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November 12, 2019

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**Re: SAFER Appeal of 3rd and Pacific Project Addendum to Downtown Plan Program EIR, Site Plan Review (SPR18-038)**

Dear Chair Lewis and Honorable Commissioners:

I am writing on behalf of the Supporters' Alliance for Environmental Responsibility ("SAFER") and its members living and working in and near Long Beach regarding SAFER's appeal of the City of Long Beach ("City") Planning Commission's September 19, 2019 approval of a Site Plan Review for the development of the 3rd and Pacific Project, which includes development of two mixed-use residential and commercial buildings within the Downtown Plan Area (the "Project"). The City's Planning Commission approved the Project based on an Addendum to the City of Long Beach Downtown Plan Program Environmental Impact Report approved by the City in 2011 (the "2011 PEIR"). As discussed below, because there is substantial evidence that the Project will have significant impacts not analyzed in the 2011 PEIR, a tiered EIR must be prepared for the Project. Approval of the Project based on an addendum violates the California Environmental Quality Act ("CEQA"), Pub. Res. Code section 21000, et seq.

This letter in support of SAFER's appeal was prepared with the assistance of environmental consulting firm SWAPE. SWAPE's expert comment and the resumes of SWAPE's consultants are attached hereto as Exhibit A, and is incorporated herein by reference in its entirety. This comment has also been prepared with the assistance of Certified Industrial Hygienist, Francis "Bud" Offermann, PE, CIH. Mr. Offermann's comment and resume are attached as Exhibit B hereto and is incorporated herein by reference in its entirety.

## PROJECT DESCRIPTION

The Project proposes to develop a mixed-use residential and commercial development in the Downtown Plan area. The proposed project would replace two existing surface parking lots with two buildings— an 8-story building at the north end of the property (North Building) and a 23-story high rise building at the south portion of the site (South Building) on a 1.2-acre site. Both buildings would include ground floor retail, with residential units on the upper stories.

The proposed project would include a total of 345 residential units that would range from studios to 3-bedroom units, 14,437 sf of retail commercial space, 563 vehicle parking spaces, and 128 bicycle parking spaces. The project's residential component would consist of 429,456 square feet (sf) of residential uses, including amenities, 14,337 sf of commercial retail uses, 217,493 sf of parking. The proposed project would also include 42,307 sf of open space, namely 13,944 sf of residential common outdoor open space, 11,688 sf of residential indoor common open space, 11,340 sf of residential private open space, and 5,335 sf of public open space. The proposed project's gross building area would be approximately 661,430 sf, including all below-grade levels.

## DISCUSSION

SAFER hereby requests that the City prepare an environmental impact report ("EIR") to analyze the significant environmental impacts of the Project and to propose all feasible mitigation measures and alternatives to reduce those impacts. The City many not rely on an addendum to the 2011 PEIR for several reasons, including, but not limited to, the following:

### I. CEQA REQUIRES THE CITY TO PREPARE A TIERED EIR FOR THE PROJECT INSTEAD OF AN ADDENDUM.

CEQA permits agencies to 'tier' EIRs, in which general matters and environmental effects are considered in an EIR "prepared for a policy, plan, program or ordinance followed by narrower or site-specific [EIRs] which incorporate by reference the discussion in any prior [EIR] and which concentrate on the environmental effects which (a) are capable of being mitigated, or (b) were not analyzed as significant effects on the environment in the prior [EIR]." (Pub. Res.

Code § 21068.5.) The initial general policy-oriented EIR is called a programmatic EIR ("PEIR") and offers the advantage of allowing "the lead agency to consider broad policy alternatives and program wide mitigation measures at an early time when the agency has greater flexibility to deal with basic problems or cumulative impacts." (EIR 14 CCR §15168.) "[T]iering is appropriate when it helps a public agency to focus upon the issues ripe for decision at each level of environmental review and in order to exclude duplicative analysis of environmental effects examined in previous [EIRs]." (Pub Resources Code § 21093.) CEQA regulations strongly promote tiering of EIRs, stating that "[EIRs] shall be tiered whenever feasible, as determined by the lead agency." (Cal Pub Resources Code § 21093.)

Once a program EIR has been prepared, "[s]ubsequent activities in the program must be examined in light of the program EIR to determine whether an additional environmental document must be prepared." (14 CCR § 15168(c).) The first consideration is whether the activity proposed is covered by the PEIR. (*Id.*) If a later project is outside the scope of the program, then it is treated as a separate project and the PEIR may not be relied upon in further review. (*Sierra Club v. County of Sonoma* (1992) 6 Cal.App.4th 1307.) The second consideration is whether the "later activity would have effects that were not examined in the program EIR." (CCR §§ 15168(c)(1).) A PEIR may only serve "to the extent that it contemplates and adequately analyzes the potential environmental impacts of the project." (*Sierra Nevada Conservation v. County of El Dorado* ( "*El Dorado*") (2012) 202 Cal.App.4th 1156). If the PEIR does not evaluate the environmental impacts of the project, a tiered EIR must be completed before the project is approved. (*Id.*) For these inquiries, the "fair argument test" applies. (*Sierra Club*, 6 Cal.App.4th 1307, 1318; *See also Sierra Club v. County of San Diego* (2014) 231 Cal.App.4th 1152, 1164 (**"**when a prior EIR has been prepared and certified for a program or plan, the question for a court reviewing an agency's decision not to use a tiered EIR for a later project 'is one of law, i.e., the sufficiency of the evidence to support a fair argument.'"))

Under the fair argument test, a new EIR must be prepared "whenever it can be fairly argued on the basis of substantial evidence that the project may have significant environmental impact. (*Id.* at 1316 (quotations omitted).) When applying the fair argument test, "deference to the agency's determination is not appropriate and its decision not to require an EIR can be upheld only when there is no credible evidence to the contrary." (*Sierra Club*, 6 Cal. App. 4th at 1312.) "[I]f there is substantial evidence in the record that the later project may arguably have a significant adverse effect on the environment which was not examined in the prior program EIR, doubts must be resolved in favor of environmental review and the agency must prepare a new tiered EIR, notwithstanding the existence of contrary evidence." (*Sierra Club*, 6 Cal.App.4th at 1319.)

In *Friends of College of San Mateo Gardens* the California Supreme Court explained the differing analyses that apply when a project EIR was originally approved and changes are being made to the project, and when a tiered program EIR was originally prepared and a subsequent project is proposed consistent with the program or plan:

> For project EIRs, of course, a subsequent or supplemental impact report is required in the event there are substantial changes to the project or its circumstances, or in the event of

> material new and previously unavailable information. (*Friends of Mammoth*, citing § 21166.) In contrast, when a tiered EIR has been prepared, review of a subsequent project proposal is more searching. **If the subsequent project is consistent with the program or plan for which the EIR was certified, then 'CEQA requires a lead agency to prepare an initial study to determine if the later project may cause significant environmental effects not examined in the first tier EIR.'** (*Ibid*. citing Pub. Resources Code, § 21094, subds. (a), (c).) 'If the subsequent project is not consistent with the program or plan, it is treated as a new project and must be fully analyzed in a project—or another tiered EIR if it may have a significant effect on the environment.' (*Friends of Mammoth*, at pp. 528–529, 98 Cal.Rptr.2d 334.)

(*Friends of Coll. of San Mateo Gardens v. San Mateo County Cmty. Coll. Dist.* ("*San Mateo Gardens*") (2016) 1 Cal.5th 937, 960.)

Here, the City prepared a program EIR in 2011 for the Downtown Plan Project.[1] As a result, CEQA requires the City to prepare an initial study to determine if the Project *may* cause significant environmental effects not examined in the PEIR. (Pub. Res. Code § 21094.) As discussed below, there is substantial evidence supporting a fair argument that the Project may result in significant environmental impacts that were not previously analyzed in the PEIR. Accordingly, an EIR must be prepared for the Project.

## II. THE CITY CANNOT ISSUE AN ADDENDUM FOR THE PROJECT BECAUSE THE PROJECT WAS NOT ADDRESSED IN THE PROGRAM EIR.

The City is wrong in concluding that the Project can be analyzed under CEQA Guidelines Section 15164 and 15162 because those sections are only applicable when a project has recently undergone CEQA review. As the California Supreme Court explained in *San Mateo Gardens*, subsequent CEQA review provisions "can apply only if the project has been subject to initial review; they can have no application if the agency has proposed a new project that has not previously been subject to review." (*Friends of Coll. of San Mateo Gardens v. San Mateo County Cmty. Coll. Dist.* ("*San Mateo Gardens*") (2016) 1 Cal.5th 937, 950.) Agencies can prepare addendums for project modifications or revisions and avoid further environmental review, but only if the project has a previously certified EIR or negative declaration. (*See Save our Heritage v. City of San Diego* (2018) 28 Cal.App.5th 656, 667.)

If the proposed Project had already been addressed in the 2011 PEIR, the standard for determining whether further review is required would be governed by 14 CCR §15162 and Pub. Res. C. §21166, and an addendum could potentially be allowed under § 15164. These sections

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[1] The 2011 PEIR states that it was "prepared in accordance with the provisions of the California Environmental Quality Act (CEQA) and Section 15168 of the CEQA Guidelines, which provides for the preparation of a PEIR '[i]n connection with issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program.'" (2011 PEIR, p. 1-1.)

are inapplicable here, however, because the proposed Project has never undergone CEQA review. Neither an EIR nor a negative declaration was prepared for the Project, and the Project was never mentioned or discussed in the PEIR. As a result, the City cannot rely on the subsequent review provisions of CEQA Guidelines sections 15162 or 15164.

## III. THERE IS SUBSTANTIAL EVIDENCE THAT THE PROJECT WILL HAVE SIGNIFICANT ENVIRONMENTAL IMPACTS.

### A. There is Substantial Evidence that the Project will have a Significant Impact on Indoor Air Quality.

Certified Industrial Hygienist, Francis “Bud” Offermann, PE, CIH concludes that it is likely that the Project will expose future residents to significant impacts related to indoor air quality, and in particular, emissions for the cancer-causing chemical formaldehyde. Mr. Offermann is one of the world’s leading experts on indoor air quality and has published extensively on the topic.

Mr. Offermann explains that many composite wood products typically used in modern home construction contain formaldehyde-based glues that off-gas formaldehyde over a very long time period. He states, “The primary source of formaldehyde indoors is composite wood products manufactured with urea-formaldehyde resins, such as plywood, medium density fiberboard, and particle board. These materials are commonly used in residential building construction for flooring, cabinetry, baseboards, window shades, interior doors, and window and door trims.” Offermann Comment, pp. 2-3.

Formaldehyde is a known human carcinogen. Mr. Offermann states that there is a fair argument that future residents of the Project will be exposed to a cancer risk from formaldehyde of approximately 125 per million, assuming all materials are compliant with the California Air Resources Board’s formaldehyde airborne toxics control measure. *Id*., pp. 3-4. This is almost 12 times the SCAQMD’s CEQA significance threshold for airborne cancer risk of 10 per million. *Id*. at 4.

In addition, employees of the commercial spaces are expected to experience similarly significant indoor air exposures to formaldehyde from building materials and furnishings commonly found in offices and hotels. Mr. Offermann calculates that full time employees in the commercial spaces may be exposed to formaldehyde in an amount that would represent a cancer risk of 18.4 per million. *Id*. at 4-5. This also exceeds the 10 per million SCAQMD threshold. *Id*.

Mr. Offermann concludes that this significant environmental impact should be analyzed in an EIR and mitigation measures should be imposed to reduce the risk of formaldehyde exposure. *Id*. at 5.

Mr. Offermann identifies several feasible mitigation measures that are available to reduce these significant health risks, including the installation of air filters and a requirement that the applicant use only composite wood materials (e.g. hardwood plywood, medium density fiberboard, particleboard) for all interior finish systems that are made with CARB approved no-added formaldehyde (NAF) resins or ultra-low emitting formaldehyde (ULEF) resins in the buildings' interiors. Offermann, pp. 11-13.

When a project exceeds a duly adopted CEQA significance threshold, as here, this alone establishes a fair argument that the project will have a significant adverse environmental impact and an EIR is required. Indeed, in many instances, such air quality thresholds are the only criteria reviewed and treated as dispositive in evaluating the significance of a project's air quality impacts. *See, e.g. Schenck v. County of Sonoma* (2011) 198 Cal.App.4th 949, 960 (County applies BAAQMD's "published CEQA quantitative criteria" and "threshold level of cumulative significance"); *see also*, *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 110-111 ("A 'threshold of significance' for a given environmental effect is simply that level at which the lead agency finds the effects of the project to be significant"). The California Supreme Court made clear the substantial importance that an air district significance threshold plays in providing substantial evidence of a significant adverse impact. *Communities for a Better Environment v. South Coast Air Quality Management Dist.* (2010) 48 Cal.4th 310, 327 ("As the [South Coast Air Quality Management] District's established significance threshold for NOx is 55 pounds per day, these estimates [of NOx emissions of 201 to 456 pounds per day] constitute substantial evidence supporting a fair argument for a significant adverse impact"). Since expert evidence demonstrates that the Project will exceed the SCAQMD's CEQA significance threshold, there is a fair argument that the Project will have significant adverse impacts and an EIR is required.

The City has a duty to investigate issues relating to a project's potential environmental impacts, especially those issues raised by an expert's comments. *See Cty. Sanitation Dist. No. 2 v. Cty. of Kern*, (2005) 127 Cal.App.4th 1544, 1597–98 ("under CEQA, the lead agency bears a burden to investigate potential environmental impacts"). In addition to assessing the Project's potential health impacts to future residents, Mr. Offermann identifies the investigatory path that the City should be following in developing an EIR to more precisely evaluate the Project's future formaldehyde emissions and establishing mitigation measures that reduce the cancer risk below the SCAQMD level. Offermann, pp. 5-9. Such an analysis would be similar in form to the air quality modeling and traffic modeling typically conducted as part of a CEQA review.

The failure to address the project's formaldehyde emissions is contrary to the California Supreme Court's decision in *California Building Industry Ass'n v. Bay Area Air Quality Mgmt. Dist.* (2015) 62 Cal.4th 369, 386 ("*CBIA*"). At issue in *CBIA* was whether the Air District could enact CEQA guidelines that advised lead agencies that they must analyze the impacts of adjacent environmental conditions on a project. The Supreme Court held that CEQA does not generally require lead agencies to consider the environment's effects on a project. *CBIA*, 62 Cal.4th at 800-801. However, to the extent a project may exacerbate existing adverse environmental conditions at or near a project site, those would still have to be considered pursuant to CEQA. *Id*. at 801 ("CEQA calls upon an agency to evaluate existing conditions in order to assess whether a project could exacerbate hazards that are already present"). In so holding, the Court expressly held that CEQA's statutory language required lead agencies to disclose and analyze "impacts on ***a***

***project's users or residents*** that arise ***from the project's effects*** on the environment." *Id*. at 800 (emphasis added).)

The carcinogenic formaldehyde emissions identified by Mr. Offermann are not an existing environmental condition. Those emissions to the air will be from the Project. Residents will be users of the Project. Currently, there is presumably little if any formaldehyde emissions at the site. Once the Project is built, emissions will begin at levels that pose significant health risks. Rather than excusing the City from addressing the impacts of carcinogens emitted into the indoor air from the project, the Supreme Court in *CBIA* expressly finds that this type of effect by the project on the environment and a "project's users and residents" must be addressed in the CEQA process.

The Supreme Court's reasoning is well-grounded in CEQA's statutory language. CEQA expressly includes a project's effects on human beings as an effect on the environment that must be addressed in an environmental review. "Section 21083(b)(3)'s express language, for example, requires a finding of a 'significant effect on the environment' (§ 21083(b)) whenever the 'environmental effects of a project will cause substantial adverse effects *on human beings,* either directly or indirectly.'" *CBIA*, 62 Cal.4th at 800 (emphasis in original). Likewise, "the Legislature has made clear—in declarations accompanying CEQA's enactment—that public health and safety are of great importance in the statutory scheme." *Id*., citing e.g., §§ 21000, subds. (b), (c), (d), (g), 21001, subds. (b), (d). It goes without saying that the hundreds of future residents of the Project are human beings and the health and safety of those residents is as important to CEQA's safeguards as nearby residents currently living adjacent to the project site.

Mr. Offermann also notes that the high cancer risk that may be posed by the Project's indoor air emissions likely will be exacerbated by the additional cancer risk that exists from the project's location  close to roads with moderate to high traffic such as Ocean Boulevard, Broadway, 3rd Street, and 7th Street, and the Long Beach Airport and the high levels of PM2.5 already present in the ambient air at this location. Offermann Comments, pp. 10-11. No analysis has been conducted of the significant cumulative health impacts that will result to residents and employees of the new Project.

Because Mr. Offermann's expert review is substantial evidence of a fair argument of a significant environmental impact to future users of the project, an EIR must be prepared to disclose and mitigate those impacts.

### B. The Addendum Relies on Unsubstantiated and Inaccurate Input Parameters to Estimate Project Emissions and Thus Failed to Adequately Analyze the Project's Air Quality Impacts.

