are used throughout the US to develop State Implementation Plans to bring areas into attainment and assess effects of emitting sources. The BenMAP model has been used since 2003. The BenMAP and PGM models are routinely updated to incorporate state of the science and are currently in use by the USEPA.

<sup>3</sup> Jackson Township Specific Plan Air Quality Mitigation Plan and Greenhouse Gas Reduction Plan, May 23, 2019. Available at: [www.planning.saccounty.net/PlansandProjectsIn-Progress/Pages/JacksonTownshipSpecificPlan.aspx](http://www.planning.saccounty.net/PlansandProjectsIn-Progress/Pages/JacksonTownshipSpecificPlan.aspx).

<sup>4</sup> Revision 3 – Updated Greenhouse Gas Reduction Plan for the Proposed Jackson Township Specific Plan, November 25, 2020.

only project in the region but including all of the VMT mitigation in the project design. Cumulative VMT is the amount of travel expected for the Jackson Township accounting for other projects in the region and including all of the VMT mitigation in the project design. BAU VMT for Jackson Township is greater than Project-Related VMT and Project-Related VMT for Jackson Township is greater than Cumulative VMT.

Based on the magnitude of the Jackson Township operational emissions for all eight scenarios, the Jackson Township project would qualify to use the Strategic Area Project Health Effects Tool discussed in the Final Guidance. Construction emissions associated with the Jackson Township project were also calculated and reported<sup>5</sup> but are much less than the operational emissions. The emissions were calculated using the California Emissions Estimator Model (CalEEMod) emissions model and based on anticipated land uses, VMT, and mitigation.

The Final Guidance screening tools use emission estimates in terms of pounds per day (lb/day). The AQMP reported emissions for Jackson Township in terms of annual [tons per year (tpy)], summer peak daily (lb/day), and winter peak daily (lb/day). Winter peak daily NO<sub>x</sub> emissions are slightly larger than summer peak daily, while summer peak daily ROG emissions are slightly larger than winter. Changes in PM<sub>2.5</sub> peak daily emissions summer to winter are de minimis. As explained below, peak winter NO<sub>x</sub> and PM<sub>2.5</sub> and peak summer ROG emissions were combined into a single assessment in order to calculate maximum possible health effects, even though peak winter and peak summer emissions cannot both occur at the same time. Furthermore, peak daily emissions were used, even though the average daily emissions are much less. Accordingly, the potential health effects are over-stated.

Emissions of NO<sub>x</sub>, ROG, and PM<sub>2.5</sub> for the three emission scenarios evaluated herein are shown in Table 1-1. The emissions shown represent the Jackson Township project at full build out, estimated to occur by 2035, after all mitigation. References for the emission values shown in Table 1-1 are discussed in Section 3 below.

**Table 1-1**  
**Jackson Township Peak Daily Emissions After Mitigation<sup>a</sup>**

Scenario	Alternative	NO <sub>x</sub> (lb/day)	ROG (lb/day)	PM <sub>2.5</sub> (lb/day)
1	Alternative 2, Project-Related VMT, with Additional Mitigation	419.3	392.7	79.1
2	Alternative 2, Cumulative VMT, with Additional Mitigation	372.8	381.3	66.0

<sup>a</sup> Peak daily emissions are the winter peak daily for NO<sub>x</sub> and PM<sub>2.5</sub> and the summer peak daily for ROG.

Jackson Township emissions from Table 1-1 were input into the Final Guidance screening tool for Strategic Area Project II, “Rancho Cordova”, to estimate the incremental health effects. The results are shown in Table 1-2. The method for arriving at the values shown in Table 1-2 are discussed in Section 4 below.

<sup>5</sup> AQMP Appendix J.

**Table 1-2**

**Summary of Jackson Township Potential Incremental Annual Health Incidences**

<b>Scenario</b>	<b>Alternative</b>	<b>Total Number of Annual Health Incidences</b>	<b>Percent of Background Incidences</b>
1	Alternative 2, Project-Related VMT, with Additional Mitigation	11.76	0.0064%
2	Alternative 2, Cumulative VMT, with Additional Mitigation	11.30	0.0061%

Table 1-2 shows that there is not much difference in potential health effects between the Project-Related VMT and Cumulative VMT. The relatively small number of health effects is due to the extensive mitigation built into the project design that reduces the amount of vehicle travel, reduces emissions from vehicles (enhancing electric vehicle penetration), and reduces emissions through a variety of other mitigation measures such as an Enhanced Transit Program, energy efficient boilers, residential electric hot water heaters, public electric vehicle charging stations, and residential electric vehicle charging stations as discussed in the AQMP<sup>6</sup> and GHGRP<sup>7</sup>.

In addition to conservatism that is inherent in any screening tool, the potential health effects are over-stated for Alternative 2 because peak daily emissions were used instead of average daily emissions, peak winter and peak summer emissions have been comingled, the CalEEMod model itself includes conservative over-estimates of emissions, some of the health incidences may be double counted, and, as explained in the AQMP, not all of the mitigation measures designed into the proposed Jackson Township project have been accounted for in the emission reductions.<sup>8</sup>

**2.0 TECHNICAL BASIS FOR THE GUIDANCE METHODOLOGY**

The SMAQMD Final Guidance and screening tools are based on sophisticated air quality and health effects models. PGM modeling was conducted with the USEPA-approved Comprehensive Air Quality Model with Extensions (CAMx) model and health effects modeling was conducted with the USEPA BenMAP model. Both of these models are used extensively by federal, state, and local regulatory agencies as well as applicants to assess proposed projects' potential air quality and health effects and are the currently most sophisticated models available for this type of assessment. CAMx and BenMAP are used throughout the US to assess the benefits of reducing emissions in a region. BenMAP has been in use by the USEPA since 2003, and CAMx has been in use since 1997. Both models are routinely updated to the state of the science.