The Addendum's air quality analysis relies on emissions calculated from the California Emissions Estimator Model Version CalEEMod.2016.3.2 ("CalEEMod"). This model relies on recommended default values or on site specific information related to a number of factors. The model is used to generate a project's construction and operational emissions. SWAPE reviewed the Project's CalEEMod output files and found that the values input into the model were either unsubstantiated or inconsistent with information provided in the Addendum. This resulted in an underestimation of the Project's emissions. As a result, the Project may have a significant air quality impacts and an EIR is required to properly analyze these potential impacts.

**1. The Addendum's air model used incorrect land use sizes and vehicle trips.**

According to the Addendum, the Project would include 217,473 square feet of parking. Addendum, p. 37, table 2. In addition, the Project includes 14,481 square feet of retail commercial space. *Id*. However, the CalEEMod output files demonstrate that the Addendum only modeled an area of 215,559 square feet for parking and 14,437 square feet for retail commercial space. SWAPE, p. 2 (citing Addendum Appendix B pp. 41, 71). In addition, the Addendum states that the residential space will include 11,688 square feet of indoor residential common areas, comprised of residential amenities such as gym and storage areas. Addendum, p. 37, table 2. However, the CalEEMod output files disclose that none of this land use space was included in the model. SWAPE, p. 3.

The use of incorrect land use areas has impacts throughout the Project's environmental analysis. As SWAPE explains:

> The land use type and size features are used throughout CalEEMod to determine default variable and emission factors that go into the model's calculations. For example, the square footage of a land use is used for certain calculations such as determining the wall space to be painted (i.e., VOC emissions from architectural coatings) and volume that is heated or cooled (i.e., energy impacts). Furthermore, CalEEMod assigns each land use type with its own set of energy usage emission factors. Thus, by underestimating the size of the proposed parking, retail, and residential land uses within the air model, the model underestimates the emissions associated with construction and operation of the proposed Project.

SWAPE, p. 3.

Similarly, the Addendum's air model used an incorrect number of traffic trips. According to the Addendum's Traffic Study, the Project will generate 2,574 daily trips. However, the CalEEMod output files demonstrate that the model only considered 2,567 weekday trips, and 1,890 Sunday trips. SWAPE, p. 4.

These inaccuracies must be corrected in an updated air quality analysis. Use of these incorrect input parameters resulted in an underestimation of air quality impacts.

**2. The Addendum's air model used an incorrect list of construction equipment.**

The Project's CalEEMod output files also demonstrate that the air model used an incorrect list of construction equipment. The air quality analysis, included as Exhibit B to the

Addendum, includes a list of construction equipment needed for the Project. That list includes the need for one Concrete/Industrial Saw, one Rubber Tired Dozer, and one Tractor/Loader/Backhoe during the grading phase of Project construction. Addendum, Appendix B, p. 34. SWAPE's review of the CalEEMod output files, however demonstrate that a Grader was included as part of the construction equipment, and no Concrete/Industrial Saws were included in the grading phase of construction. SWAPE, p. 6 (citing Addendum, Appendix B, p. 48).

**3. The Addendum's air model is based on an unsubstantiated reduction in carbon intensity factor.**

The CalEEMOd output data also demonstrates that the default value for CO2 intensity factor was changed, without any justification being given. SWAPE, p. 7. Specifically, the default CO2 intensity factor of 702.44 pounds per megawatt-hour (lbs/MWhr) was changed to 516.04 lbs/MWhr in the air model. Addendum, Appendix B, pp. 43, 73. SWAPE explains that "this intensity factor is used to estimate the $CO_2$ emissions generated from electricity usage during Project operation. By reducing the carbon intensity factor, the air model underestimates the Project's operational greenhouse gas (GHG) emissions." SWAPE, p. 8. Without justification, reduction in the CO2 intensity factor was improper and resulted in an underestimation of the Project's impacts. *Id*.

**C. There is Substantial Evidence that the Project may have a Significant Impact on Human Health.**

The Addendum determined that the Project would result in a less-than-significant health risk impact from diesel particulate matter emissions. Addendum, p. 67. This conclusion is not supported by substantial evidence because a quantitative health risk assessment ("HRA") was never prepared for the Project.

SWAPE conducted a screening-level HRA in order to demonstrate the potential risk posed by Project construction and operation to nearby sensitive receptors. SWAPE, pp. 9-13. SWAPE's HRA corrected the errors in the CalEEMod model described above. Based on the HRA, SWAPE concludes that the Project's construction and operational diesel particulate matter emissions may result in a significant health risk impacts that was not analyzed or mitigated in the Addendum. *Id*. at 9.

According to the HRA, the Project will result in an excess cancer risk to adults, children, and infants of 31, 280, and 240 per million when using the age sensitivity factors recommended by the Office of Health Hazards Assessment ("OEHHA"). SWAPE, p. 13. The excess cancer risk over the course of a residential life time (30 years) at the closest receptor, 25 meters away, is 560 per million. *Id*. Even without using the age sensitivity factors recommended by OEHHA, the excess cancer risk to adults, children, and infants is 31, 93, and 24 in one million, while the excess cancer risk over the course of a residential life time is 150 in one million. *Id*. Each of these risks exceed the South Coast Air Quality Management District's threshold of significance of 10 in one million. *Id*. Accordingly, each of these risks is a significant impact that must be analyzed in an EIR.

### D. There is Substantial Evidence that the Project will have a Significant Greenhouse Gas Impact.

The Addendum improperly concludes that the Project will not have a significant greenhouse gas ("GHG") impact because the Project will be consistent with Ab 32, SB 375, and the City of Long Beach Sustainable City Action Plan. In addition the Addendum quantifies emissions and compares them to SCAQMD's per service population threshold for 2020 to support its conclusion. As explained in SWAPE's comment letter, none of these justifications are sufficient. SWAPE, pp. 14-21.

The Addendum also inadequately compares the Project's annual GHG emissions to the applicable SCAQMD threshold of significance. SWAPE, p. 19. According to the Addendum's GHG analysis the Project would result in a net increase of 4,389 metric tons of $CO_2$ equivalents per year (MT $CO_2$e/year). Addendum Appendix E, p. 60, Table 11. The analysis then goes on to state that:

> [T[here is no scientific or regulatory consensus regarding what particular quantity of GHG emissions is significant. Further, no agency with regulatory authority and expertise, such as CARB or SCAQMD, as adopted numeric GHG thresholds for land use development projects for purposes of CEQA…[D]ividing the total Project 2020 scenario mitigated GHG emissions by the estimated service population yields an efficiency metric of 4.3 $CO_2$e per service population per year as compared to 4.8 for the year 2020 threshold. This comparison is provided for informational purposes.

Addendum Appendix E, p. 34.

There are two problems with this analysis. First, the analysis is deficient because it relies on SCAQMD's 2020 service population efficiency threshold of 4.8 MT $CO_2$e/year. SWAPE, p. 20. This is improper because, as the CalEEMod output files demonstrate, the Project's development and construction would continue beyond 2020, not becoming operational until 2021. Addendum Appendix B, pp. 42, 72. As a result, the GHG analysis should have used SCAQMD's 2030 efficiency standard of 3.0 MT $CO_2$e/year to evaluate the Project's 2021 and beyond emissions. SWAPE, p. 20. When the per-service population emissions estimated in the Addendum are compared to the relevant SCAQMD threshold of significance, "the Project's 2021 service population efficiency value of 4.33 MT $CO_2$e/SP/year exceeds the 2035 service population efficiency threshold of 3.0 MT $CO_2$e/SP/year." *Id*. This is constitutes substantial evidence that the Project will have a significant GHG impact that must be analyzed and mitigated in an EIR.

The second issue with the Addendum's quantitative GHG analysis is that, as discussed above, the Addendum's CalEEMod model relies on inaccurate input parameters, which resulted in an underestimation of the Project's GHG emissions. SWAPE, pp. 19-20. Using the updated CalEEMod model with corrected inputs, SWAPE determined that the Project would emit 4,677.46 MT $CO_2e$/year rather than the Addendum's inaccurate estimation of 4,389 MT $CO_2e$/year. SWAPE, p. 20. The Project's annual GHG emissions of 4,677.46 MT $CO_2e$/year exceed SCAQMD's Tier 3 Option 1's 3,000 MT $CO_2e$/year mixed-use/non-industrial project screening threshold. *Id*. Moreover, when divided by the maximum service population of 1,013, this results in a per service population efficiency value of 4.62 MT $CO_2e$/SP/year, which is an even greater exceedance of the applicable 3.0 MT $CO_2e$/SP/year than is disclosed in the Addendum. *Id*. at 21.

SWAPE's comments constitute substantial evidence that the Proejct may have a significant GHG impact. This impact must be analyzed and mitigated in an EIR. SWAPE's comment contains a number of feasible mitigation measures that should be considered to reduce the Project's GHG impact. SWAPE, pp. 26-32.

**E. There is Substantial Evidence that the Project may have a Significant Impact on Biological Resources as a Result of Window Collisions.**

The Project as planned would contribute to an ongoing national catastrophe in bird collision deaths caused by poorly planned incorporation of windows into building designs. Constructing 8- and 23-story buildings, as the Project proposes to do, will not only take aerial habitat from birds, but it will also interfere with the movement of birds in the region and it will result in large numbers of annual window collision fatalities.

Window collisions are often characterized as either the second or third largest source or anthropogenic-caused bird mortality. The numbers behind these characterizations are often attributed to Klem's (1990)[2] and Dunn's (1993)[3] estimates of about 100 million to 1 billion bird fatalities in the USA, or more recently Loss et al.'s (2014)[4] estimate of 365-988 million bird fatalities in the USA or Calvert et al.'s (2013)[5] and Machtans et al.'s (2013)[6] estimates of 22.4 million and 25 million bird fatalities in Canada, respectively.

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[2] Klem, D., Jr. 1990. Collisions between birds and windows: mortality and prevention. Journal of Field Ornithology 61:120-128.

[3] Dunn, E. H. 1993. Bird mortality from striking residential windows in winter. Journal of Field Ornithology 64:302-309.

[4] Loss, S. R., T. Will, S. S. Loss, and P. P. Marra. 2014. Bird–building collisions in the United States: Estimates of annual mortality and species vulnerability. The Condor: Ornithological Applications 116:8-23. DOI: 10.1650/CONDOR-13-090.1

[5] Calvert, A. M., C. A. Bishop, R. D. Elliot, E. A. Krebs, T. M. Kydd, C. S. Machtans, and G. J. Robertson. 2013. A synthesis of human-related avian mortality in Canada. Avian Conservation and Ecology 8(2): 11. http://dx.doi.org/10.5751/ACE-00581-080211

[6] Machtans, C. S., C. H. R. Wedeles, and E. M. Bayne. 2013. A first estimate for Canada of the number of birds killed by colliding with building windows. Avian Conservation and Ecology 8(2):6. http://dx.doi.org/10.5751/ACE-00568-080206

Gelb and Delacretaz (2009)[7] recorded 5,400 bird fatalities under buildings in New York City, based on a decade of monitoring only during migration periods, and some of the high-rises were associated with hundreds of fatalities each. Klem et al. (2009)[8] monitored 73 building façades in New York City during 114 days of two migratory periods, tallying 549 collision victims, nearly 5 birds per day. Borden et al. (2010)[9] surveyed a 1.8 km route 3 times per week during 12-month period and found 271 bird fatalities of 50 species. Parkins et al. (2015)[10] found 35 bird fatalities of 16 species within only 45 days of monitoring under 4 building façades. In San Francisco, Kahle et al. (2016)[11] found 355 collision victims within 1,762 days under a 5-story building. Ocampo-Peñuela et al. (2016)[12] searched the perimeters of 6 buildings on a university campus, finding 86 fatalities after 63 days of surveys. One of these buildings produced 61 of the 86 fatalities, and another building with collision-deterrent glass caused only 2 of the fatalities.

Here, there is ample evidence to support a fair argument that the Project will result in many collision fatalities of birds, and that this may result in a significant impact. Yet neither the 2011 PEIR nor the Addendum make any attempt to analyze this potentially significant impact. An EIR is required to fully analyze and mitigate this impact.

## IV. THE CITY MUST PREPARE AN EIR BECAUSE THE 2011 PROGRAM EIR ADMITS SIGNIFICANT AND UNAVAILABLE ENVIRONMENTAL IMPACTS.

An EIR must be prepared for the Project because the 2011 PEIR determined that the Downtown Plan would cause significant and unavoidable impacts on aesthetics, air quality, cultural resources, greenhouse gases, noise, population and housing, public services, transportation and traffic, and utilities and service systems. (Addendum, p. 8.)

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[7] Gelb, Y. and N. Delacretaz. 2009. Windows and vegetation: Primary factors in Manhattan bird collisions. Northeastern Naturalist 16:455-470.

[8] Klem, D., Jr. 2009. Preventing bird-window collisions. The Wilson Journal of Ornithology 121:314-321.

[9] Borden, W. C., O. M. Lockhart, A. W. Jones, and M. S. Lyons. 2010. Seasonal, taxonomic, and local habitat components of bird-window collisions on an urban university campus in Cleveland, OH. Ohio Journal of Science 110(3):44-52.

[10] Parkins, K. L., S. B. Elbin, and E. Barnes. 2015. Light, Glass, and Bird–building Collisions in an Urban Park. Northeastern Naturalist 22:84-94.

[11] Kahle, L. Q., M. E. Flannery, and J. P. Dumbacher. 2016. Bird-window collisions at a west-coast urban park museum: analyses of bird biology and window attributes from Golden Gate Park, San Francisco. PLoS ONE 11(1):e144600 DOI 10.1371/journal.pone.0144600.

[12] Ocampo-Peñuela, N., R. S. Winton, C. J. Wu, E. Zambello, T. W. Wittig and N. L. Cagle . 2016. Patterns of bird-window collisions inform mitigation on a university campus. PeerJ4:e1652;DOI10.7717/peerj.1652

In the case of *Communities for a Better Environment v. Cal. Resources Agency* (2002) 103 Cal.App.4th 98, 122-125, the court of appeal held that when a "first tier" EIR admits a significant, unavoidable environmental impact, then the agency must prepare second tier EIRs for later projects to ensure that those unmitigated impacts are "mitigated or avoided." (*Id*. citing CEQA Guidelines §15152(f)) The court reasoned that the unmitigated impacts was not "adequately addressed" in the first tier EIR since it was not "mitigated or avoided." (*Id*.) Thus, significant effects disclosed in first tier EIRs will trigger second tier EIRs unless such effects have been "adequately addressed," in a way that ensures the effects will be "mitigated or avoided." (*Id*.) Such a second tier EIR is required, even if the impact still cannot be fully mitigated and a statement of overriding considerations will be required. The court explained, "The requirement of a statement of overriding considerations is central to CEQA's role as a public accountability statute; it requires public officials, in approving environmental detrimental projects, to justify their decisions based on counterbalancing social, economic or other benefits, and to point to substantial evidence in support." (*Id*. at 124-125)

Since the 2011 PEIR admitted numerous significant, unmitigated impacts, a second tier EIR is not required to determine if mitigation measure can now be imposed to reduce or eliminate those impacts. If the impacts still remain significant and unavoidable, a statement of overriding considerations will be required.

## CONCLUSION

For the above reasons, the City must prepare an EIR to analyze and mitigate the impacts of the Project that were not previously analyzed in the 2011 PEIR. The County may not on an addendum.

Sincerely,

Rebecca L. Davis

# EXHIBIT A

SWAPE Technical Consultation, Data Analysis and Litigation Support for the Environment

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November 4, 2019

Rebecca Davis
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**Subject: Comments on the 3rd and Pacific Project (EIRA-02-19)**

Dear Ms. Davis,

We have reviewed the September 2019 Addendum ("Addendum") for the 3rd and Pacific Project ("Project") located in the City of Long Beach ("City"). The Project proposes to construct 345 residential units, totaling 429,456 square feet of residential space, as well as 14,481 square feet of retail commercial space, and 565 parking spaces on the 1.2-acre site.

Our review concludes that the Addendum fails to adequately evaluate the Project's Air Quality, Health Risk, and Greenhouse Gas impacts. As a result, emissions and health risk impacts associated with construction and operation of the proposed Project are underestimated and inadequately addressed. An updated CEQA analysis should be prepared to adequately assess and mitigate the potential air quality and health risk impacts that the project may have on the surrounding environment.

# Air Quality

## Unsubstantiated Input Parameters Used to Estimate Project Emissions

The Addendum's air quality analysis relies on emissions calculated with CalEEMod.2016.3.2.[1] CalEEMod provides recommended default values based on site-specific information, such as land use type, meteorological data, total lot acreage, project type and typical equipment associated with project type. If more specific project information is known, the user can change the default values and input project-specific values, but the California Environmental Quality Act (CEQA) requires that such changes be justified by substantial evidence.[2] Once all of the values are inputted into the model, the Project's construction and operational emissions are calculated, and "output files" are generated. These output

[1] CAPCOA (November 2017) CalEEMod User's Guide, http://www.aqmd.gov/docs/default-source/caleemod/01_user-39-s-guide2016-3-2_15november2017.pdf?sfvrsn=4.
[2] Ibid, p. 1, 9.

files disclose to the reader what parameters were utilized in calculating the Project's air pollutant emissions and make known which default values were changed as well as provide justification for the values selected.[3]

Review of the Project's air modeling demonstrates that the Addendum underestimates emissions associated with Project activities. As previously stated, the Addendum's air quality analysis relies on air pollutant emissions calculated using CalEEMod. When we reviewed the Project's CalEEMod output files, provided in Appendix B and E to the Addendum, we found that several of the values inputted into the model were not consistent with information disclosed in the Addendum. As a result, the Project's construction and operational emissions are underestimated. An updated CEQA analysis should be prepared to include an updated air quality analysis that adequately evaluates the impacts that construction and operation of the Project will have on local and regional air quality.

### *Use of Incorrect Land Use Sizes*

Review of the Project's CalEEMod output files demonstrates that the size of the proposed retail and parking land uses were underestimated within the model. According to the Addendum, the Project would include 217,473 square feet of parking (p. 37, Table 2). Furthermore, the Addendum proposes 14,481 square feet of retail commercial space (p. 37, Table 2). However, review of the CalEEMod output files demonstrates that an area value of 215,559 square feet was modeled for parking and 14,437 square feet was modeled for the Regional Shopping Center land use (see excerpt below) (Appendix B, pp. 41, 71).

**1.1 Land Usage**

| Land Uses | Size | Metric | Lot Acreage | Floor Surface Area | Population |
|---|---|---|---|---|---|
| Enclosed Parking Structure | 565.00 | Space | 0.40 | 215,559.00 | 0 |
| Apartments High Rise | 203.00 | Dwelling Unit | 0.53 | 285,851.00 | 589 |
| Apartments Mid Rise | 142.00 | Dwelling Unit | 0.26 | 143,824.00 | 412 |
| Regional Shopping Center | 14.40 | 1000sqft | 0.03 | 14,437.00 | 12 |

As you can see in the excerpt above, the model underestimates the Enclosed Parking Structure land use size by approximately 1,934 square feet and the Regional Shopping Center land use size by 44 square feet.

Furthermore, according to the Addendum, the 345 residential units will include 11,688 square feet of indoor residential common areas, comprised of residential amenities such as gym and storage areas (see excerpt below) (p. 37, Table 2).

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[3] Supra, fn 1, p. 11, 12 – 13. A key feature of the CalEEMod program is the "remarks" feature, where the user explains why a default setting was replaced by a "user defined" value. These remarks are included in the report.

**TABLE 2**
**PROPOSED PROJECT DEVELOPMENT**

| Type of Use | North Building-Phase I | South Building-Phase II | Total |
|---|---|---|---|
| **Residential** | | | |
| Residential dwelling units | 114,137 sf (142 dwelling units) | 220,189 sf (203 dwelling units) | 334,326 sf (345 dwelling units) |
| Residential amenities and services | 29,543 sf | 65,587 sf | 95,130 sf |
| *Subtotal* | | | *429,456 sf (345 dwelling units)* |
| **Retail** | | | |
| Retail space | 6,802 sf | 7,679 sf | 14,481 sf |
| **Parking** | | | |
| Vehicle Parking | 90,160 sf (242 vehicle stalls) | 127,333 sf (321 vehicle stalls) | 217,493 sf (563 vehicle stalls) |
| **Open Space** | | | |
| Residential Common Outdoor (ground floor paseo and outdoor decks) | 10,864 sf | 8,415 sf | 19,279 sf |
| Residential Common Indoor (residential amenities such as a gym, bike lock and storage areas, and lobbies) | 4,438 sf | 7,250 sf | 11,688 |
| Residential Private Outdoor (balconies and patios) | 3,940 sf (57 balconies; 6 patios) | 7,400 sf (45 balconies; 5 patios) | 11,340 sf (102 balconies; 11 patios) |
| *Subtotal* | | | *42,307 sf* |
| **Total Building Area** | | | 661,430 sf |

SOURCE: Ankrom Moisan Architects, 2018.

As you can see in the excerpt above, the Addendum demonstrates that the proposed residential land uses will include 11,688 square feet of amenities space. However, review of the Project's CalEEMod output files demonstrates that the additional indoor residential common space was not included in the model.

The land use type and size features are used throughout CalEEMod to determine default variable and emission factors that go into the model's calculations.[4] For example, the square footage of a land use is used for certain calculations such as determining the wall space to be painted (i.e., VOC emissions from architectural coatings) and volume that is heated or cooled (i.e., energy impacts). Furthermore, CalEEMod assigns each land use type with its own set of energy usage emission factors.[5] Thus, by underestimating the size of the proposed parking, retail, and residential land uses within the air model, the model underestimates the emissions associated with construction and operation of the proposed Project.

[4] CalEEMod User's Guide, *available at:* http://www.aqmd.gov/docs/default-source/caleemod/upgrades/2016.3/01_user-39-s-guide2016-3-1.pdf?sfvrsn=2, p. 17
[5] CalEEMod User's Guide, Appendix D, *available at:* http://www.aqmd.gov/docs/default-source/caleemod/upgrades/2016.3/05_appendix-d2016-3-1.pdf?sfvrsn=2

### *Use of Incorrect Trip Rates*

Review of the Project's CalEEMod output files demonstrates that the trip rates modeled for the Project were underestimated when compared to the Traffic Study. As a result, the Project's emissions are underestimated.

According to the Traffic Study, provided as Appendix I to the Addendum, the Project predicts to generate 2,574 daily trips (see excerpt below) (Appendix I, p. 14, Table 5-1).

**TABLE 5-1**
**PROJECT TRIP GENERATION FORECAST[4]**

| ITE Land Use Code / Project Description | Daily 2-Way | AM Peak Hour | | | PM Peak Hour | | |
|---|---|---|---|---|---|---|---|
| | | Enter | Exit | Total | Enter | Exit | Total |
| *Generation Rates:* | | | | | | | |
| ▪ 221: Multifamily Housing (Mid-Rise[5]) (TE/DU) | 5.44 | 26% | 74% | 0.36 | 61% | 39% | 0.44 |
| ▪ 222: Multifamily Housing (High-Rise[6]) (TE/DU) | 4.45 | 24% | 76% | 0.31 | 61% | 39% | 0.36 |
| ▪ 820: Shopping Center (TE/1000 SF) | [a] | 62% | 38% | [a] | 48% | 52% | [a] |
| *Generation Forecasts:* | | | | | | | |
| ▪ 221: Apartments (142 DU) | 772 | 13 | 38 | 51 | 38 | 24 | 62 |
| *Internal Capture[7]* | -134 | 0 | 0 | 0 | -8 | -3 | -11 |
| Subtotal | 638 | 13 | 38 | 51 | 30 | 21 | 51 |
| ▪ 222: Apartments (203 DU) | 903 | 15 | 48 | 63 | 45 | 28 | 73 |
| *Internal Capture[7]* | -157 | -1 | -1 | -2 | -10 | -3 | -13 |
| Subtotal | 746 | 14 | 47 | 61 | 35 | 25 | 60 |
| ▪ 820: Retail/Restaurant (14,481 SF) | 1,616 | 99 | 60 | 159 | 62 | 68 | 130 |
| *Internal Capture[7]* | -291 | -1 | -1 | -2 | -6 | -18 | -24 |
| Subtotal | 1,325 | 98 | 59 | 157 | 56 | 50 | 106 |
| **Project Trip Generation Subtotal** | **2,709** | **125** | **144** | **269** | **121** | **96** | **217** |
| **Non-Auto Trip Adjustment (5%)** | **-135** | **-6** | **-7** | **-13** | **-6** | **-5** | **-11** |
| **Net Trip Generation Potential** | **2,574** | **119** | **137** | **256** | **115** | **91** | **206** |

As you can see in the excerpt above, the Traffic Study claims that the Project will generate approximately 2,574 daily trips. However, review of the Project's CalEEMod output files demonstrates that the model only considers approximately 2,567 weekday trips and 1,890 Sunday trips (see excerpt below) (Appendix B, pp. 64, 94, Appendix E, pp. 68).

**4.2 Trip Summary Information**

| | Average Daily Trip Rate | | | Unmitigated | Mitigated |
|---|---|---|---|---|---|
| Land Use | Weekday | Saturday | Sunday | Annual VMT | Annual VMT |
| Apartments High Rise | 606.97 | 718.62 | 525.77 | 2,088,973 | 2,088,973 |
| Apartments Mid Rise | 708.58 | 681.60 | 624.80 | 2,367,256 | 2,367,256 |
| Enclosed Parking Structure | 0.00 | 0.00 | 0.00 | | |
| Regional Shopping Center | 1,251.79 | 1,464.91 | 739.87 | 2,615,108 | 2,615,108 |
| Total | 2,567.34 | 2,865.13 | 1,890.44 | 7,071,338 | 7,071,338 |

As you can see in the excerpt above, the trip rates and associated daily trip totals are inconsistent with the information provided in the Traffic Study. As previously stated, the CalEEMod User's Guide requires that any non-default values inputted must be justified.[6] However, this change was not addressed or justified in the Addendum or associated appendices. Thus, the weekday and Sunday trip rates are underestimated, and as a result, the model underestimates the Project's operational emissions.

[6] Supra, fn 1, p. 7, p. 13.

### *Use of an Incorrect Construction Equipment List*

Review of the Project's CalEEMod output files demonstrates that the air model uses an incorrect construction equipment list, and as a result, the Project's construction emissions may be underestimated.

The Air Quality Analysis, provided as Appendix B to the Addendum, includes a construction equipment list. Review of this list indicates that there will be one Concrete/Industrial Saw, one Rubber Tired Dozer, and one Tractor/Loader/Backhoe during the Grading phase of Project construction (see excerpt below) (Appendix B, pp. 34).

| Construction Phase Name[1,2] | Phase Dates | | Phase Length[5] | Offroad Equipment | |
|---|---|---|---|---|---|
| | Phase Start Date | Phase End Date | | Equipment Type | Equipment Unit Amount |
| Demolition | 1/1/2020 | 2/27/2020 | 42 | Concrete/Industrial Saws | 1 |
| | | | | Rubber Tired Dozers | 1 |
| | | | | Tractors/Loaders/Backhoes | 3 |
| Site Preparation | 2/28/2020 | 3/5/2020 | 5 | Graders | 1 |
| | | | | Rubber Tired Dozers | 1 |
| | | | | Tractors/Loaders/Backhoes | 1 |
| Grading[3] | 3/6/2020 | 6/5/2020 | 66 | Concrete/Industrial Saws | 1 |
| | | | | Rubber Tired Dozers | 1 |
| | | | | Tractors/Loaders/Backhoes | 1 |
| Building Construction | 6/8/2020 | 10/28/2021 | 364 | Cranes | 1 |
| | | | | Forklifts | 1 |
| | | | | Generator Sets | 1 |
| | | | | Tractors/Loaders/Backhoes | 1 |
| | | | | Welders | 3 |
| Paving[4] | 9/1/2021 | 11/26/2021 | 63 | Cement and Mortar Mixers | 1 |
| | | | | Pavers | 1 |
| | | | | Paving Equipment | 1 |
| | | | | Rollers | 1 |
| | | | | Tractors/Loaders/Backhoes | 1 |
| Architectural Coating | 9/1/2021 | 11/26/2021 | 63 | Air Compressors | 1 |

However, review of the CalEEMod output files demonstrates that no Concrete/Industrial Saws were included in the Grading phase of Project construction and that instead, the default piece of equipment, a Grader, remained (see excerpt below) (Appendix B, pp. 48).

| Phase Name | Offroad Equipment Type | Amount | Usage Hours | Horse Power | Load Factor |
|---|---|---|---|---|---|
| Demolition | Concrete/Industrial Saws | 1 | 8.00 | 81 | 0.73 |
| Demolition | Rubber Tired Dozers | 1 | 8.00 | 247 | 0.40 |
| Demolition | Tractors/Loaders/Backhoes | 3 | 8.00 | 97 | 0.37 |
| Site Preparation | Graders | 1 | 8.00 | 187 | 0.41 |
| Site Preparation | Rubber Tired Dozers | 1 | 7.00 | 247 | 0.40 |
| Site Preparation | Tractors/Loaders/Backhoes | 1 | 8.00 | 97 | 0.37 |
| Grading | Graders | 1 | 6.00 | 187 | 0.41 |
| Grading | Rubber Tired Dozers | 1 | 6.00 | 247 | 0.40 |
| Grading | Tractors/Loaders/Backhoes | 1 | 7.00 | 97 | 0.37 |
| Building Construction | Cranes | 1 | 6.00 | 231 | 0.29 |
| Building Construction | Forklifts | 1 | 6.00 | 89 | 0.20 |
| Building Construction | Generator Sets | 1 | 8.00 | 84 | 0.74 |
| Building Construction | Tractors/Loaders/Backhoes | 1 | 6.00 | 97 | 0.37 |
| Building Construction | Welders | 3 | 8.00 | 46 | 0.45 |
| Paving | Cement and Mortar Mixers | 1 | 6.00 | 9 | 0.56 |
| Paving | Pavers | 1 | 6.00 | 130 | 0.42 |
| Paving | Paving Equipment | 1 | 8.00 | 132 | 0.36 |
| Paving | Rollers | 1 | 7.00 | 80 | 0.38 |
| Paving | Tractors/Loaders/Backhoes | 1 | 8.00 | 97 | 0.37 |
| Architectural Coating | Air Compressors | 1 | 6.00 | 78 | 0.48 |

As you can see in the excerpt above, the air model fails to accurately represent the equipment that will be used. As a result, the air model may underestimate construction emissions and should not be relied upon to determine Project significance.

### *Unsubstantiated Reduction in Carbon Intensity Factor*

Review of the Project's CalEEMod output files demonstrates that the default value for $CO_2$ intensity factor was changed without justification. As a result, the Project's operational emissions may be underestimated.

Review of the "User Entered Comments & Non-Default Data" table reveals that the default $CO_2$ intensity factor of 702.44 pounds per megawatt-hour (lb/MWhr) was manually changed to 516.04 lb/MWhr in the air model (see excerpt below) (Appendix B, pp. 43, 73).

| Table Name | Column Name | Default Value | New Value |
|---|---|---|---|
| tblProjectCharacteristics | CO2IntensityFactor | 702.44 | 516.04 |

As you can see in the excerpt above, the $CO_2$ intensity factor was reduced by approximately 27%. However, review of the Addendum and associated appendices reveals that the change in the carbon intensity factor is not justified or mentioned.

CalEEMod provides recommended default values based on site specific information. If more specific project information is known, the user can change the default values and input project-specific values, but CEQA requires that such changes be justified by substantial evidence.[7] This intensity factor is used to estimate the $CO_2$ emissions generated from electricity usage during Project operation. By reducing the carbon intensity factor, the air model underestimates the Project's operational greenhouse gas (GHG) emissions. Without justification or reasoning as to why the value was reduced, we cannot verify the change and the air model is thus unreliable. Therefore, an updated analysis should be prepared.

## Diesel Particulate Matter Health Risk Emissions Inadequately Evaluated

The Addendum determines that the proposed Project would result in a less than significant health risk impact without conducting a quantitative construction or operational health risk assessment (HRA) to nearby sensitive receptors (p. 67). The Addendum attempts to justify the omission of a quantified HRA by stating,

> "The commercial land uses associated with the project consist of commercial retail uses, and would not include dry cleaning facilities that use perchloroethylene and would not accommodate more than 100 trucks per day, or 40 trucks equipped with Transport Refrigeration Units (TRUs). Furthermore, construction of the project would be required to minimize air pollutant emissions via implementation of Certified PEIR Mitigation Measure AQ-1(a), which includes enhanced exhaust control practices on off-road vehicle and off-road construction equipment. Thus, the project is not expected to expose sensitive receptors to TAC emissions that exceed an incremental increase of 10 in 1 million for the cancer risk and/or a noncarcinogenic Hazard Index of 1.0. Therefore, as described in Mitigation Measure AQ-4(a) of the Certified PEIR, a site-specific project-level HRA is not required" (p. 67)

However, these justifications for failing to evaluate the health risk posed to nearby sensitive receptors are incorrect for several reasons.

First, simply stating that the land uses included in the Project would not result in sources of long-term TAC emissions is incorrect. During operation, the Project will generate vehicle trips and truck deliveries, which will generate additional exhaust emissions, thus exposing nearby sensitive receptors to emissions. As a result, the Addendum cannot simply claim a less than significant impact without quantifying the health risk to nearby sensitive receptors. Thus, the Addendum should have conducted an HRA, as long-term exposure to DPM and other TACs may result in a significant health risk impact.

Second, claiming that the Project's potentially significant health risks impacts will be minimized to a less than significant level by implementing mitigation does not justify the omission of a quantified HRA. Without actually quantifying emissions, we are unable to verify that significant impacts occur, and if they do, that this mitigation measure will adequately reduce emissions to below threshold levels. By failing to prepare a quantified HRA, we cannot verify that emissions will, in fact, be significant as a result of the Project and less than significant with mitigation.