In order to create the screening tools, the District retained a consultant (Ramboll) to perform the modeling. Ramboll modeled two sets of hypothetical projects: Minor Projects and Strategic Area Projects. Minor projects are those with emissions less than the TOS, and Strategic Area Projects

<sup>6</sup> AQMP Pages 48 to 56.

<sup>7</sup> GHGRP Pages 19 to 21.

<sup>8</sup> AQMP Pages 21-22.

are those with emissions from 2 to 8 times the TOS. Forty-one hypothetical minor projects were modeled at locations throughout Sacramento and surrounding counties and six hypothetical Strategic Area Projects were modeled. The center of one of the hypothetical modeled Strategic Area Projects (Source II) is located only about 6 kilometers (km) north of the center of the proposed Jackson Township project. The PGM modeling was conducted with a 4 km grid, so Source II adequately represents potential health effects from Jackson Township and is essentially within one grid cell as suggested by the Final Guidance for representative Strategic Area Projects.

After Ramboll modeled the hypothetical projects with PGM to calculate ozone and PM<sub>2.5</sub> concentrations, the concentrations were input to the BenMAP model to calculate potential health effects. Although ozone and PM<sub>2.5</sub> concentrations and associated health effects are not necessarily linear with respect to emissions, within a relatively small range of emissions linearity can be used. That is why the Final Guidance based emissions for the Strategic Area Projects from 2 to 8 times the TOS. Linearity allows one to take the PGM and BenMAP results for the hypothetical projects and scale those results by emissions for an actual proposed project<sup>9</sup>.

### 3.0 EMISSIONS FOR THE JACKSON TOWNSHIP PROJECT

The SMAQMD Final Guidance screening tool for Strategic Area Projects was used to assess the potential health effects of the Jackson Township project. Two emission scenarios were assessed and the potential health effects as calculated by the Final Guidance screening tool for Strategic Area Projects are reported in Attachments 1 and 2. Table 3-1 shows emissions for Alternative 2 prior to additional mitigation. The emissions in Table 3-1 came from the AQMP as noted and were estimated with CalEEMod as described in the AQMP and noted below the Table.

**Table 3-1  
Alternative 2 Peak Daily Emissions Prior to Additional Mitigation**

Scenario	Alternative		NO <sub>x</sub> (lb/day)	ROG (lb/day)	PM <sub>2.5</sub> (lb/day)
1	Alternative 2 Project-Related VMT, prior to Additional Mitigation	Summer	529.3	412.1	82.1
		Winter	534.1	372.1	82.2
2	Alternative 2 Cumulative VMT, prior to Additional Mitigation	Summer	478.0	398.9	69.3
		Winter	481.6	363.0	69.3

Source, AQMP:

- Alternative 2 Project-Related VMT, Appendix F-3, Page 9, Summer
- Alternative 2 Project-Related VMT, Appendix F-4, Page 9, Winter
- Alternative 2 Cumulative VMT, Appendix F-7, Page 9, Summer
- Alternative 2 Cumulative VMT, Appendix F-8, Page 9, Winter

As shown in Table 3-1, summer emissions of NO<sub>x</sub> are less than winter, but winter emissions of ROG are less than summer. In order to yield a maximum possible estimate of health effects, the peak winter and peak summer daily emissions were comingled, i.e., peak daily winter NO<sub>x</sub> and PM<sub>2.5</sub> were used along with peak daily summer ROG even though this combination could not

<sup>9</sup> See Final Guidance Appendix C, Page C-4.

occur. Nevertheless, because models are used to estimate emissions, pollutant concentrations, and potential health effects; the analysis uses this most conservative hypothetical worst-case approach.

Note that the emissions shown in Table 3-1 are peak daily emissions, not an average over the year. For example, Table 3-2 shows the annual emissions (in terms of tons per year) and the annual average daily emissions (calculated by taking the annual emissions and dividing by 365). The peak daily emissions shown in Table 3-1 are on the order of 20 percent greater than the annual average daily emissions shown in Table 3-2.

**Table 3-2**  
**Alternative 2 Average Daily Emissions Prior to Additional Mitigation**

Scenario	Alternative		NO <sub>x</sub>	ROG	PM <sub>2.5</sub>
1	Alternative 2 Project-Related VMT, prior to Additional Mitigation	Annual (tpy)	78.8	65.7	12.4
		Average Daily (lb/day)	431.8	360.0	67.9
2	Alternative 2 Cumulative VMT, prior to Additional Mitigation	Annual (tpy)	68.6	63.8	10.1
		Average Daily (lb/day)	375.9	349.6	55.3

Source, AQMP:

Alternative 2 Project-Related VMT, Appendix E-2, Page 10, Summer  
Alternative 2 Cumulative VMT, Appendix E-4, Page 10, Winter

Emissions for the two scenarios evaluated herein, Alternative 2 with Project-Related VMT and Alternative 2 with Cumulative VMT, are reported in the AQMP without and with additional mitigation. The additional mitigation in the AQMP is mitigation not included in the initial project design, but was added in order to achieve the SMAQMD requirements for a 35 percent reduction from BAU for NO<sub>x</sub> and ROG. The SMAQMD 35 percent requirement is applied to annual emissions and some of the additional mitigation is not included in the CalEEMod emissions model (i.e., the mitigation calculations were applied after the CalEEMod emissions models were run). Furthermore, the updated GHGRP contains additional mitigation beyond that contained in the AQMP. Accordingly, in order to obtain peak daily emissions after additional mitigation was applied, a three-step process was completed.