Finally, the omission of a quantified HRA is inconsistent with the most recent guidance published by the Office of Environmental Health Hazard Assessment (OEHHA), the organization responsible for providing

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[7] CalEEMod User Guide, p. 2, 9, *available at:* http://www.caleemod.com/

recommendations and guidance on how to conduct HRAs in California. In February of 2015, the OEHHA released its most recent *Risk Assessment Guidelines: Guidance Manual for Preparation of Health Risk Assessments*, which was formally adopted in March of 2015.[8] This guidance document describes the types of projects that warrant the preparation of an HRA. As previously stated, grading and construction activities for the proposed Project will produce emissions of DPM through the exhaust stacks of construction equipment over an approximate 23-month construction schedule (Appendix B, pp. 34). The OEHHA document recommends that all short-term projects lasting at least two months be evaluated for cancer risks to nearby sensitive receptors.[9] Once construction is complete, Project operation will generate vehicle and truck trips, which will generate additional exhaust emissions, thus continuing to expose nearby sensitive receptors to DPM emissions. The OEHHA document recommends that exposure from projects lasting more than 6 months should be evaluated for the duration of the project and recommends that an exposure duration of 30 years be used to estimate individual cancer risk for the maximally exposed individual resident (MEIR). [10] Even though we were not provided with the expected lifetime of the Project, we can reasonably assume that the Project will operate for at least 30 years, if not more. Therefore, per OEHHA guidelines, health risk impacts from Project construction and operation should have been evaluated in an HRA. These recommendations reflect the most recent HRA policy, and as such, an assessment of health risks to nearby sensitive receptors from construction and operation should be included in an updated CEQA analysis.

Thus, an HRA is required to determine whether the Project would expose sensitive receptors to substantial air pollutants. The Addendum should have conducted some sort of quantitative analysis and compared the results of this analysis to applicable thresholds. The SCAQMD provides a specific numerical threshold of 10 in one million for determining a project's health risk impact.[11] Therefore, the Addendum should have conducted an assessment that compares the Project's construction and operational health risks to this threshold in order to determine the proposed Project's health risk impacts. By failing to prepare an HRA, the Addendum fails to provide a comprehensive analysis of the sensitive receptor impacts that may occur as a result of exposure to substantial air pollutants.

## Screening-Level Assessment Indicates Significant Impact

In an effort to demonstrate the potential risk posed by Project construction and operation to nearby sensitive receptors, we prepared a simple screening-level HRA. The results of our assessment, as described below, provide substantial evidence that the Project's construction and operational DPM

[8] "Risk Assessment Guidelines Guidance Manual for Preparation of Health Risk Assessments." OEHHA, February 2015, *available at:* https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf
[9] "Risk Assessment Guidelines Guidance Manual for Preparation of Health Risk Assessments." OEHHA, February 2015, *available at:* https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf, p. 8-18.
[10] "Risk Assessment Guidelines Guidance Manual for Preparation of Health Risk Assessments." OEHHA, February 2015, *available at:* https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf, p. 8-6, 8-15.
[11] "South Coast AQMD Air Quality Significance Thresholds." SCAQMD, April 2019, *available at:* http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf?sfvrsn=2

emissions may result in a potentially significant health risk impact not previously identified by the Addendum.

In order to conduct our screening level risk assessment, we relied upon AERSCREEN, which is a screening level air quality dispersion model. [12] The model replaced SCREEN3, and AERSCREEN is included in the OEHHA[13] and the California Air Pollution Control Officers Associated (CAPCOA)[14] guidance as the appropriate air dispersion model for Level 2 health risk screening assessments ("HRSAs"). A Level 2 HRSA utilizes a limited amount of site-specific information to generate maximum reasonable downwind concentrations of air contaminants to which nearby sensitive receptors may be exposed. If an unacceptable air quality hazard is determined to be possible using AERSCREEN, a more refined modeling approach is required prior to approval of the Project.

We prepared a preliminary HRA of the Project's construction and operational health-related impact to residential sensitive receptors using the annual $PM_{10}$ exhaust estimates from the SWAPE annual CalEEMod output files. According to the Addendum, the nearest sensitive receptor is located approximately 25 meters away from the Project site (p. 66). Consistent with recommendations set forth by OEHHA, we assumed residential exposure begins during the third trimester stage of life. The Project's construction CalEEMod output files indicate that construction activities will generate approximately 234 pounds of diesel particulate matter (DPM). The AERSCREEN model relies on a continuous average emission rate to simulate maximum downward concentrations from point, area, and volume emission sources. To account for the variability in equipment usage and truck trips over Project construction, we calculated an average DPM emission rate by the following equation:

$$Emission\ Rate\ \left(\frac{grams}{second}\right) = \frac{233.6\ lbs}{696\ days} \times \frac{453.6\ grams}{lbs} \times \frac{1\ day}{24\ hours} \times \frac{1\ hour}{3{,}600\ seconds} = \mathbf{0.001762\ g/s}$$

Using this equation, we estimated a construction emission rate of 0.001762 grams per second (g/s). Subtracting the 696-day construction duration from the total residential duration of 30 years, we assumed that after Project construction the MEIR would be exposed to the Project's operational DPM for an additional 28.09 years, approximately. The Project's operational CalEEMod emissions indicate that operational activities will generate approximately 134 pounds of DPM per year throughout operation. Applying the same equation used to estimate the construction DPM rate, we estimated the following emission rate for Project operation:

$$Emission\ Rate\ \left(\frac{grams}{second}\right) = \frac{133.8\ lbs}{365\ days} \times \frac{453.6\ grams}{lbs} \times \frac{1\ day}{24\ hours} \times \frac{1\ hour}{3{,}600\ seconds} = \mathbf{0.001925\ g/s}$$

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[12] "AERSCREEN Released as the EPA Recommended Screening Model," USEPA, April 11, 2011, *available at:* http://www.epa.gov/ttn/scram/guidance/clarification/20110411_AERSCREEN_Release_Memo.pdf

[13] "Risk Assessment Guidelines Guidance Manual for Preparation of Health Risk Assessments." OEHHA, February 2015, *available at:* https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf

[14] "Health Risk Assessments for Proposed Land Use Projects," CAPCOA, July 2009, *available at:* http://www.capcoa.org/wp-content/uploads/2012/03/CAPCOA_HRA_LU_Guidelines_8-6-09.pdf

Using this equation, we estimated an operational emission rate of 0.001925 g/s. Construction and operational activity was simulated as a 1.2-acre rectangular area source in AERSCREEN with dimensions of 107 meters by 45.5 meters. A release height of three meters was selected to represent the height of exhaust stacks on operational equipment and other heavy-duty vehicles, and an initial vertical dimension of one and a half meters was used to simulate instantaneous plume dispersion upon release. An urban meteorological setting was selected with model-default inputs for wind speed and direction distribution.

The AERSCREEN model generates maximum reasonable estimates of single-hour DPM concentrations from the Project site. EPA guidance suggests that in screening procedures, the annualized average concentration of an air pollutant be estimated by multiplying the single-hour concentration by 10%.[15] AS previously stated, there are residential sensitive receptors located approximately 25 meters from the Project site. The single-hour concentration estimated by AERSCREEN for Project construction is approximately 7.088 μg/m$^3$ DPM at approximately 25 meters downwind. Multiplying this single-hour concentration by 10%, we get an annualized average concentration of 0.7088 μg/m$^3$ for Project construction at the nearest sensitive receptor. For Project operation, the single-hour concentration is estimated by AERSCREEN is approximately 7.744 μg/m$^3$ at approximately 25 meters downwind. Multiplying this single-hour concentration by 10%, we get an annualized average concentration of 0.7744 μg/m$^3$ for Project operation at the nearest sensitive receptor.

We calculated the excess cancer risk to the residential receptors both maximally exposed and located closest to the Project site using applicable HRA methodologies prescribed by OEHHA and the SCAQMD. Consistent with the construction schedule proposed by the Addendum, the annualized average concentration for construction was used for the entire third trimester of pregnancy (0.25 years) and for 1.66 years of the infantile stage of life (0 – 2 years). The annualized average concentration for operation was used for the remainder of the 30-year exposure period, including the remaining infantile stage of life, child stage of life (2 – 16 years), and adult stage of life (16 – 30 years).

Consistent with OEHHA, SCAQMD, BAAQMD, and SJVAPCD guidance, we used Age Sensitivity Factors (ASFs) to account for the heightened susceptibility of young children to the carcinogenic toxicity of air

[15] "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources Revised." EPA, 1992, *available at*: http://www.epa.gov/ttn/scram/guidance/guide/EPA-454R-92-019_OCR.pdf; *see also* "Risk Assessment Guidelines Guidance Manual for Preparation of Health Risk Assessments." OEHHA, February 2015, *available at:* https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf, p. 4-36

pollution.[16, 17, 18, 19] According to the most updated guidance, quantified cancer risk should be multiplied by a factor of ten during the third trimester of pregnancy and during the first two years of life (infant) and should be multiplied by a factor of three during the child stage of life (2 – 16 years). We also included the quantified cancer risk without adjusting for the heightened susceptibility of young children to the carcinogenic toxicity of air pollution in accordance with older OEHHA guidance from 2003. This guidance utilizes a less health protective scenario than what is currently recommended by SCAQMD, the air quality district responsible for the City, and several other air districts in the state. Furthermore, in accordance with guidance set forth by OEHHA, we used the 95$^{th}$ percentile breathing rates for infants.[20] Finally, according to SCAQMD guidance, we used a Fraction of Time At Home (FAH) Value of 1 for the 3rd trimester and infant receptors.[21] We used a cancer potency factor of 1.1 (mg/kg-day)$^{-1}$ and an averaging time of 25,550 days. The results of our calculations are shown below.

**The Maximum Exposed Individual at an Existing Residential Receptor**

| Activity | Duration (years) | Concentration (ug/m3) | Breathing Rate (L/kg-day) | Cancer Risk without ASFs* | ASF | Cancer Risk with ASFs* |
|---|---|---|---|---|---|---|
| Construction | 0.25 | 0.7088 | 361 | 9.6E-07 | 10 | 9.6E-06 |
| ***3rd Trimester Duration*** | ***0.25*** | | | ***9.6E-07*** | ***3rd Trimester Exposure*** | ***9.6E-06*** |
| Construction | 1.66 | 0.7088 | 1090 | 1.9E-05 | 10 | 1.9E-04 |
| Operation | 0.34 | 0.7744 | 1090 | 4.4E-06 | 10 | 4.4E-05 |
| ***Infant Exposure Duration*** | ***2.00*** | | | ***2.4E-05*** | ***Infant Exposure*** | ***2.4E-04*** |

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16 "Risk Assessment Guidelines Guidance Manual for Preparation of Health Risk Assessments." OEHHA, February 2015, *available at:* https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf.

17 "Draft Environmental Impact Report (DEIR) for the Proposed The Exchange (SCH No. 2018071058)." SCAQMD, March 2019, *available at:* http://www.aqmd.gov/docs/default-source/ceqa/comment-letters/2019/march/RVC190115-03.pdf?sfvrsn=8, p. 4.

18 "California Environmental Quality Act Air Quality Guidelines." BAAQMD, May 2017, *available at:* http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en, p. 56; see also "Recommended Methods for Screening and Modeling Local Risks and Hazards." BAAQMD, May 2011, *available at:* http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/BAAQMD%20Modeling%20Approach.ashx, p. 65, 86.

19 "Update to District's Risk Management Policy to Address OEHHA's Revised Risk Assessment Guidance Document." SJVAPCD, May 2015, *available at:* https://www.valleyair.org/busind/pto/staff-report-5-28-15.pdf, p. 8, 20, 24.

20 "Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics 'Hot Spots' Information and Assessment Act," June 5, 2015, *available at:* http://www.aqmd.gov/docs/default-source/planning/risk-assessment/ab2588-risk-assessment-guidelines.pdf?sfvrsn=6, p. 19.
"Risk Assessment Guidelines Guidance Manual for Preparation of Health Risk Assessments." OEHHA, February 2015, *available at:* https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf

21 "Risk Assessment Procedures for Rules 1401, 1401.1, and 212." SCAQMD, August 2017, *available at:* http://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1401/riskassessmentprocedures_2017_080717.pdf, p. 7.

| | | | | | | |
|---|---|---|---|---|---|---|
| Operation | 14.00 | 0.7744 | 572 | 9.3E-05 | 3 | 2.8E-04 |
| ***Child Exposure Duration*** | ***14.00*** | | | ***9.3E-05*** | ***Child Exposure*** | ***2.8E-04*** |
| Operation | 14.00 | 0.7744 | 261 | 3.1E-05 | 1 | 3.1E-05 |
| ***Adult Exposure Duration*** | ***14.00*** | | | ***3.1E-05*** | ***Adult Exposure*** | ***3.1E-05*** |
| **Lifetime Exposure Duration** | **30.00** | | | **1.5E-04** | **Lifetime Exposure** | **5.6E-04** |

* We, along with CARB and SCAQMD, recommend using the more updated and health protective 2015 OEHHA guidance, which includes ASFs.

As indicated in the tables above, the excess cancer risk posed to adults, children, infants, and during the third trimester of pregnancy at the closest receptor, located approximately 25 meters away, over the course of Project construction and operation, utilizing age sensitivity factors, are approximately 31, 280, 240, and 9.6 in one million, respectively. The excess cancer risk over the course of a residential lifetime (30 years) at the closest receptor, with age sensitivity factors, is approximately 560 in one million. The adult, child, infant, and lifetime cancer risks, using age sensitivity factors, exceed the SCAQMD threshold of 10 in one million, thus resulting in a potentially significant impact not previously addressed or identified by the Addendum. The excess cancer risk posed to adults, children, infants, and during the third trimester of pregnancy at the closest receptor, located approximately 25 meters away, over the course of Project construction and operation, without utilizing age sensitivity factors, are approximately 31, 93, 24, and .96 in one million. The excess cancer risk over the course of a residential lifetime (30 years) at the closest receptor, without utilizing age sensitivity factors, is approximately 150 in one million. The adult, child, infant, and lifetime cancer risks, without using age sensitivity factors, exceed the SCAQMD threshold of 10 in one million, thus resulting in a potentially significant impact not previously addressed or identified by the Addendum.

An agency must include an analysis of health risks that connects the Project's air emissions with the health risk posed by those emissions. Our analysis represents a screening-level HRA, which is known to be conservative and tends to err on the side of health protection.[22] The purpose of the screening-level construction HRA shown above is to demonstrate the link between the proposed Project's emissions and the potential health risk. Our screening-level HRA demonstrates that construction of the Project could result in a potentially significant health risk impact, when correct exposure assumptions and up-to-date, applicable guidance are used. Therefore, since our screening-level construction HRA indicates a potentially significant impact, an updated CEQA analysis should include a reasonable effort to connect the Project's air quality emissions and the potential health risks posed to nearby receptors. Thus, an updated CEQA analysis should include a quantified air pollution model as well as an updated, quantified refined health risk assessment which adequately and accurately evaluates health risk impacts associated with both Project construction and operation.

[22] *Supra*, fn 20, p. 1-5.

# Greenhouse Gas

## Failure to Adequately Evaluate Greenhouse Gas Impacts

The Addendum concludes that the proposed Project would have a less than significant GHG impact as a result of consistency with AB 32, SB 375, and the City of Long Beach Sustainable City Action Plan. The Addendum also quantifies emissions and compares them to the SCAQMD per service population efficiency threshold for 2020. Specifically, the Addendum states,

> "The Greenhouse Gas Technical Report assesses significance of GHG impacts using three different methodologies. Each of the three methodologies is a separate and independent ground for the significance determination.
>
> First, this report assesses consistency with AB 32 through evaluating the Project's consistency and compliance with applicable statewide and local regulatory programs designed to reduce GHG emissions consistent with AB 32.
>
> Second, this report assesses the Project's consistency with SB 375. Consistency with SB 375 was evaluated based on the growth assumptions of Southern California Association of Governments' (SCAG) 2016-2040 Regional Transportation Plan/Sustainable Community Strategy (RTP/SCS).
>
> Third, this report assesses if the Project is consistent with the local strategies within the City of Long Beach Sustainable City Action Plan to reduce GHG emissions.
>
> In addition to the methodologies listed above, this report quantitatively reports the Project's GHG emissions and compares these emissions to a service population threshold for informational purposes. This methodology utilizes an efficiency metric expressed in relation to a project's service population, which is defined to include the total number of the residents and workers associated with a project. For informational purposes, this evaluation includes a comparison to the SCAQMD proposed 4.8 MT/year CO2e per service population for project level threshold for 2020" (Appendix E, pp. 26).

This justification and subsequent less-than-significant impact finding are incorrect and unsubstantiated for several reasons:

(1) The Addendum fails to demonstrate additionality;
(2) AB 32 and SB 375 cannot be relied upon to determine Project significance;
(3) Compliance with the City of Long Beach's Sustainable City Action Plan cannot be relied upon to determine Project significance;
(4) Notwithstanding the Addendum's use of incorrect and unsubstantiated analysis to estimate the Project's GHG emissions, it nevertheless demonstrates that the Project exceeds thresholds;
(5) Updated analysis demonstrates a significant impact that was not previously identified or addressed by the Addendum; and
(6) The Addendum's failure to rely on the SCAQMD's efficiency thresholds to Project emissions is inconsistent with evolving scientific knowledge and regulatory schemes.