The first step to calculate peak daily emissions including the additional mitigation was to obtain from the AQMP the peak daily emissions for Alternative 2 when Project-Related and Cumulative VMT were accounted for with CalEEMod. These values are the maximum peak summer or winter daily emissions (in terms of pounds per day) as shown in Table 3-1 and repeated in the first row of Tables 3-3 and 3-4.

The second step was to calculate the annual percent reduction in ROG and NO<sub>x</sub> (in terms of tpy) that were not accounted for in the CalEEMod emissions model but were included in the AQMP and GHGRP. As shown in Tables 3-3 and 3-4 the emission reductions include mitigation

contained in the AQMP, elimination of natural gas per BMP 1 of the GHGRP, and additional mitigation included in the GHGRP.

The third step was to apply the annual percent reduction to the peak daily emissions. The calculations and the source of the emission values for Alternative 2 Project-Related VMT are shown in Table 3-3 and Alternative 2 Cumulative VMT in Table 3-4.

**Table 3-3  
Peak Daily Emissions for Alternative 2 Project-Related VMT with Additional Mitigation**

Scenario	Alternative	Emission Type	NO <sub>x</sub>	ROG	PM <sub>2.5</sub>	Source of Values
1	Alternative 2 Project-Related VMT	Winter Peak Daily NO <sub>x</sub> and PM <sub>2.5</sub> and Summer Peak Daily ROG (lb/day) when only accounting for VMT	534.1	412.1	82.2	a
		AQMP Annual when only accounting for VMT (tpy)	78.8	65.7	12.4	b
		AQMP Annual Additional Mitigation (tpy)	- 8.24	- 1.77	0	c
		BMP 1 GHG Eliminate Natural Gas	- 5.89	- 0.68	- 0.47	d
		GHGRP Annual Additional Mitigation (tpy)	- 2.78	- 0.61	0	e
		Percent Reduction from Annual Emissions with Additional Mitigation	- 21.5%	- 4.7%	- 3.8%	f
		<b>Winter Peak Daily NO<sub>x</sub> and PM<sub>2.5</sub> and Summer Peak Daily ROG with Additional Mitigation (lb/day)</b>	<b>419.3</b>	<b>392.7</b>	<b>79.1</b>	<b>g</b>

Source of Values:

- AQMP Appendix F-4, Page 9 for winter and Appendix F-3, Page 9 for summer.
- AQMP Appendix E-2, Page 10.
- AQMP Table 1-12. Sum of Enhanced Transit Program, Public Electric Vehicle Charging Stations, and Residential Electric Vehicle Charging Stations mitigation. No credit for Energy Efficient Boilers and Residential Electric Hot Water Heaters because BMP 1 eliminates natural gas infrastructure. No credit was taken for possible PM<sub>2.5</sub> reductions in the AQMP.
- AQMP Appendix E-2, Page 21, emissions due to natural gas usage
- GHGRP Appendix F. NO<sub>x</sub>: 0.27 tpy Additional Public Charging Stations + 2.51 Additional Multi-family Pre-wiring = 2.78 tpy. ROG: 0.14 tpy + 0.47 tpy = 0.61 tpy.
- Calculated: NO<sub>x</sub> (- 8.24 – 5.89 – 2.78)/78.8 = - 21.5%. ROG (- 1.77 – 0.68 – 0.61)/65.7 = - 4.7%. PM<sub>2.5</sub> – 0.47/12.4 = - 3.8%.
- Calculated: NO<sub>x</sub> 534.1 x (1-0.215) = 419.3. ROG 412.1 x (1 – 0.047) = 392.7. PM<sub>2.5</sub> = 82.2 x (1 – 0.038) = 79.1.

**Table 3-4**

**Peak Daily Emissions for Alternative 2 Cumulative VMT with Additional Mitigation**

Scenario	Alternative	Emission Type	NO <sub>x</sub>	ROG	PM <sub>2.5</sub>	Source of Values
2	Alternative 2 Cumulative VMT	Winter Peak Daily NO <sub>x</sub> and PM <sub>2.5</sub> and Summer Peak Daily ROG (lb/day) when only accounting for VMT	481.6	398.9	69.3	a
		AQMP Annual when only accounting for VMT (tpy)	68.6	63.8	10.1	b
		AQMP Annual Additional Mitigation (tpy)	- 7.22	- 1.58	0	c
		BMP 1 GHG Eliminate Natural Gas	- 5.89	- 0.68	- 0.47	d
		GHGRP Annual Additional Mitigation (tpy)	- 2.42	- 0.54	0	e
		Percent Reduction from Annual Emissions with Additional Mitigation	- 22.6%	- 4.4%	- 4.7%	f
		<b>Winter Peak Daily NO<sub>x</sub> and PM<sub>2.5</sub> and Summer Peak Daily ROG with Additional Mitigation (lb/day)</b>	<b>372.8</b>	<b>381.3</b>	<b>66.0</b>	<b>g</b>