### *(1) Failure to Demonstrate Additionality*

The Addendum's reliance on AB 32, SB 375, and the City of Long Beach Sustainable City Action Plan is inadequate, as projects must incorporate emissions reductions measures beyond those that comprise basic requirements. Just because "a project is designed to meet high building efficiency and conservation standards … does not establish that its [GHG] emissions from transportation activities lack significant impacts." *Newhall Ranch*, 62 Cal.4th at 229 (citing Natural Resources Agency).[23] This concept is known as "additionality" whereby GHG emission reductions otherwise required by law or regulation are appropriately considered part of the baseline and, pursuant to CEQA Guideline § 15064.4(b)(1), a new project's emissions should be compared against that existing baseline.[24] Hence, a "project should not subsidize or take credit for emissions reductions which would have occurred regardless of the project."[25] In short, as observed by the Court, newer developments must be more GHG-efficient. *See Newhall Ranch,* 62 Cal.4th at 226.

Furthermore, CARB asserts that SCAG's RTP/SCS is not enough, and recently found that California "***is not on track***" to meet GHG reductions expected under SB 375 (i.e., Sustainable Communities Strategy).[26] As warned by CARB (emphasis added), "with emissions from the transportation sector continuing to rise despite increases in fuel efficiency and decreases in the carbon content of fuel, ***California will not achieve the necessary [GHG] emissions reductions to meet mandates for 2030*** and beyond …."[27] This is further supported by two recent climate change reports where scientists described (emphasis added) the ***quickening rate of carbon dioxide emissions as a "speeding freight train***" with an unexpected surge in people buying more cars and driving them farther than in the past — "***more than offsetting any gains from the spread of electric vehicles***."[28] Therefore, the Project may require more GHG-reducing measures to offset the lost GHG reductions anticipated under the outdated, unmonitored GGRP, such as the net-zero approach utilized in the wake of the Supreme Court's *Newhall Ranch* decision. *See Newhall Ranch,* 62 Cal.4th at 226 ("a greater degree of reduction may be needed from new land use projects ….");
*see also Californians for Alternatives to Toxics v. Department of Food and Agriculture* (2005) 136

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[23] *See* California Natural Resources Agency (Dec. 2009) Final Statement of Reasons for Regulatory Action: Amendments to State CEQA Guidelines Addressing Analysis and Mitigation of GHG Emissions Pursuant to SB-97, p. 23 (while a Platinum LEED® rating may be relevant to emissions from a building's energy use, "that performance standard may not reveal sufficient information to evaluate transportation-related emissions associated with that proposed project"), http://resources.ca.gov/ceqa/docs/Final_Statement_of_Reasons.pdf.

[24] *Ibid*., p. 89; *see also* CAPCOA (Aug. 2010) Quantifying Greenhouse Gas Mitigation Measures, p. 32, A3 ("… in practice is that if there is a rule that requires, for example, increased energy efficiency in a new building, the project proponent cannot count that increased efficiency as a mitigation or credit unless the project goes beyond what the rule requires; and in that case, only the efficiency that is in excess of what is required can be counted."), http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf.

[25] *Ibid*., CAPCOA, p. 433.

[26] CARB (Nov. 2018) 2018 Progress Report, p. 4-7 (emphasis added), https://ww2.arb.ca.gov/sites/default/files/2018-11/Final2018Report_SB150_112618_02_Report.pdf.

[27] *Ibid*.

[28] New York Times (12/5/18) Greenhouse Gas Emissions Accelerate Like a 'Speeding Freight Train' in 2018 (emphasis added), https://www.nytimes.com/2018/12/05/climate/greenhouse-gas-emissions-2018.html; *see also* Global Carbon Project (Dec. 2018) Global Carbon Budget 2018, https://www.earth-syst-sci-data.net/10/2141/2018/essd-10-2141-2018.pdf; R.B. Jackson, et al. (Dec. 2015) Global Energy Growth Is Outpacing Decarbonization, http://iopscience.iop.org/article/10.1088/1748-9326/aaf303/pdf.

Ca1.App.4th 1, 17 ("[c]ompliance with the law is not enough to support a finding of no significant impact under the CEQA."). Additional reduction efforts may be required for the Project, including those new, feasible mitigation measures found in CAPCOA's *Quantifying Greenhouse Gas Mitigation Measures,* which attempt to reduce GHG levels.[29]

### *(2) AB 32 and SB 375 Contain No Binding, Project-Specific Requirements*

While CEQA Guidelines § 15064.4(a) provides lead agencies the discretion to conduct a quantitative and/or qualitative analysis, both shall be "based to the extent possible on scientific and factual data" and "must reasonably reflect evolving scientific knowledge and state regulatory schemes." CEQA Guidelines § 15064.4 subds. (a) & (b). So too, the selection of any threshold must be supported by substantial evidence. CEQA Guidelines § 15604.7(c).

Here, while the Addendum provides a quantitative analysis for informational purposes only, the Addendum relies solely on a qualitative analysis to determine the Project's GHG significance (Appendix E, pp. 26). The Addendum's qualitative analysis seeks to show the Project's consistency with AB 32, SB 375, and the City's Sustainable City Action Plan (SCAP). However, none of these are qualified plans as envisioned under CEQA Guidelines §§ 15064.4(b)(3), 15183.5(b), and 15064(h)(3).

First, CEQA Guidelines § 15064.4(b)(3) allows a lead agency to consider "[t]he extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions (*see, e.g., section 15183.5(b)*)." (Emph. added). When adopting this language, the California Natural Resources Agency ("Resources Agency") explained in its 2018 Final Statement of Reasons for Regulatory Action ("2018 Statement of Reason")[30] that it explicitly added referenced to section 15183.5(b) because it was "needed to clarify that lead agencies may rely on plans *prepared pursuant to section 15183.5* in evaluating a project's [GHG] emissions … [and] consistent with the Agency's Final Statement of Reasons for the addition of section 15064.4, which states that 'proposed section 15064.4 is intended to be *read in conjunction with . . . proposed section 15183.5*. Those sections each indicate that local and regional plans may be developed to reduce GHG emissions.'" 2018 Final Statement of Reason, p. 19 (emph. added); *see also* 2009 Final Statement of Reasons for Regulatory Action, p. 27.[31] When read in conjunction, CEQA Guidelines §§ 15064.4(b)(3) and 15183.5(b)(1) make clear qualified GHG reduction plans (also commonly referred to as a Climate Action Plan ["CAP"]) should include the following features:

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[29] "Quantifying Greenhouse Gas Mitigation Measures." CAPCOA, August 2010, *available at:* http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

[30] Resources Agency (Nov. 2018) Final Statement of Reasons For Regulatory Action: Amendments To The State CEQA Guidelines, http://resources.ca.gov/ceqa/docs/2018_CEQA_Final_Statement_of%20Reasons_111218.pdf.

[31] Resources Agency (Dec. 2009) Final Statement of Reasons for Regulatory Action, p. 27 ("Those sections each indicate that local and regional plans may be developed to reduce GHG emissions. If such plans reduce community-wide emissions to a level that is less than significant, a later project that complies with the requirements in such a plan may be found to have a less than significant impact."), http://resources.ca.gov/ceqa/docs/Final_Statement_of_Reasons.pdf.

(1) **Inventory**: Quantify GHG emissions, both existing and projected over a specified time period, resulting from activities (e.g., projects) within a defined geographic area (e.g., lead agency jurisdiction);
(2) **Establish GHG Reduction Goal**: Establish a level, based on substantial evidence, below which the contribution to GHG emissions from activities covered by the plan would not be cumulatively considerable;
(3) **Analyze Project Types**: Identify and analyze the GHG emissions resulting from specific actions or categories of actions anticipated within the geographic area;
(4) **Craft Performance Based Mitigation Measures**: Specify measures or a group of measures, including performance standards, that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level;
(5) **Monitoring**: Establish a mechanism to monitor the CAP progress toward achieving said level and to require amendment if the plan is not achieving specified levels;

The above-listed CAP features provide the necessary *substantial evidence demonstrating a project's incremental contribution is not cumulative considerable*, as required under CEQA Guidelines § 15064.4(b)(3).[32] Here, however, none of the plans identified in the Addendum include the above-listed features to be considered a qualified CAP for the City, such as: inventorying the City's contribution to the State's GHG emissions, establishing the City's fair share in GHG reduction goal, quantifying the GHG impact of various project types in the City, crafting performance-based mitigation measures that quantifiably meets City-specific reduction goal, or including a City monitoring program that ensures the plan's effectiveness.

Second, none of these plans satisfy requirements under CEQA Guideline § 15064(H)(3). Subdivision (h)(3) permits lead agencies to find projects not cumulative considerable when a project complies with an approved plan or mitigation program that "provides *specific requirements* that will avoid or substantially lessen the cumulative problems *within the geographic area* in which the project is located … [and] the lead agency should *explain* how implementing the particular requirements in the plan, regulation or program ensure that the *project's incremental contribution* to the cumulative effect is not cumulatively considerable." (Emph. added). When adopted, the Resources Agency explained that this subsection provides a "rebuttable presumption" for "certain" plans, such as local CAPs. 2009 Final Statement of Reason, p. 14-15. As further explained, "consistency with plans that are *purely aspirational* (i.e., those that include *only unenforceable goals without mandatory reduction measures*), and *provide no assurance that emissions within the area governed by the plan will actually address the cumulative problem*, may not achieve the level of protection necessary to give rise to this subdivision's presumption." *Id*., p. 16 (emph. added). Hence, lead agencies must "*draw a link* between the project and

[32] *See Mission Bay Alliance v. Office of Community Investment & Infrastructure* (2016) 6 Cal.App.5th 160, 200-201 (Upheld qualitative GHG analysis when based on city's adopted its greenhouse gas strategy that contained "multiple elements" of CEQA Guidelines § 15183.5(b), "quantification of [city's] baseline levels of [GHG] emissions and planned reductions[,]" approved by the regional air district, and "[a]t the heart" of the city's greenhouse gas strategy was "specific regulations" and measures to be implemented on a "project-by-project basis … designed to achieve the specified citywide emission level.").

the *specific provisions of a binding plan or regulation*," before subsection (h)(3) rebuttable presumption is to take effect.

Here, however, AB 32 and SB 375 are not City specific. While the City's SCAP is geographic-specific, it too contains only aspirational actions without and specific requirements for private developments.[33] As such, the Addendum leaves an analytical gap showing compliance with said plans will translate into a project-level insignificance determination for the Project, and/or that the City is meeting its fair share in reducing the State's GHG emissions required under AB 32.[34]

Third, the City's current efforts to adopt its own CAP (i.e., the Climate Action and Adaptation Plan), begs the question why would the City go forth with its own CAP if the AB 32 Scoping Plans, 2016 RTP/SCS, and SCAP already qualify under 15064(h)(3). The clear indication is that those existing plans are not appropriate to determine GHG significance at a City, project-level.

In sum, none of the plans relied upon in the Addendum are geographic-specific with mandatory, binding mitigation measures specific for the Project. The Addendum fails to draw the link between any *specific provisions that* ensure the Project's incremental contribution to climate change is not cumulatively considerable.

### *(3) The City of Long Beach's Sustainable City Action Plan is Not Applicable to the Project*

As previously mentioned, the Project relies upon consistency with the City of Long Beach's Sustainable City Action Plan to determine Project significance. However, review of the plan demonstrates that the City has failed to include goals or targets beyond 2020.[35]

Given the construction schedule, the Project is not set to become operational until the end of 2021 (Appendix B, pp. 47). However, the City's Sustainability Action Plan is only applicable to projects that will be fully operational by 2020. Because the City's Sustainable Action Plan fails to include an emissions reduction target for 2030, it is therefore not applicable to the proposed Project. Thus, we require that

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[33] See City (Feb. 2010) SCAP, ("*Explore* green development requirements … *Incorporate* sustainability strategies … *Encourage* neighborhood and business groups to sponsor and participate in community clean-up … *Employ* best practices to avoid, minimize or mitigate greenhouse gas emissions … *Educate* and *encourage* residents and businesses to calculate their carbon footprint … *Pursue* emerging cutting-edge renewable energy technologies … *Implement* energy efficiency and conservation measures … *Encourage* the community to participate in energy efficiency and conservation programs … *Promote* the development of renewable energy and emerging greenhouse gas technologies … *Encourage* local car-pool programs to reduce the number of single occupancy commute trips … *Support* the use of neighborhood electric vehicles … *Promote* bike share opportunities throughout the city ….") (Emphasis added), http://www.longbeach.gov/globalassets/sustainability/media-library/documents/nature-initiatives/action-plan/scap-final.

[34] *See Golden Door Properties, LLC v. County of San Diego* (2018) 27 Cal.App.5th 892, 905 (held County's GHG threshold relying on statewide standards failed to comply with CEQA Guidelines § 15064.7(c) because it did not address the County specifically); *Center for Biological Diversity v. Department of Fish & Wildlife* (2015) 62 Cal.4th 204, 230 ("Local governments thus bear the primary burden of evaluating a land use project's impact on greenhouse gas emissions. Some of this burden can be relieved by using geographically specific greenhouse gas emission reduction plans to provide a basis for the tiering or streamlining of project-level CEQA analysis.");

[35] *Supra* fn. 39.

an updated CEQA analysis be prepared to include an adequate evaluation and mitigation of the proposed Project's GHG emissions to ensure that impacts are reduced to a less than significant level.

### *(4) Incorrect and Unsubstantiated Analysis of Greenhouse Gas Emissions Demonstrates Significant GHG Impact*

In addition to the Project's reliance upon consistency with plans and regulations to determine Project significance, the Addendum fails to adequately compare the Project's annual GHG emissions to the applicable SCAQMD threshold.

Review of Appendix E to the Addendum demonstrates that the Project would result in a net increase of 4,389 metric tons of $CO_2$ equivalents per year (MT $CO_2$e/year) (see excerpt below) (Appendix E, pp. 60, Table 11).

**Table 11. Summary of GHG Emissions**
3rd and Pacific Avenue Project
Long Beach, California

| Category[1] | $CO_2$e Emissions[2] (MT/yr) |
|---|---|
| Area | 81 |
| Energy Use | 827 |
| Water Use | 143 |
| Waste Disposed | 87 |
| Traffic | 3,192 |
| **Sub-Total** | **4,330** |
| Construction Amortized | 58 |
| **Total** | **4,389** |
| Service Population[3] | 1,013 |
| Total per Service Population (MT/yr/SP) | 4.3 |
| 2020 Threshold (MT/yr/SP) | 4.8 |

As you can see in the excerpt above, the Addendum concludes that the Project will produce 4,389 MT $CO_2$e/year from construction and operation and 4.3 MT $CO_2$e/ServicePopulation/year. The Addendum goes on to state that,

> "The proposed Project would emit 4,387 MT CO2e per year. While the Project results in an obvious change to the existing environment, by increasing existing GHG emission levels by 4,387 MT of CO2e per year, there is no scientific or regulatory consensus regarding what particular quantity of GHG emissions is significant. Further, no agency with regulatory authority and expertise, such as CARB or SCAQMD, as adopted numeric GHG thresholds for land use development projects for purposes of CEQA…[D]ividing the total Project 2020 scenario mitigated GHG emissions by the estimated service population yields an efficiency metric of 4.3 $CO_2$e per service population per year as compared to 4.8 for the year 2020 threshold. This comparison is provided for informational purposes" (Appendix E, pp. 34).

However, this GHG analysis is incorrect for two reasons.

First, as previously discussed, the Addendum's CalEEMod model relies upon incorrect input parameters to estimate the Project's criteria air pollutant and GHG emissions, resulting in an underestimation of Project emissions. Therefore, we find the Addendum's quantitative GHG analysis to be incorrect and unreliable.

Furthermore, the Addendum's reliance on the SCAQMD's 2020 service population efficiency threshold of 4.8 MT $CO_2e$/SP/year is incorrect, because, as the Addendum's CalEEMod output files demonstrate, the Project's development would occur beyond 2020 and the Project would become operational in 2021 (Appendix B, pp. 42, 72). Thus, the Addendum should have used the SCAQMD's 2030 substantial progress service population efficiency threshold of 3.0 MT $CO_2e$/SP/year to evaluate the Project's 2021 emissions. If the correct threshold had been used to adequately evaluate the Project's emissions, a significant impact would be revealed that was not previously identified in the Addendum (see table below).

**Annual Greenhouse Gas Emissions Efficiency**

| Source | Project Emissions | Unit |
|---|---|---|
| Addendum Annual Emissions | 4,389 | MT $CO_2e$/year |
| Maximum Service Population | 1,013 | Residents &Employees |
| **Per Service Population Annual Emissions** | **4.33** | **MT $CO_2e$/sp/year** |
| 2035 SCAQMD Project Level Efficiency Threshold | 3.0 | MT $CO_2e$/sp/year |
| ***Exceed?*** | ***Yes*** | **-** |

As you can see in the excerpt above, when we compare the per service population emissions estimated in the Addendum to the relevant SCAQMD threshold, the Project's 2021 service population efficiency value of 4.33 MT $CO_2e$/SP/year exceeds the 2035 service population efficiency threshold of 3.0 MT $CO_2e$/SP/year. Thus, we find a significant GHG impact not previously identified in the Addendum. According to CEQA Guidelines § 15064.4(b), if there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding compliance with the adopted regulations or requirements, a full CEQA analysis must be prepared for the project. The Addendum may not ignore this analysis and application of routinely used GHG thresholds by claiming discretion in deciding which thresholds it wishes to employ. As one court explained when setting aside an EIR where commenters questioned the city's use of a particular threshold, the discretion granted to lead agencies are not "unbounded" and (emphasis added):

> "[T]he fact that a particular environmental effect *meets a particular threshold cannot be used as an automatic determinant that the effect is or is not significant* … a threshold of significance *cannot be applied in a way that would foreclose the consideration of other substantial evidence tending to show the environmental effect to which the threshold relates might be significant*." *East Sacramento Partnership for a Livable City v. City of Sacramento* (2016) 5 Cal.App.5th 281, 300, 303-304 (internal citations omitted).