Source of Values:

- a. AQMP Appendix F-8, Page 9 for winter and Appendix F-7, Page 9 for summer.
- b. AQMP Appendix E-4, Page 10.
- c. AQMP Table 1-13. Sum of Enhanced Transit Program, Public Electric Vehicle Charging Stations, and Residential Electric Vehicle Charging Stations mitigation. No credit for Energy Efficient Boilers and Residential Electric Hot Water Heaters because BMP 1 eliminates natural gas infrastructure. No credit was taken for possible PM<sub>2.5</sub> reductions in the AQMP.
- d. AQMP Appendix E-4, Page 21, emissions due to natural gas usage.
- e. GHGRP Appendix F. NO<sub>x</sub>: 0.27 tpy Additional Public Charging Stations + 2.15 Additional Multi-family Pre-wiring = 2.42 tpy. ROG: 0.14 tpy + 0.40 tpy = 0.54 tpy.
- f. Calculated: NO<sub>x</sub> (- 7.22 - 5.89 - 2.42)/68.6 = - 22.6%. ROG (- 1.58 - 0.68 - 0.54)/63.8 = - 4.4%. PM<sub>2.5</sub> - 0.47/10.1 = - 4.7%.
- g. Calculated: NO<sub>x</sub> 481.6 x (1 - 0.226) = 372.8. ROG 398.9 x (1 - 0.044) = 381.3. PM<sub>2.5</sub> = 69.3 x (1 - 0.047) = 66.0.

**4.0 RESULTS OF THE HEALTH EFFECTS SCREENING CALCULATIONS FOR THE JACKSON TOWNSHIP PROJECT**

The peak daily emissions after mitigation shown in Tables 3-3 and 3-4 were entered into the Final Guidance screening tool for Strategic Area Projects to estimate the potential health effects related to the emissions. The screening tool output is shown in Attachments 1 and 2 and summarized in Table 4-1. The screening tool reports the projected number of health incidences per year in model

year 2035 in terms of both the number of incidences and in terms of the percent increase above background in both the 4-km modeling domain and in the 5-Air-District region. The 4-km modeling domain is most of northern California as shown in the Final Guidance Appendix B, Figure B-2. The 5-Air-District region includes the air districts of Sacramento Metropolitan, Yolo-Solano, Placer County, El Dorado County, and Feather River as shown in the Final Guidance Figure 3, Page 13. The 5-Air-District Region has an estimated 2035 population of 3,271,451 persons per Footnote 3 of the Guidance screening tool. Tables 4-1 and 4-2 show the results for the 5-Air-District Region.

**Table 4-1**

**Potential Annual Incremental Health Incidences for the Jackson Township Alternative 2**

Scenario		1	2
Description		Alternative 2 Project Related VMT after Additional Mitigation	Alternative 2 Cumulative VMT after Additional Mitigation
PM <sub>2.5</sub> Health Endpoint	Age Range	Annual Incidences (mean)	Annual Incidences (mean)
<b>Respiratory</b>			
Emergency Room Visits, Asthma	0 - 99	1.8	1.8
Hospital Admissions, Asthma	0 - 64	0.12	0.12
Hospital Admissions, All Respiratory	65 - 99	0.69	0.68
<b>Cardiovascular</b>			
Hospital Admissions, All Cardiovascular (less Myocardial Infarctions)	65 - 99	0.39	0.39
Acute Myocardial Infarction, Nonfatal	18 - 24	0.00015	0.00015
Acute Myocardial Infarction, Nonfatal	25 - 44	0.013	0.013
Acute Myocardial Infarction, Nonfatal	45 - 54	0.035	0.034
Acute Myocardial Infarction, Nonfatal	55 - 64	0.056	0.056
Acute Myocardial Infarction, Nonfatal	65 - 99	0.25	0.25
<b>Mortality</b>			
Mortality, All Causes	30 - 99	4.6	4.5
Ozone Health Endpoint	Age Range	Incidences (mean)	Incidences (mean)
<b>Respiratory</b>			
Hospital Admissions, All Respiratory	65 - 99	0.31	0.28
Emergency Room Visits, Asthma	0 - 17	1.2	1.1
Emergency Room Visits, Asthma	18 - 99	2.1	1.9
<b>Mortality</b>			
Mortality, Non-Accidental	0 - 99	0.20	0.18
<b>TOTAL INCIDENCES</b>	0 - 99	<b>11.76</b>	<b>11.30</b>

Note: Total incidences are not reported in the screening tool, but the Total incidences shown in the table are the sum of the screening tool incidences for both health endpoints. The Total Incidences comes from adding the screening tool values and may not match exactly the sum of values shown in the table due to round-off differences.

The total number of incidences shown in Table 4-1 was calculated by summing the values from the screening tool results (Attachments 1 and 2) for all health endpoints. The total number of

incidences are over-stated because there may be double counting. For example, an individual admitted for PM<sub>2.5</sub> may be the same individual admitted for ozone.

The total background number of health incidences in the 5-Air-District Region shown in the screening tool and Table 4-2 is 184,505 incidences out of the projected 2035 population of about 3.3 million persons. This helps put the roughly 11 additional incidences associated with the Jackson Township shown in Table 4-1 in perspective. The background number of health incidences and the incremental percentage increase are shown in Table 4-2.

**Table 4-2  
Annual Background Number of Health Incidences and  
Percent Above Background for the Jackson Township**

Scenario		Background	1	2
Description		Annual Number of Background Health Incidences Projected for 2035	Alternative 2 Project Related VMT after Additional Mitigation	Alternative 2 Cumulative VMT after Additional Mitigation
PM <sub>2.5</sub> Health Endpoint	Age Range		% Increase above Background	% Increase above Background
<b>Respiratory</b>				
Emergency Room Visits, Asthma	0 - 99	18,419	0.010%	0.0098%
Hospital Admissions, Asthma	0 - 64	1,846	0.0064%	0.0063%
Hospital Admissions, All Respiratory	65 - 99	19,644	0.0035%	0.0035%
<b>Cardiovascular</b>				
Hospital Admissions, All Cardiovascular (less Myocardial Infarctions)	65 - 99	24,037	0.0016%	0.0016%
Acute Myocardial Infarction, Nonfatal	18 - 24	4	0.0039%	0.0039%
Acute Myocardial Infarction, Nonfatal	25 - 44	308	0.0044%	0.0043%
Acute Myocardial Infarction, Nonfatal	45 - 54	741	0.0047%	0.0046%
Acute Myocardial Infarction, Nonfatal	55 - 64	1,239	0.0045%	0.0045%
Acute Myocardial Infarction, Nonfatal	65 - 99	5,052	0.0049%	0.0049%
<b>Mortality</b>				
Mortality, All Causes	30 - 99	44,766	0.010%	0.010%
Ozone Health Endpoint	Age Range		% Increase above Background	% Increase above Background
<b>Respiratory</b>				
Hospital Admissions, All Respiratory	65 - 99	19,644	0.0016%	0.0014%
Emergency Room Visits, Asthma	0 - 17	5,859	0.021%	0.019%
Emergency Room Visits, Asthma	18 - 99	12,560	0.017%	0.015%
<b>Mortality</b>				
Mortality, Non-Accidental	0 - 99	30,386	0.00067%	0.00060%
<b>TOTAL INCIDENCES</b>	0 - 99	<b>184,505</b>	<b>0.0064%</b>	<b>0.0061%</b>

Note: Total incidences are not reported in the screening tool, but the Total Incidences shown in the table are the sum of the screening tool incidences for both health endpoints. Total percent increase is not the sum of the individual percentages because the background for each effect is different. The number of background incidences

was calculated from the screening tool and differs slightly for each scenario due to round off differences. Sum of the values in the table may not match exactly the sum calculated from the screening tool because of round off differences.

## 5.0 ADDITIONAL CONTEXT FOR THE RESULTS

The approximately 11 incremental health incidences calculated by the screening model includes about 5 deaths (projected for 2035) out of approximately 20,000 deaths per year from all causes for the period 2016-2018 in the 5-Air-District region.<sup>10</sup> For the projected health incidences in 2035, the data in Tables 4-1 and 4-2 can be used to establish additional context. For example, Table 4-1 shows a possible 1.8 additional emergency room visits for asthma due to Project-related PM<sub>2.5</sub> out of an estimated background value of 18,419 visits shown in Table 4-2.

The number of projected health incidences is a conservative upper bound estimate because (a) it is based on continuous exposure to the maximum daily average pollutant concentrations; (b) the emission rates used in the assessment were a combination of maximum summer and winter daily rates, which could not occur; (c) health incidences were counted separately for PM<sub>2.5</sub> and ozone, when a person could experience both so there is potential for double counting; and (d) other conservative assumptions and methods used in the CalEEMod, PGM, and BenMAP models. On the other hand, the health incidences were calculated only for those health effects that have been researched sufficiently to be quantifiable.<sup>11</sup> There could be additional non-quantifiable health effects, for example changes in metabolism, weight gain, diabetes, or nervous system issues, among others.

The health incidence models and screening tools used in the Guidance represent regional average values for the 5-Air-District region. Within the region it is possible that there are subgroups of the population that could experience higher health incidences than average and other subgroups that could experience lower than average incidences. For example, vulnerable populations (populations defined by age, race/ethnicity, levels of education and income, and linguistic isolation) have been linked to increased health effects from air pollution. It has also been reported that increased ozone and PM<sub>2.5</sub> concentrations lead to a greater risk of death for racial minorities and people with low income.<sup>12</sup> This is especially the case for populations located close to freeways and major roadways.

---

<sup>10</sup> The California Department of Public Health annually publishes County Health Status Profiles (<https://www.cdph.ca.gov/Programs/CHSI/Pages/County-Health-Status-Profiles.aspx>). The 2020 Profile showed an average number of deaths per County for the period 2016-2018. The county average annual death numbers were 11,692.3 for Sacramento County; 3,281.0 for Placer County; 1,567.7 for El Dorado County; 1,322.7 for Yolo County; 841.3 for Sutter County; and 674.0 for Yuba County; or a total of 19,379.0 for those 6 counties. The 5-Air District region includes a portion of Solano County, and the total deaths for Solano County were 3,418.0. Assuming about one-fourth of the deaths in Solano County were in the 5-Air District region, that would add another about 855 deaths; for a total in the 5-Air District region of 20,233 deaths.

<sup>11</sup> See *Final Guidance*, Page 20.

<sup>12</sup> See *Final Guidance*, Pages 21 and 22.