Thus, the results of the above analysis provide substantial evidence that the proposed Project's GHG emissions are still cumulatively considerable notwithstanding its purported compliance with AB 32, SB 375, and the City of Long Beach Sustainable City Action Plan (as challenged herein). Therefore, an updated CEQA analysis must be prepared for the Project, and mitigation should be implemented where necessary, per CEQA guidelines.

### *(5) Updated Greenhouse Gas Analysis Demonstrates Significant Impact*

Notwithstanding the flawed GHG evaluation discussed above, applicable thresholds and site-specific modeling demonstrate that the Project will have a significant GHG impact. The updated CalEEMod output files, modeled by SWAPE with Project-specific information, disclose the Project's mitigated emissions, which include approximately 919 MT $CO_2e$ of total construction emissions and approximately 4,647 (sum of 2020 and 2021) MT $CO_2e$/year of annual operational emissions (sum of area, energy, mobile, waste, and water-related emissions). When we compare the Project's GHG emissions to the 3,000 MT $CO_2e$/year mixed-use threshold (SCAQMD Tier 3 Option 1), we find that the Project's GHG emissions exceed the threshold (see table below).

| SWAPE Annual Greenhouse Gas Emissions | |
|---|---|
| **Project Phase** | **Proposed Project (MT $CO_2e$/year)** |
| Construction (amortized over 30 years) | 30.6344 |
| Area | 80.9735 |
| Energy | 1,065.6748 |
| Mobile | 3,229.9336 |
| Waste | 87.4546 |
| Water | 182.7909 |
| **Total** | **4,677.46** |
| SCAQMD Threshold | 3,000 |
| ***Exceed?*** | ***Yes*** |

As demonstrated in the table above, the proposed Project would generate a total of approximately 4,678 MT $CO_2e$/year when modeled correctly, which exceeds the SCAQMD's 3,000 MT $CO_2e$/year mixed-use/non-industrial project screening threshold. Hence, a Tier 4 analysis is warranted. When dividing the Project's GHG emissions by a service population value of 1,013 people, as indicated by the Addendum, we find that the Project would emit approximately 4.62 MT $CO_2e$/SP/year. This exceeds the SCAQMD 2035 efficiency target of 3.0 MT $CO_2e$/SP/year.

| Annual Greenhouse Gas Emissions Efficiency | | |
|---|---|---|
| **Source** | **Project Emissions** | **Unit** |
| SWAPE Annual Emissions | 4,677.46 | MT $CO_2e$/year |
| Service Population | 1,013 | Residents & Employees |
| **Per Service Population Annual Emissions** | **4.62** | **MT $CO_2e$/sp/year** |

| | | |
|---|---|---|
| 2035 SCAQMD Project Level Efficiency Threshold | 3.0 | MT $CO_2$e/sp/year |
| ***Exceed?*** | ***Yes*** | **-** |

As you can see in the table above, when we compare the Project's per service population emissions, estimated by a Project-specific CalEEMod model, to the 2035 SCAQMD threshold of 3.0 MT $CO_2$e/SP, we find that the Project's emissions would exceed the threshold, thus, resulting in a potentially significant impact not identified in the Addendum. According to CEQA Guidelines § 15064.4(b), if there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding compliance with the adopted regulations or requirements, a full CEQA analysis must be prepared for the project. The results of the above analysis provide substantial evidence that the proposed Project's GHG emissions are still cumulatively considerable notwithstanding its purported compliance with AB 32, SB 375, and the City of Long Beach Sustainable City Action Plan (as challenged herein). Therefore, an updated CEQA analysis must be prepared for the Project, and additional mitigation should be implemented where necessary, per CEQA guidelines.

### *(6) Failure to Evaluate Cumulative Greenhouse Gas Impact Consistent with Evolving Scientific Knowledge and Regulatory Schemes*

It is commonly recognized by California air districts that a project's impact on climate change is cumulative in nature.[36] According to the Technical Advisory prepared by the Office of Planning and Research ("OPR"), "[t]he potential effects of a project may be individually limited but cumulatively considerable[]" and that "[l]ead agencies should not dismiss a proposed project's direct and/or indirect climate change impacts without careful consideration, supported by substantial evidence … [including]

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[36] *See e.g.,* SCAQMD (Oct. 2008), *supra* fn. 56, p. 1-4 - 1-5 (citing the OPR Technical Advisor: "When assessing whether a project's effects on climate change are 'cumulatively considerable' even though its GHG contribution may be individually limited, the lead agency must consider the impact of the project when viewed in connection with the effects of past, current, and probable future projects."), http://www.aqmd.gov/docs/default-source/ceqa/handbook/greenhouse-gases-(ghg)-ceqa-significance-thresholds/ghgattachmente.pdf; Bay Area Air Quality Management District ("BAAQMD") (May 2017) CEQA Air Quality Guidelines, p. 2-1 ("No single project could generate enough GHG emissions to noticeably change the global average temperature [but rather] [t]he combination of GHG emissions from past, present, and future projects contribute substantially to the phenomenon of global climate change and its associated environmental impacts."), http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en; San Luis Obispo County Air Pollution Control District ("SLOAPCD") (Mar. 28, 2012) GHG Threshold and Supporting Evidence, p. 5 ("No single land use project could generate enough GHG emissions to noticeably change the global average temperature. Cumulative GHG emissions, however, contribute to global climate change and its significant adverse environmental impacts. Thus, the primary goal in adopting GHG significance thresholds, analytical methodologies, and mitigation measures is to ensure new land use development provides its fair share of the GHG reductions needed to address cumulative environmental impacts from those emissions.), https://storage.googleapis.com/slocleanair-org/images/cms/upload/files/Greenhouse%20Gas%20Thresholds%20and%20Supporting%20Evidence%204-2-2012.pdf; Sacramento Metropolitan Air Quality Management District ("SMAQMD") (May 2018) Guide to Air Quality Assessment in Sacramento County, p. 6-1-3, ("(GHG) emissions adversely affect the environment through contributing, on a cumulative basis, to global climate change … *the District recommends that lead agencies address the impacts of climate change on a proposed project and its ability to adapt to these changes in CEQA documents* … [thus urging] evaluating whether the GHG emissions associated with a proposed project will be responsible for making a cumulatively considerable contribution to global climate change."[emphasis original]), http://www.airquality.org/LandUseTransportation/Documents/Ch6GHGFinal5-2018.pdf.

analysis should be provided for any project that may significantly contribute to new GHG emissions, either individually or cumulatively, directly or indirectly."[37] Furthermore, OPR rightfully acknowledge, consistent with state regulatory scheme and CEQA case law, that "thresholds cannot be used to determine automatically whether a given effect will or will not be significant; instead, thresholds of significance can be used only as a measure of whether a certain environmental effect will normally be determined to be significant or normally will be determined to be less than significant by the agency."[38] Recognizing this principle, CEQA Guidelines § 15064.7(c) permits the use of thresholds developed by other public agencies.

Similarly, the California Supreme Court has made clear that CEQA demands robust GHG analysis to assess a project's impact on climate change, and while lead agencies have discretion, that discretion must be exercised "based to the extent possible on scientific and factual data" and "stay[ing] in step with evolving scientific knowledge and state regulatory schemes." *Cleveland National Forest Foundation v. San Diego Assn. of Governments* ("*Cleveland II*") (2017) 3 Cal.5th 497, 504, 515, 518 (quoting CEQA Guidelines § 15064(b)); *see also* 519 (noting to meet the State's long-term climate goals, "regulatory clarification, together with improved methods of analysis, may well change the manner in which CEQA analysis of long-term [GHG] emission impacts is conducted."). Hence, a GHG analysis which "understates the severity of a project's impacts impedes meaningful public discussion and skews the decisionmaker's perspective concerning the environmental consequences of the project, the necessity for mitigation measures, and the appropriateness of project approval." *Id*., on remand ("*Cleveland III*"), 17 Cal.App.5th 413, 444; *see also Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553, 564 (quoting *Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 392).

Here, the SCAQMD's multi-tiered approach under its *Interim Thresholds,* although not officially adopted, represents the current standard of evolving scientific data and regulatory scheme notwithstanding even more aggressive efforts taken at the State level (i.e., Senate Bill 32, CARB's 2017 Scoping Plan). Given the City's Sustainability Climate Action Plan is outdated, and the SCAG RTP/SCS and the CARB 2017 Scoping Plan are inapplicable as CAPs with a quantified threshold, the Addendum cannot ignore the *Interim Thresholds* simply because SCAQMD failed to adopt these measures. To do so would not be in keeping with the evolving scientific knowledge and state regulatory schemes—*nor in keeping with the City's past practices*.

Consistent with the edicts of SB 32, other air control districts have adopted more aggressive GHG thresholds for project-level analysis that mirror SCAQMD's *Interim Thresholds*, including but not limited to the Sacramento Metropolitan Air Quality Management District ("SMAQMD"), Bay Area Air Quality Management District ("BAAQMD"), and San Luis Obispo Air Pollution Control District ("SLOAPCD") (as summarized in the table on the following pages). Given the cumulative nature of GHG emissions and consistent with CEQA Guidelines § 15064.7(c), these recommended thresholds complement SCAQMD's

[37] OPR (6/19/08) Technical Advisory on CEQA and Climate Change, p. 6, http://opr.ca.gov/docs/june08-ceqa.pdf.
[38] OPR (Nov. 2017) Proposed Updates to the CEQA Guidelines, p. 7 (citing CEQA Guidelines §§ 15064 and 15064.7 and *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1108-1109), http://opr.ca.gov/docs/20171127_Comprehensive_CEQA_Guidelines_Package_Nov_2017.pdf.

*Interim Thresholds* and further support the conclusion that they constitute the current standard for evaluating a project's GHG significance.

**Current GHG Thresholds from Other Air Districts**

*SMAQMD (May 2018) Guide to Air Quality Assessment*[39]

| Land Development and Construction Projects | | |
|---|---|---|
| | Construction Phase | Operational Phase |
| *Greenhouse Gas Emissions (GHG) Thresholds* | | |
| GHG as CO2e | 1,100 metric tons/year | 1,100 metric tons/year |

| Stationary Source Only | | |
|---|---|---|
| | Construction Phase | Operational Phase |
| *Greenhouse Gas Emissions (GHG) Thresholds* | | |
| GHG as CO2e | 1,100 metric tons/year | 10,000 metric tons/year |

1) Construction phase of all project types – 1,100 MT $CO_2e$/yr.
2) Operational phase of a land development project – 1,100 $MTCO_2e$/yr.
3) Stationary source operational emissions – 10,000 MT $CO_2e$/yr.

*BAA*
*QMD (May 2017) CEQA Air Quality Guidelines*[40]

| | |
|---|---|
| GHGs – Projects other than Stationary Sources | Compliance with Qualified GHG Reduction Strategy<br>OR<br>1,100 MT of $CO_2e$/yr<br>OR<br>4.6 MT $CO_2e$/SP/yr (residents+employees) |
| GHGs –Stationary Sources | 10,000 MT/yr |

While providing 10,000 $MTCO_2e$/year for stationary-source projects, other projects (e.g., residential, commercial, public land uses):

1) **CAP**: Compliance with a qualified GHG Reduction Strategy; or
2) **Bright Line**: Annual emissions less than 1,100 $MTCO_2e$/year; or
3) **Efficiency Level**: 4.6 $MTCO_2e$/SP/year (residents + employees).

*SLOAPCD (Mar. 2012) GHG Thresholds and Supporting Evidence*[41]

[39] SMAQMD (May 2018), *supra* fn. 70, p. 6-10-12; *see also* SMAQMD Thresholds of Significance Table, http://www.airquality.org/LandUseTransportation/Documents/CH2ThresholdsTable5-2015.pdf.

[40] BAAQMD (May 2017), *supra* fn. 70, p. 2-2 - 2-4. Like the SCAQMD area, BAAQMD is designated as a nonattainment area for state/national ozone and particulate matter ("PM") and thresholds would seem particularly apt for the Project. *Compare id*. at p. 2-1 *with* SCAQMD NAAQS/CAAQS Attainment Status (noting "extreme" and "serious" nonattainment for multiple ozone and PM standards), http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/naaqs-caaqs-feb2016.pdf.

[41] SLOAPCD (Mar. 28, 2012), *supra* fn. 70, p. 25-30, 42.

| GHG Emissions Threshold Summary | |
|---|---|
| Residential and Commercial Projects | Compliance with Qualified GHG Reduction Strategy<br>OR<br>Bright-Line Threshold of 1,150 MT of $CO_2e$/yr.<br>OR<br>Efficiency Threshold of 4.9 MT $CO_2e$/SP*/yr. |
| Industrial (Stationary Sources) | 10,000 MT of $CO_2e$/yr. |

1) **CAP**: Consistency with qualitative reduction strategies (e.g., Climate Action Plans).
2) **Bright-Line Threshold**: 1,150 $MTCO_2e$/year after inclusion of emission-reducing features of a proposed project, those still exceeding the threshold would have to reduce their emissions below that level to be considered less than significant.
3) **Efficiency-Based Threshold**: 4.9 $MTCO_2e$/SP/year dependent on per capita basis for residential projects or the sum of jobs and residents for mixed-use projects.

*PCAPCD (Oct. 2016) CEQA Threshold Significance Justification Report*[42]

| Bright-line Threshold 10,000 MT CO2e/yr | | | |
|---|---|---|---|
| Efficiency Matrix | | | |
| Residential | | Non-residential | |
| Urban | Rural | Urban | Rural |
| (MT CO2e/capita) | | (MT CO2e/1,000sf) | |
| 4.5 | 5.5 | 26.5 | 27.3 |
| De Minimis Level 1,100 MT CO2e/yr | | | |

Although more demanding, the above-listed thresholds adopted by these air districts are analogous with the application of SCAQMD's Tier 3 screening threshold for commercial and mixed-use/non-industrial developments (1,400 and 3,000 $MTCO_2e$/year, respectively) and SCAQMD's Tier 4 efficiency target goals (4.8 and 3.0 $MTCO_2e$/SP/year for target year 2020 and 2035, respectively).[43] The overwhelming weight of the actions taken by the other air districts, the regulatory agencies with the most expertise in the area of assessing GHG emission impacts, is the most compelling rationale for why the *Interim Thresholds* apply here as the current standard set of evolving scientific knowledge and regulatory schemes. Thus, only through application of SCAQMD's Tier 3 screening thresholds and comparison to SCAQMD's Tier 4

[42] PCAPCD (Oct. 2016) CEQA thresholds of Significance Justification Report, pp. E-2, 2, 17-22 ("CEQA requires that the lead agency review not only a project's direct effects on the environment, but also the cumulative impacts of a project and other projects causing related impacts. When the incremental effect of a project is cumulatively considerable, the lead agency must discuss the cumulative impacts in an EIR. [citing CEQA Guidelines § 15064]"), https://www.placer.ca.gov/DocumentCenter/View/2061/Threshold-Justification-Report-PDF; *see also* PCAPCD (11/21/17) CEQA Thresholds And Review Principles, http://www.placerair.org/landuseandceqa/ceqathresholdsandreviewprinciples.

[43] SCAQMD (12/5/08), *supra* fn. 56; *see also* SCAQMD (Oct. 2008), *supra* fn. 56; SCAQMD (9/28/10), *supra* fn. 57.

efficiency target goals can the City be consistent with the improved analysis methods that are regularly practiced by other air districts, consistent with City's past practices, and further CEQA's demand for "'conservative analysis' to afford 'fullest possible protection of the environment.'"[44] Absent this, the Addendum's GHG analysis is inconsistent with evolving scientific knowledge or regulatory standards, and its conclusion that the Project has an insignificant GHG impact is not supported by substantial evidence. An updated CEQA analysis must be prepared to include a more robust GHG emissions analysis and mitigation to the extent necessary.

## Additional Mitigation Measures Available to Reduce Construction Emissions

Our HRA and GHG analysis demonstrate that, when Project activities are modeled correctly, construction and operation-related emissions would result in potentially significant health risk and GHG impacts. Therefore, additional mitigation measures must be identified and incorporated in an updated CEQA analysis to reduce these emissions to a less than significant level.