According to Section 22 of the Draft Environmental Impact Report (DEIR) for the Jackson Township Specific Plan<sup>13</sup>, the Jackson Township project area (Census Tract 90.05) total population is slightly lower and the portion of households that primarily speak a language other than English is slightly higher than the County overall; but the race, culture, and income of the occupants of the area is comparable to the average demographics of the remainder of the County.

Other than vehicle traffic associated with the Project, Jackson Township does not contain sources of primary PM<sub>2.5</sub> emissions. Thus, the ozone and PM<sub>2.5</sub> concentrations and health effects modeled are a regional issue, not a local Jackson Township issue. Potential health effects are related to respiratory issues, and one indicator of respiratory issues is asthma. Sacramento County hosts a web site that shows various health (as well as other) data trends.<sup>14</sup> According to the web site, 19.2 percent of the population in the County had asthma in 2018. This compares to 23.5 percent in 2017, 16.0 percent for California overall, and 14.7 percent for the United States as a whole. Prior to 2018 the data showed a gradual increase in the percent of persons with asthma in Sacramento County, from about 17 percent in 2009 to 23.5 percent in 2017.

Although the percentage of persons with asthma in Sacramento County is greater than California as a whole, the County is in general a healthy environment as reported by the Healthy Places Index published by the Public Health Alliance of Southern California.<sup>15</sup> The Healthy Places Index (HPI) for Sacramento County is 57.1, indicating that the County is healthier than 57 percent of other California Counties. Jackson Township is located in a census tract that has an HPI of 36.4, less healthy than the County in general. The HPI is based on an assessment of economic, education, transportation, social, neighborhood, healthcare access, housing, and environment criteria. The environment criterion includes clean water and air criteria. Although Jackson Township will cause emissions and thus slightly impact clean air, all of the other criteria would be improved by the presence of Jackson Township. For example, the Project will provide employment opportunities, improve multi-modal transportation options, improve access the healthcare and other neighborhood services, and provide affordable housing opportunities for all income levels,

The proposed Jackson Township includes numerous features designed to reduce potential health effects from air pollution. For example, the Project reduces VMT by 49 to 59 percent from a typical (business as usual) project.<sup>16</sup> Reducing VMT encourages physical activity, which reduces obesity, diabetes, high blood pressure, heart disease, and other chronic conditions associated with a sedentary life style<sup>17</sup>. The benefit of reduced VMT through increased physical activity is not

---

<sup>13</sup> Draft Environmental Impact Report, Jackson Township Specific Plan, September 16, 2019. Available at <https://planning.saccounty.net/PlansandProjectsIn-Progress/Pages/JacksonTownshipSpecificPlan.aspx>

<sup>14</sup> [www.behealthysacramento.org](http://www.behealthysacramento.org).

<sup>15</sup> Healthy Places Index website: [www.healthypacesindex.org](http://www.healthypacesindex.org) for Sacramento County. Accessed December 17, 2020.

<sup>16</sup> See AQMP, Table 1-1.

<sup>17</sup> Final Guidance, Page 24.

accounted for in the health effects models. The reduction in Jackson Township VMT is accomplished through the following measures:

- Location in a suburban center within approximately 10 miles of the Sacramento downtown central business district, less than 5 miles from other existing high-density commercial/job center areas, and adjacent to other planned developments such that single-use trips are minimized, i.e., there are more pass-by and diverted trips.
- A compact mix of land uses in close proximity to each other with a highly connected street and trail network and the streets are designed in a grid pattern.
- High and medium density housing for over half of the total project dwelling units with a housing density better than 9.5 dwelling units per acre.
- Below market rate housing to help provide affordable housing for all income levels.
- Approximately 15 percent of the total commercial square footage is dedicated to a mixed-use facility that combines residences and commercial/retail uses.
- Most residential units are within 1,320 feet (one-quarter mile) of a neighborhood park, open space, school, and/or bicycle/pedestrian trail.
- Most residential units are less than one-half mile from shopping and services.
- At least four schools located within the project boundaries such that most students can walk to a local school.
- At least eight parks located within the project boundaries such that residents can walk/bike to enjoy the parks
- Access to high frequency bus service that connects to the Watt/Manlove light rail station.
- Signalized bus routes in order to avoid traffic delays.
- Multi-modal system that makes public transit, walking, and bicycling viable and attractive travel choices for residents and employees with:
  - Adequate bike parking at non-residential locations, including the transit center and park and ride locations;
  - Showers/lockers and other end of trip facilities at non-residential buildings; and
  - Long-term bike parking facilities.
- An extensive pedestrian path and trail system that is convenient and accessible from homes, schools, parks, employment and shopping.
- Pedestrian and bike paths minimize barriers to pedestrian/bicycle use, e.g., fences, berms and other impediments are eliminated where possible.
- An on-site transit center and park and ride facilities along the designated transit route of Jackson Highway.
- Subsidized bus rapid transit lanes on Jackson Highway.
- Funding and design that will result in bus headways of 15 minutes or better.
- A Transportation Management Association (TMA) funded through assessments and assessments for regional transportation improvements.

In addition to the VMT-reducing measures, as discussed above, Project-related emissions will be mitigated such that the emissions are less than thresholds established by the SMAQMD and Sacramento County for nitrogen oxides, reactive organic gases, and greenhouse gases.