Additional mitigation measures can be found in CAPCOA's *Quantifying Greenhouse Gas Mitigation Measures,* which attempt to reduce GHG levels, as well as reduce criteria air pollutants such as particulate matter and NOx.[45] DPM and NOx are a byproduct of diesel fuel combustion and are emitted by on-road vehicles and by off-road construction equipment. Mitigation for criteria pollutant emissions should include consideration of the following measures in an effort to reduce construction emissions.[46]

### *Require Implementation of Diesel Control Measures*

The Northeast Diesel Collaborative (NEDC) is a regionally coordinated initiative to reduce diesel emissions, improve public health, and promote clean diesel technology. The NEDC recommends that contracts for all construction projects require the following diesel control measures: [47]

- All diesel generators on site for more than 10 total days must be equipped with emission control technology verified by EPA or CARB to reduce PM emissions by a minimum of 85 percent.
- All diesel vehicles, construction equipment, and generators on site shall be fueled with ultra-low sulfur diesel fuel (ULSD) or a biodiesel blend[48] approved by the original engine manufacturer with sulfur content of 15 parts per million (ppm) or less.

[44] SCAQMD (June 2014) Warehouse Truck Trip Study Data Results and Usage Presentation: Inland Empire Logistics Council, p. 3, http://www.aqmd.gov/docs/default-source/ceqa/handbook/high-cube-warehouse-trip-rate-study-for-air-quality-analysis/final-ielc_6-19-2014.pdf?sfvrsn=2; *see also Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 390 ("The foremost principle under CEQA is that the Legislature intended the act to be interpreted in such manner as to afford the fullest possible protection to the environment within the reasonable scope of the statutory language.") (internal citations omitted).

[45] http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

[46] For measures to reduce operational DPM emissions, see section titled "Additional Feasible Mitigation Measures Available to Reduce Operational Emissions" on p. 29 of this letter. These measures would effectively reduce operational VOC and NOx emissions, DPM emissions, as well as GHG emissions.

[47] Diesel Emission Controls in Construction Projects, *available at:*http://www2.epa.gov/sites/production/files/2015-09/documents/nedc-model-contract-sepcification.pdf

[48] Biodiesel lends are only to be used in conjunction with the technologies which have been verified for use with biodiesel blends and are subject to the following requirements: http://www.arb.ca.gov/diesel/verdev/reg/biodieselcompliance.pdf

### *Repower or Replace Older Construction Equipment Engines*

The NEDC recognizes that availability of equipment that meets the EPA's newer standards is limited.[49] Due to this limitation, the NEDC proposes actions that can be taken to reduce emissions from existing equipment in the *Best Practices for Clean Diesel Construction* report.[50] These actions include but are not limited to:

- Repowering equipment (i.e. replacing older engines with newer, cleaner engines and leaving the body of the equipment intact).

Engine repower may be a cost-effective emissions reduction strategy when a vehicle or machine has a long useful life and the cost of the engine does not approach the cost of the entire vehicle or machine. Examples of good potential replacement candidates include marine vessels, locomotives, and large construction machines.[51] Older diesel vehicles or machines can be repowered with newer diesel engines or in some cases with engines that operate on alternative fuels. The original engine is taken out of service and a new engine with reduced emission characteristics is installed. Significant emission reductions can be achieved, depending on the newer engine and the vehicle or machine's ability to accept a more modern engine and emission control system. It should be noted, however, that newer engines or higher tier engines are not necessarily cleaner engines, so it is important that the Project Applicant check the actual emission standard level of the current (existing) and new engines to ensure the repower product is reducing emissions for DPM.[52]

- Replacement of older equipment with equipment meeting the latest emission standards.

Engine replacement can include substituting a cleaner highway engine for a nonroad engine. Diesel equipment may also be replaced with other technologies or fuels. Examples include hybrid switcher locomotives, electric cranes, LNG, CNG, LPG or propane yard tractors, forklifts or loaders. Replacements using natural gas may require changes to fueling infrastructure.[53] Replacements often require some re-engineering work due to differences in size and configuration. Typically, there are benefits in fuel efficiency, reliability, warranty, and maintenance costs.[54]

### *Install Retrofit Devices on Existing Construction Equipment*

PM emissions from alternatively-fueled construction equipment can be further reduced by installing retrofit devices on existing and/or new equipment. The most common retrofit technologies are retrofit devices for engine exhaust after-treatment. These devices are installed in the exhaust system to reduce

[49] http://northeastdiesel.org/pdf/BestPractices4CleanDieselConstructionAug2012.pdf

[50] http://northeastdiesel.org/pdf/BestPractices4CleanDieselConstructionAug2012.pdf

[51] Repair, Rebuild, and Repower, EPA, *available at:*https://www.epa.gov/verified-diesel-tech/learn-about-verified-technologies-clean-diesel#repair

[52] Diesel Emissions Reduction Program (DERA): Technologies, Fleets and Projects Information, *available at:*http://www2.epa.gov/sites/production/files/2015-09/documents/420p11001.pdf

[53] Alternative Fuel Conversion, EPA, *available at:* https://www3.epa.gov/otaq/consumer/fuels/altfuels/altfuels.htm#fact

[54] Cleaner Fuels, EPA, *available at:*https://www.epa.gov/verified-diesel-tech/learn-about-verified-technologies-clean-diesel#cleaner

emissions and should not impact engine or vehicle operation. [55] It should be noted that actual emissions reductions and costs will depend on specific manufacturers, technologies and applications.

### *Use Electric and Hybrid Construction Equipment*

CAPCOA's *Quantifying Greenhouse Gas Mitigation Measures*[56] report also proposes the use of electric and/or hybrid construction equipment as a way to mitigate DPM emissions. When construction equipment is powered by grid electricity rather than fossil fuel, direct emissions from fuel combustion are replaced with indirect emissions associated with the electricity used to power the equipment. Furthermore, when construction equipment is powered by hybrid-electric drives, emissions from fuel combustion are also greatly reduced. Electric construction equipment is available commercially from companies such as Peterson Pacific Corporation,[57] which specialize in the mechanical processing equipment like grinders and shredders. Construction equipment powered by hybrid-electric drives is also commercially available from companies such as Caterpillar.[58] For example, Caterpillar reports that during an 8-hour shift, its D7E hybrid dozer burns 19.5 percent fewer gallons of fuel than a conventional dozer while achieving a 10.3 percent increase in productivity. The D7E model burns 6.2 gallons per hour compared to a conventional dozer which burns 7.7 gallons per hour.[59] Fuel usage and savings are dependent on the make and model of the construction equipment used. The Project Applicant should calculate project-specific savings and provide manufacturer specifications indicating fuel burned per hour.

### *Implement a Construction Vehicle Inventory Tracking System*

CAPCOA's *Quantifying Greenhouse Gas Mitigation Measures*[60] report recommends that the Project Applicant provide a detailed plan that discusses a construction vehicle inventory tracking system to ensure compliances with construction mitigation measures. The system should include strategies such as requiring engine run time meters on equipment, documenting the serial number, horsepower, manufacture age, fuel, etc. of all onsite equipment and daily logging of the operating hours of the equipment. Specifically, for each onroad construction vehicle, nonroad construction equipment, or generator, the contractor should submit to the developer's representative a report prior to bringing said equipment on site that includes:[61]

- Equipment type, equipment manufacturer, equipment serial number, engine manufacturer, engine model year, engine certification (Tier rating), horsepower, and engine serial number.
- The type of emission control technology installed, serial number, make, model, manufacturer, and EPA/CARB verification number/level.

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[55] Retrofit Technologies, EPA, *available at:*https://www.epa.gov/verified-diesel-tech/learn-about-verified-technologies-clean-diesel#retrofit

[56] http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

[57] Peterson Electric Grinders Brochure, *available at:*http://www.petersoncorp.com/wp-content/uploads/peterson_electric_grinders1.pdf

[58] Electric Power Products, *available at:*http://www.cat.com/en_US/products/new/power-systems/electric-power-generation.html

[59] http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

[60] http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

[61] Diesel Emission Controls in Construction Projects, *available at:*http://www2.epa.gov/sites/production/files/2015-09/documents/nedc-model-contract-sepcification.pdf

- The Certification Statement[62] signed and printed on the contractor's letterhead.

Furthermore, the contractor should submit to the developer's representative a monthly report that, for each on-road construction vehicle, nonroad construction equipment, or generator onsite, includes: [63]

- Hour-meter readings on arrival on-site, the first and last day of every month, and on off-site date.
- Any problems with the equipment or emission controls.
- Certified copies of fuel deliveries for the time period that identify:
    - Source of supply
    - Quantity of fuel
    - Quality of fuel, including sulfur content (percent by weight)

In addition to these measures, we also recommend that the Applicant implement the following mitigation measures, called "Enhanced Exhaust Control Practices,"[64] that are recommended by the Sacramento Metropolitan Air Quality Management District (SMAQMD):

1. The project representative shall submit to the lead agency a comprehensive inventory of all off-road construction equipment, equal to or greater than 50 horsepower, that will be used an aggregate of 40 or more hours during any portion of the construction project.
    - The inventory shall include the horsepower rating, engine model year, and projected hours of use for each piece of equipment.
    - The project representative shall provide the anticipated construction timeline including start date, and name and phone number of the project manager and on-site foreman.
    - This information shall be submitted at least 4 business days prior to the use of subject heavy-duty off-road equipment.
    - The inventory shall be updated and submitted monthly throughout the duration of the project, except that an inventory shall not be required for any 30-day period in which no construction activity occurs.
2. The project representative shall provide a plan for approval by the lead agency demonstrating that the heavy-duty off-road vehicles (50 horsepower or more) to be used in the construction project, including owned, leased, and subcontractor vehicles, will achieve a project wide fleet-average 20% NOX reduction and 45% particulate reduction compared to the most recent California Air Resources Board (ARB) fleet average.
    - This plan shall be submitted in conjunction with the equipment inventory.
    - Acceptable options for reducing emissions may include use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, and/or other options as they become available.

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[62] Diesel Emission Controls in Construction Projects, *available at:*http://www2.epa.gov/sites/production/files/2015-09/documents/nedc-model-contract-sepcification.pdf The NEDC Model Certification Statement can be found in Appendix A.

[63] Diesel Emission Controls in Construction Projects, *available at:*http://www2.epa.gov/sites/production/files/2015-09/documents/nedc-model-contract-sepcification.pdf

[64]http://www.airquality.org/ceqa/Ch3EnhancedExhaustControl_10-2013.pdf

- The District's Construction Mitigation Calculator can be used to identify an equipment fleet that achieves this reduction.

3. The project representative shall ensure that emissions from all off-road diesel-powered equipment used on the project site do not exceed 40% opacity for more than three minutes in any one hour.
    - Any equipment found to exceed 40 percent opacity (or Ringelmann 2.0) shall be repaired immediately. Non-compliant equipment will be documented and a summary provided to the lead agency monthly.
    - A visual survey of all in-operation equipment shall be made at least weekly.
    - A monthly summary of the visual survey results shall be submitted throughout the duration of the project, except that the monthly summary shall not be required for any 30-day period in which no construction activity occurs. The monthly summary shall include the quantity and type of vehicles surveyed as well as the dates of each survey.
4. The District and/or other officials may conduct periodic site inspections to determine compliance. Nothing in this mitigation shall supersede other District, state or federal rules or regulations.

When combined, the measures that we recommend in these comments offer a cost-effective, feasible way to incorporate lower-emitting equipment into the Project's construction fleet, which subsequently reduces DPM emissions released during Project construction. An updated EIR must be prepared to include additional mitigation measures, as well as include an HRA to ensure that the necessary mitigation measures are implemented to reduce construction emissions. Furthermore, the Project Applicant needs to demonstrate commitment to the implementation of these measures prior to Project approval to ensure that the Project's construction-related emissions are reduced to the maximum extent possible.

## Feasible Mitigation Measures Available to Reduce Operational Emissions

Our analysis demonstrates that the Project's operational emissions may present a potentially significant impact. In an effort to reduce the Project's emissions, we identified several mitigation measures that are applicable to the Project. Additional mitigation measures that could be implemented to reduce emissions include, but are not limited to, the following: [65]

- Use passive solar design, such as: [66,67]
    - Orient buildings and incorporate landscaping to maximize passive solar; heating during cool seasons, and minimize solar heat gain during hot seasons; and
    - Enhance natural ventilation by taking advantage of prevailing winds.
- Reduce unnecessary outdoor lighting by utilizing design features such as limiting the hours of operation of outdoor lighting.

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[65] http://ag.ca.gov/globalwarming/pdf/GW_mitigation_measures.pdf

[66] Santa Barbara Air Pollution Control District, Scope and Content of Air Quality Sections in Environmental Documents, September 1997.

[67] Butte County Air Quality Management District, Indirect Source Review Guidelines, March 1997.

- Develop and follow a "green streets guide" that requires:
    - Use of minimal amounts of concrete and asphalt;
    - Installation of permeable pavement to allow for storm water infiltration; and
    - Use of groundcovers rather than pavement to reduce heat reflection.[68]
- Implement Project design features such as:
    - Shade HVAC equipment from direct sunlight;
    - Install high-albedo white thermoplastic polyolefin roof membrane;
    - Install high-efficiency HVAC with hot-gas reheat;
    - Install formaldehyde-free insulation; and
    - Use recycled-content gypsum board.
- Provide education on energy efficiency to residents, customers, and/or tenants. Provide information on energy management services for large energy users.
- Meet "reach" goals for building energy efficiency and renewable energy use.
- Install solar, wind, and geothermal power systems and solar hot water heaters.
- Maximize use of solar energy including solar panels; installing the maximum possible number of solar energy arrays on all building roofs and/or on the Project site to generate solar energy for the facility.
- Include energy storage where appropriate to optimize renewable energy generation systems and avoid peak energy use.
- Plant low-VOC emitting shade trees, e.g., in parking lots to reduce evaporative emissions from parked vehicles.
- Use CARB-certified or electric landscaping equipment in project and tenant operations; and introduce electric lawn, and garden equipment exchange program.
- Install an infiltration ditch to provide an opportunity for 100% of the storm water to infiltrate on-site.

Finally, additional, feasible mitigation measures can be found in CAPCOA's *Quantifying Greenhouse Gas Mitigation Measures,* which attempt to reduce GHG and DPM levels.[69] GHG and DPM emissions are produced during fuel combustion and are emitted by on-road vehicles and by off-road equipment. Therefore, to reduce the Project's mobile-source GHG and DPM emissions, consideration of the following measures should be made.

- Limit Parking Supply
    - This mitigation measure will change parking requirements and types of supply within the Project site to encourage "smart growth" development and alternative transportation choices by project residents and employees. This can be accomplished in a multi-faceted strategy:

[68] *See* Irvine Sustainable Travelways "Green Street" Guidelines; www.ci.irvine.ca.us/civica/filebank/blobdload.asp?BlobID=8934; and Cool Houston Plan; www.harc.edu/Projects/CoolHouston.
[69] http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

        - Elimination (or reduction) of minimum parking requirements
        - Creation of maximum parking requirements
        - Provision of shared parking
- Unbundle Parking Costs from Property Cost
    - Unbundling separates parking from property costs, requiring those who wish to purchase parking spaces to do so at an additional cost from the property cost. This removes the burden from those who do not wish to utilize a parking space. Parking should be priced separately from home rents/purchase prices or office leases.
- Implement Subsidized or Discounted Transit Program
    - This project can provide subsidized/discounted daily or monthly public transit passes to incentivize the use of public transport. The project may also provide free transfers between all shuttles and transit to participants. These passes can be partially or wholly subsidized by the employer, school, or development. Many entities use revenue from parking to offset the cost of such a project.

All feasible mitigation, including the above measures, should be considered in an updated CEQA analysis in an effort to further reduce the Project's operational emissions, potentially to a less-than-significant level. When combined, these measures offer a cost-effective, feasible way to incorporate lower-emitting design features into the proposed Project, which subsequently reduces emissions during Project operation.  An updated CEQA analysis should be prepared to include additional mitigation measures, as well as include updated air quality and health risk analyses to ensure that the necessary mitigation measures are implemented to reduce operational emissions to below thresholds. The updated analysis should also demonstrate commitment to the implementation of these measures prior to Project approval, to ensure that the Project's operational emissions are reduced to the maximum extent possible.

SWAPE has received limited discovery regarding this project. Additional information may become available in the future; thus, we retain the right to revise or amend this report when additional information becomes available. Our professional services have been performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable environmental consultants practicing in this or similar localities at the time of service. No other warranty, expressed or implied, is made as to the scope of work, work methodologies and protocols, site conditions, analytical testing results, and findings presented. This report reflects efforts which were limited to information that was reasonably accessible at the time of the work, and may contain informational gaps, inconsistencies, or otherwise be incomplete due to the unavailability or uncertainty of information obtained or provided by third parties.

Sincerely,

Matt Hagemann, P.G., C.Hg.