## 6.0 CONCLUSION

Potential health effects related to the proposed Jackson Township possibly caused by emissions from the proposed project result in about 11 additional health incidences per year (e.g., hospital admissions, emergency room visits) compared to a background number of incidences in the 5-Air-District Region of about 185,000 incidences per year, or an increase of about 0.006 percent. The 11 incremental incidences per year projected for 2035 are from a modeled population of about 3.3 million persons.

The potential health effect incidences were calculated from a screening tool developed by the SMAQMD to attempt to substantively connect the Project's air quality effects to the likely health consequences. In addition to conservatism that is inherent in any screening tool, the potential health effects are over-stated because peak daily emissions were used instead of average daily emissions, peak daily winter was combined with peak daily summer even though that cannot occur, the CalEEMod model itself includes conservative over-estimates of emissions, some of the health incidences may be double counted, the health benefits from increased physical activity resulting from reduced VMT have also not been accounted for, and, as explained in the AQMP and GHGRP, not all of the mitigation measures designed into the proposed Jackson Township project have been accounted for in the emission estimates<sup>18</sup>.

If you have additional questions or concerns, please feel free to contact the undersigned at [erbes@kleinfelder.com](mailto:erbes@kleinfelder.com) or by phone at 303.748.7190. In the alternative you may contact Ms. Amal Hijazi at [ahijazi@kleinfelder.com](mailto:ahijazi@kleinfelder.com) or by phone at 303.237.6601.

Sincerely,

**KLEINFELDER**



Russell E. Erbes, CCM  
Senior Principal Air Quality Scientist

Attachments 1 and 2

---

<sup>18</sup> *Ibid.* Pages 21-22.

**ATTACHMENT 1**

**JACKSON TOWNSHIP ALTERNATIVE 2 PROJECT-RELATED VMT  
WITH ADDITIONAL MITIGATION HEALTH SCREENING RESULTS**

---



## Strategic Area Project Health Effects Tool

Strategic Area Location	II. Rancho Cordova	←- Step 1: Input the area
NOx Emissions	419.3	←- Step 2: Input NOx emissions in lbs./day
ROG Emissions	392.7	←- Step 3: Input ROG emissions in lbs./day
PM2.5 Emissions	79.1	←- Step 4: Input PM2.5 emissions in lbs./day

PM2.5 Health Endpoint	Age Range <sup>1</sup>	Incidences Across the Reduced Sacramento 4-km Modeling Domain Resulting from Project Emissions (per year) <sup>2,5</sup>	Incidences Across the 5-Air-District Region Resulting from Project Emissions (per year) <sup>2</sup>	Percent of Background Health Incidences Across the 5-Air-District Region <sup>3</sup>	Total Number of Health Incidences Across the 5-Air-District Region (per year) <sup>4</sup>
		(Mean)	(Mean)		
<b>Respiratory</b>					
Emergency Room Visits, Asthma	0 - 99	2.0	1.8	0.010%	18419
Hospital Admissions, Asthma	0 - 64	0.13	0.12	0.0064%	1846
Hospital Admissions, All Respiratory	65 - 99	0.78	0.69	0.0035%	19644
<b>Cardiovascular</b>					
Hospital Admissions, All Cardiovascular (less Myocardial Infarctions)	65 - 99	0.43	0.39	0.0016%	24037
Acute Myocardial Infarction, Nonfatal	18 - 24	0.00017	0.00015	0.0039%	4
Acute Myocardial Infarction, Nonfatal	25 - 44	0.014	0.013	0.0044%	308
Acute Myocardial Infarction, Nonfatal	45 - 54	0.037	0.035	0.0047%	741
Acute Myocardial Infarction, Nonfatal	55 - 64	0.060	0.056	0.0045%	1239
Acute Myocardial Infarction, Nonfatal	65 - 99	0.27	0.25	0.0049%	5052
<b>Mortality</b>					
Mortality, All Cause	30 - 99	5.1	4.6	0.010%	44766
<b>Ozone Health Endpoint</b>					
Ozone Health Endpoint	Age Range <sup>1</sup>	Incidences Across the Reduced Sacramento 4-km Modeling Domain Resulting from Project Emissions (per year) <sup>2,5</sup>	Incidences Across the 5-Air-District Region Resulting from Project Emissions (per year) <sup>2</sup>	Percent of Background Health Incidences Across the 5-Air-District Region <sup>3</sup>	Total Number of Health Incidences Across the 5-Air-District Region (per year) <sup>4</sup>
		(Mean)	(Mean)		
<b>Respiratory</b>					
Hospital Admissions, All Respiratory	65 - 99	0.38	0.31	0.0016%	19644
Emergency Room Visits, Asthma	0 - 17	1.5	1.2	0.021%	5859
Emergency Room Visits, Asthma	18 - 99	2.5	2.1	0.017%	12560
<b>Mortality</b>					
Mortality, Non-Accidental	0 - 99	0.24	0.20	0.00067%	30386

1. Affected age ranges are shown. Other age ranges are available, but the endpoints and age ranges shown here are the ones used by the USEPA in their health assessments. The age ranges are consistent with the epidemiological study that is the basis of the health function.

2. Health effects are shown in terms of incidences of each health endpoint and how it compares to the base (2035 base year health effect incidences, or "background health incidence") values. Health effects are shown for the Reduced Sacramento 4-km Modeling Domain and the 5-Air-District Region.

3. The percent of background health incidence uses the mean incidence. The background health incidence is an estimate of the average number of people that are affected by the health endpoint in a given population over a given period of time. In this case, the background incidence rates cover the 5-Air-District Region (estimated 2035 population of 3,271,451 persons). Health incidence rates and other health data are typically collected by the government as well as the World Health Organization. The background incidence rates used here are obtained from BenMAP.

4. The total number of health incidences across the 5-Air-District Region is calculated based on the modeling data. The information is presented to assist in providing overall health context.

5. The technical specifications and map for the Reduced Sacramento 4-km Modeling Domain are included in Appendix A, Table A-1 and Appendix B, Figure B-2 of the *Guidance to Address the Friant Ranch Ruling for CEQA Projects in the Sac Metro Air District*.

**Sac Metro Air District Strategic Area Project Health Effects Tool, version 2, published September 2020**

**ATTACHMENT 2**

**JACKSON TOWNSHIP ALTERNATIVE 2 CUMULATIVE VMT  
WITH ADDITIONAL MITIGATION HEALTH SCREENING RESULTS**

---



## Strategic Area Project Health Effects Tool

Strategic Area Location	II. Rancho Cordova	←- Step 1: Input the area
NOx Emissions	372.8	←- Step 2: Input NOx emissions in lbs./day
ROG Emissions	381.3	←- Step 3: Input ROG emissions in lbs./day
PM2.5 Emissions	66	←- Step 4: Input PM2.5 emissions in lbs./day

PM2.5 Health Endpoint	Age Range <sup>1</sup>	Incidences Across the Reduced Sacramento 4-km Modeling Domain Resulting from Project Emissions (per year) <sup>2,5</sup>	Incidences Across the 5-Air-District Region Resulting from Project Emissions (per year) <sup>2</sup>	Percent of Background Health Incidences Across the 5-Air-District Region <sup>3</sup>	Total Number of Health Incidences Across the 5-Air-District Region (per year) <sup>4</sup>
		(Mean)	(Mean)		
<b>Respiratory</b>					
Emergency Room Visits, Asthma	0 - 99	2.0	1.8	0.0098%	18419
Hospital Admissions, Asthma	0 - 64	0.13	0.12	0.0063%	1846
Hospital Admissions, All Respiratory	65 - 99	0.77	0.68	0.0035%	19644
<b>Cardiovascular</b>					
Hospital Admissions, All Cardiovascular (less Myocardial Infarctions)	65 - 99	0.42	0.39	0.0016%	24037
Acute Myocardial Infarction, Nonfatal	18 - 24	0.00016	0.00015	0.0039%	4
Acute Myocardial Infarction, Nonfatal	25 - 44	0.014	0.013	0.0043%	308
Acute Myocardial Infarction, Nonfatal	45 - 54	0.037	0.034	0.0046%	741
Acute Myocardial Infarction, Nonfatal	55 - 64	0.059	0.056	0.0045%	1239
Acute Myocardial Infarction, Nonfatal	65 - 99	0.27	0.25	0.0049%	5052
<b>Mortality</b>					
Mortality, All Cause	30 - 99	5.0	4.5	0.010%	44766
Ozone Health Endpoint	Age Range <sup>1</sup>	Incidences Across the Reduced Sacramento 4-km Modeling Domain Resulting from Project Emissions (per year) <sup>2,5</sup>	Incidences Across the 5-Air-District Region Resulting from Project Emissions (per year) <sup>2</sup>	Percent of Background Health Incidences Across the 5-Air-District Region <sup>3</sup>	Total Number of Health Incidences Across the 5-Air-District Region (per year) <sup>4</sup>
		(Mean)	(Mean)		
<b>Respiratory</b>					
Hospital Admissions, All Respiratory	65 - 99	0.34	0.28	0.0014%	19644
Emergency Room Visits, Asthma	0 - 17	1.3	1.1	0.019%	5859
Emergency Room Visits, Asthma	18 - 99	2.3	1.9	0.015%	12560
<b>Mortality</b>					
Mortality, Non-Accidental	0 - 99	0.22	0.18	0.00060%	30386

1. Affected age ranges are shown. Other age ranges are available, but the endpoints and age ranges shown here are the ones used by the USEPA in their health assessments. The age ranges are consistent with the epidemiological study that is the basis of the health function.

2. Health effects are shown in terms of incidences of each health endpoint and how it compares to the base (2035 base year health effect incidences, or "background health incidence") values. Health effects are shown for the Reduced Sacramento 4-km Modeling Domain and the 5-Air-District Region.

3. The percent of background health incidence uses the mean incidence. The background health incidence is an estimate of the average number of people that are affected by the health endpoint in a given population over a given period of time. In this case, the background incidence rates cover the 5-Air-District Region (estimated 2035 population of 3,271,451 persons). Health incidence rates and other health data are typically collected by the government as well as the World Health Organization. The background incidence rates used here are obtained from BenMAP.

4. The total number of health incidences across the 5-Air-District Region is calculated based on the modeling data. The information is presented to assist in providing overall health context.

5. The technical specifications and map for the Reduced Sacramento 4-km Modeling Domain are included in Appendix A, Table A-1 and Appendix B, Figure B-2 of the *Guidance to Address the Friant Ranch Ruling for CEQA Projects in the Sac Metro Air District*.

**Sac Metro Air District Strategic Area Project Health Effects Tool, version 2, published September 2020**