Paul Rosenfeld

Paul E. Rosenfeld, Ph.D.

```
Start date and time  11/04/19 12:27:04

                             AERSCREEN 16216


3rd and Pacific Construction


            3rd and Pacific Construction



         -----------------  DATA ENTRY VALIDATION  -----------------

                        METRIC              ENGLISH

 ** AREADATA **  ---------------     ----------------


 Emission Rate:    0.176E-02 g/s         0.140E-01 lb/hr

 Area Height:           3.00 meters          9.84 feet

 Area Source Length:  107.00 meters        351.05 feet

 Area Source Width:    45.50 meters        149.28 feet

 Vertical Dimension:    1.50 meters          4.92 feet

 Model Mode:           URBAN

 Population:          469450

 Dist to Ambient Air:          1.0 meters             3. feet



 ** BUILDING DATA **
```

No Building Downwash Parameters

** TERRAIN DATA **

No Terrain Elevations

Source Base Elevation:   0.0 meters        0.0  feet

Probe distance:   5000. meters       16404. feet

No flagpole receptors

No discrete receptors used

** FUMIGATION DATA **

No fumigation requested

** METEOROLOGY DATA **

Min/Max Temperature:  250.0 / 310.0 K   -9.7 /  98.3 Deg F

Minimum Wind Speed:     0.5 m/s

Anemometer Height:   10.000 meters

Dominant Surface Profile: Urban

Dominant Climate Type:    Average Moisture

Surface friction velocity (u*): not adjusted

DEBUG OPTION ON

AERSCREEN output file:

2019.11.4_3rdandPacific_Construction.out

*** AERSCREEN Run is Ready to Begin

No terrain used, AERMAP will not be run

**************************************************

SURFACE CHARACTERISTICS & MAKEMET

Obtaining surface characteristics...

Using AERMET seasonal surface characteristics for Urban with Average Moisture

| Season | Albedo | Bo | zo |
|---|---|---|---|
| Winter | 0.35 | 1.50 | 1.000 |
| Spring | 0.14 | 1.00 | 1.000 |
| Summer | 0.16 | 2.00 | 1.000 |
| Autumn | 0.18 | 2.00 | 1.000 |

Creating met files aerscreen_01_01.sfc & aerscreen_01_01.pfl

Creating met files aerscreen_02_01.sfc & aerscreen_02_01.pfl

Creating met files aerscreen_03_01.sfc & aerscreen_03_01.pfl

Creating met files aerscreen_04_01.sfc & aerscreen_04_01.pfl

Buildings and/or terrain present or rectangular area source, skipping probe

FLOWSECTOR   started 11/04/19 12:28:52

*********************************************

Running AERMOD

Processing Winter

Processing surface roughness sector  1

```
*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
```

```
*************************************************

Processing wind flow sector   4


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  15


    ********   WARNING MESSAGES   ********
               ***  NONE  ***


*************************************************

Processing wind flow sector   5


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  20


    ********   WARNING MESSAGES   ********
               ***  NONE  ***


*************************************************

Processing wind flow sector   6


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  25


    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 *****************************************
```

```
  Running AERMOD

 Processing Spring


Processing surface roughness sector  1


*****************************************************

Processing wind flow sector   1


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   0


    ********   WARNING MESSAGES   ********

               ***  NONE  ***


*****************************************************

Processing wind flow sector   2


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   5


    ********   WARNING MESSAGES   ********

               ***  NONE  ***


*****************************************************

Processing wind flow sector   3


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  10
```

```
    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  25
```

```
    ********   WARNING MESSAGES   ********

               ***  NONE  ***

 ********************************************

  Running AERMOD

 Processing Summer

Processing surface roughness sector  1

*****************************************************

Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   0

    ********   WARNING MESSAGES   ********

               ***  NONE  ***

*****************************************************

Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   5

    ********   WARNING MESSAGES   ********

               ***  NONE  ***
```

```
*****************************************************

Processing wind flow sector   3


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  10


    ********   WARNING MESSAGES   ********

               ***  NONE  ***


*****************************************************

Processing wind flow sector   4


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  15


    ********   WARNING MESSAGES   ********

               ***  NONE  ***


*****************************************************

Processing wind flow sector   5


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  20


    ********   WARNING MESSAGES   ********

               ***  NONE  ***


*****************************************************
```

```
Processing wind flow sector   6


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  25


    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************


  Running AERMOD
 Processing Autumn


Processing surface roughness sector  1


*****************************************************
Processing wind flow sector   1


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   0


    ********   WARNING MESSAGES   ********
               ***  NONE  ***


*****************************************************
Processing wind flow sector   2


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   5
```

```
    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  20
```

```
    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

FLOWSECTOR   ended 11/04/19 12:28:58

REFINE       started 11/04/19 12:28:58

 AERMOD Finishes Successfully for REFINE stage 3 Winter sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

REFINE       ended 11/04/19 12:29:00

 **********************************************
 AERSCREEN Finished Successfully
 With no errors or warnings
```

Check log file for details

```
***********************************************
```

Ending date and time  11/04/19 12:29:01

```
 Concentration     Distance Elevation  Diag  Season/Month   Zo sector       Date
 H0     U*     W*  DT/DZ ZICNV ZIMCH  M-O LEN    Z0  BOWEN ALBEDO  REF WS     HT
REF TA     HT
   0.61143E+01         1.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.70879E+01        25.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.77627E+01        50.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
*  0.78491E+01        54.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.46747E+01        75.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.29315E+01       100.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.20849E+01       125.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15920E+01       150.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.12728E+01       175.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.10519E+01       200.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.88946E+00       225.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.76659E+00       250.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.67084E+00       275.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.59375E+00       300.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.53108E+00       325.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.47903E+00       350.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
```

```
310.0    2.0
   0.43531E+00       375.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.39806E+00       400.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.36592E+00       425.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.33808E+00       450.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.31376E+00       475.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.29233E+00       500.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.27333E+00       525.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.25640E+00       550.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.24123E+00       575.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.22756E+00       600.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.21516E+00       625.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.20387E+00       650.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.19356E+00       675.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.18408E+00       700.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17538E+00       725.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16737E+00       750.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15997E+00       775.00      0.00   0.0        Winter       0-360   10011001
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-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15313E+00      800.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14677E+00      825.00      0.00   5.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14086E+00      850.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13579E+00      875.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13063E+00      900.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.12580E+00      925.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.12128E+00      950.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.11702E+00      975.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.11302E+00     1000.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.10925E+00     1025.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.10570E+00     1050.00      0.00   5.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.10234E+00     1075.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.99158E-01     1100.00      0.00   5.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.96146E-01     1125.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.93291E-01     1150.00      0.00   5.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.90579E-01     1175.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
```

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   0.88002E-01      1200.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.85547E-01      1225.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.83208E-01      1250.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.80977E-01      1275.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.78848E-01      1300.00      0.00  15.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.76814E-01      1325.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.74869E-01      1350.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.73008E-01      1375.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.71226E-01      1400.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.69517E-01      1425.00      0.00  15.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.67879E-01      1450.00      0.00  20.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.66306E-01      1475.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.64795E-01      1500.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.63343E-01      1525.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.61946E-01      1550.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.60602E-01      1574.99      0.00  25.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.59307E-01      1600.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
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310.0    2.0
   0.58060E-01      1625.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.56857E-01      1650.00      0.00  20.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.55697E-01      1675.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.54577E-01      1700.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.53496E-01      1725.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.52451E-01      1750.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.51441E-01      1775.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.50465E-01      1800.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.49520E-01      1825.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.48605E-01      1850.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.47719E-01      1875.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.46861E-01      1900.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.46029E-01      1924.99      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.45222E-01      1950.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.44439E-01      1975.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.43680E-01      2000.00      0.00  15.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.42943E-01      2025.00      0.00   5.0        Winter       0-360   10011001
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-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.42227E-01      2050.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.41532E-01      2075.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.40856E-01      2100.00      0.00  15.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.40199E-01      2125.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.39560E-01      2150.00      0.00  25.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.38938E-01      2175.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.38333E-01      2200.00      0.00  20.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.37745E-01      2225.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.37171E-01      2250.00      0.00  15.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.36613E-01      2275.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.36069E-01      2300.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.35539E-01      2325.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.35022E-01      2350.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.34518E-01      2375.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.34027E-01      2400.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.33547E-01      2425.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
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   0.33079E-01      2449.99      0.00  25.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.32623E-01      2475.00      0.00   5.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.32177E-01      2500.00      0.00  15.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.31741E-01      2525.00      0.00  20.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.31316E-01      2550.00      0.00  25.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.30900E-01      2575.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.30494E-01      2600.00      0.00  20.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.30097E-01      2625.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.29709E-01      2650.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.29330E-01      2675.00      0.00  25.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.28958E-01      2700.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.28595E-01      2725.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.28240E-01      2750.00      0.00  10.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.27892E-01      2775.00      0.00  15.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.27552E-01      2800.00      0.00  10.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.27219E-01      2825.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.26892E-01      2850.00      0.00  20.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
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310.0    2.0
   0.26572E-01      2875.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.26260E-01      2900.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.25953E-01      2925.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.25652E-01      2950.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.25357E-01      2975.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.25069E-01      3000.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.24785E-01      3025.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.24508E-01      3050.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.24236E-01      3074.99      0.00  20.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.23968E-01      3100.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.23706E-01      3125.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.23449E-01      3150.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.23197E-01      3175.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.22949E-01      3199.99      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.22706E-01      3225.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.22467E-01      3250.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.22233E-01      3275.00      0.00   0.0        Winter       0-360   10011001
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-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.22003E-01      3300.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.21776E-01      3325.00      0.00  15.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.21554E-01      3350.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.21336E-01      3375.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.21122E-01      3400.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.20911E-01      3425.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.20704E-01      3450.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.20500E-01      3475.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.20300E-01      3500.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.20103E-01      3525.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.19910E-01      3550.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.19720E-01      3575.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.19532E-01      3600.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.19348E-01      3625.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.19167E-01      3650.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.18989E-01      3675.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
```

```
   0.18814E-01      3700.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.18641E-01      3725.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.18471E-01      3750.00      0.00  15.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.18304E-01      3775.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.18140E-01      3800.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17978E-01      3825.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17818E-01      3850.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17661E-01      3875.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17506E-01      3900.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17354E-01      3925.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17204E-01      3950.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17056E-01      3975.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16910E-01      4000.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16766E-01      4025.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16625E-01      4050.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16486E-01      4075.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16348E-01      4100.00      0.00  25.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
```

```
310.0    2.0
   0.16213E-01      4125.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16079E-01      4150.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15948E-01      4175.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15818E-01      4200.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15690E-01      4225.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15564E-01      4250.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15440E-01      4275.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15317E-01      4300.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15196E-01      4325.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15077E-01      4350.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14959E-01      4375.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14843E-01      4400.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14728E-01      4425.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14615E-01      4450.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14503E-01      4475.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14393E-01      4500.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14285E-01      4525.00      0.00   0.0        Winter       0-360   10011001
```

```
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14177E-01      4550.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14071E-01      4575.00      0.00   5.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13967E-01      4600.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13864E-01      4625.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13762E-01      4650.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13661E-01      4675.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13562E-01      4700.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13464E-01      4725.00      0.00  25.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13367E-01      4750.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13272E-01      4775.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13177E-01      4800.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13084E-01      4825.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.12992E-01      4850.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.12900E-01      4875.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.12811E-01      4900.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.12722E-01      4924.99      0.00  15.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
```

```
   0.12634E-01      4950.00      0.00   5.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.12547E-01      4975.00      0.00   0.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.12461E-01      5000.00      0.00   5.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
```

Start date and time  11/04/19 12:30:50

AERSCREEN 16216

3rd and Pacific Operational

3rd and Pacific Operational

----------------- DATA ENTRY VALIDATION -----------------

| | METRIC | ENGLISH |
|---|---|---|
| ** AREADATA ** | --------------- | ---------------- |
| Emission Rate: | 0.192E-02 g/s | 0.153E-01 lb/hr |
| Area Height: | 3.00 meters | 9.84 feet |
| Area Source Length: | 107.00 meters | 351.05 feet |
| Area Source Width: | 45.50 meters | 149.28 feet |
| Vertical Dimension: | 1.50 meters | 4.92 feet |
| Model Mode: | URBAN | |
| Population: | 469450 | |
| Dist to Ambient Air: | 1.0 meters | 3. feet |

** BUILDING DATA **

No Building Downwash Parameters

** TERRAIN DATA **

No Terrain Elevations

Source Base Elevation:   0.0 meters        0.0  feet

Probe distance:   5000. meters       16404. feet

No flagpole receptors

No discrete receptors used

** FUMIGATION DATA **

No fumigation requested

** METEOROLOGY DATA **

Min/Max Temperature:  250.0 / 310.0 K   -9.7 /  98.3 Deg F

Minimum Wind Speed:     0.5 m/s

Anemometer Height:   10.000 meters

Dominant Surface Profile: Urban

Dominant Climate Type:    Average Moisture

Surface friction velocity (u*): not adjusted

DEBUG OPTION ON

AERSCREEN output file:

2019.11.4_3rdandPacific_Operational.out

*** AERSCREEN Run is Ready to Begin

No terrain used, AERMAP will not be run

**************************************************

SURFACE CHARACTERISTICS & MAKEMET

Obtaining surface characteristics...

Using AERMET seasonal surface characteristics for Urban with Average Moisture

| Season | Albedo | Bo | zo |
|---|---|---|---|
| Winter | 0.35 | 1.50 | 1.000 |
| Spring | 0.14 | 1.00 | 1.000 |
| Summer | 0.16 | 2.00 | 1.000 |
| Autumn | 0.18 | 2.00 | 1.000 |

Creating met files aerscreen_01_01.sfc & aerscreen_01_01.pfl

Creating met files aerscreen_02_01.sfc & aerscreen_02_01.pfl

Creating met files aerscreen_03_01.sfc & aerscreen_03_01.pfl

Creating met files aerscreen_04_01.sfc & aerscreen_04_01.pfl

Buildings and/or terrain present or rectangular area source, skipping probe

FLOWSECTOR   started 11/04/19 12:32:44

 ********************************************

  Running AERMOD

 Processing Winter

Processing surface roughness sector  1

```
*****************************************************

Processing wind flow sector   1


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   0


    ********   WARNING MESSAGES   ********

               ***  NONE  ***


*****************************************************

Processing wind flow sector   2


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   5


    ********   WARNING MESSAGES   ********

               ***  NONE  ***


*****************************************************

Processing wind flow sector   3


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  10


    ********   WARNING MESSAGES   ********

               ***  NONE  ***
```

```
*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************
```

```
  Running AERMOD

 Processing Spring


Processing surface roughness sector  1


**************************************************

Processing wind flow sector   1


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   0


    ********   WARNING MESSAGES   ********

               ***  NONE  ***


**************************************************

Processing wind flow sector   2


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   5


    ********   WARNING MESSAGES   ********

               ***  NONE  ***


**************************************************

Processing wind flow sector   3


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  10
```

```
    ********   WARNING MESSAGES   ********
               ***  NONE  ***

************************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

************************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

************************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  25
```

```
    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************


  Running AERMOD
 Processing Summer


Processing surface roughness sector  1


*****************************************************
Processing wind flow sector   1


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   0


    ********   WARNING MESSAGES   ********
               ***  NONE  ***


*****************************************************
Processing wind flow sector   2


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   5


    ********   WARNING MESSAGES   ********
               ***  NONE  ***
```

```
*****************************************************

Processing wind flow sector   3


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  10


    ********   WARNING MESSAGES   ********

               ***  NONE  ***


*****************************************************

Processing wind flow sector   4


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  15


    ********   WARNING MESSAGES   ********

               ***  NONE  ***


*****************************************************

Processing wind flow sector   5


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  20


    ********   WARNING MESSAGES   ********

               ***  NONE  ***


*****************************************************
```

```
Processing wind flow sector   6


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  25


    ********   WARNING MESSAGES   ********

               ***  NONE  ***

 ********************************************


  Running AERMOD

 Processing Autumn


Processing surface roughness sector  1


*****************************************************

Processing wind flow sector   1


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   0


    ********   WARNING MESSAGES   ********

               ***  NONE  ***


*****************************************************

Processing wind flow sector   2


 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   5
```

```
    ********   WARNING MESSAGES   ********
               ***  NONE  ***

************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  20
```

```
    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

FLOWSECTOR   ended 11/04/19 12:32:50

REFINE       started 11/04/19 12:32:50

 AERMOD Finishes Successfully for REFINE stage 3 Winter sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

REFINE       ended 11/04/19 12:32:51

 **********************************************
 AERSCREEN Finished Successfully
 With no errors or warnings
```

Check log file for details

***********************************************

Ending date and time  11/04/19 12:32:53

```
 Concentration     Distance Elevation  Diag  Season/Month   Zo sector       Date
 H0     U*     W*  DT/DZ ZICNV ZIMCH  M-O LEN    Z0  BOWEN ALBEDO  REF WS     HT
REF TA     HT
   0.66802E+01         1.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.77440E+01        25.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.84812E+01        50.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
*  0.85757E+01        54.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.51074E+01        75.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.32028E+01       100.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.22778E+01       125.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17393E+01       150.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13907E+01       175.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.11492E+01       200.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.97180E+00       225.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.83755E+00       250.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.73294E+00       275.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.64871E+00       300.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.58024E+00       325.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.52337E+00       350.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
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310.0    2.0
   0.47561E+00       375.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.43491E+00       400.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.39980E+00       425.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.36938E+00       450.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.34280E+00       475.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.31939E+00       500.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.29863E+00       525.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.28013E+00       550.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.26356E+00       575.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.24863E+00       600.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.23507E+00       625.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.22274E+00       650.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.21148E+00       675.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.20112E+00       700.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.19162E+00       725.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.18286E+00       750.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17478E+00       775.00      0.00   0.0        Winter       0-360   10011001
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-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16730E+00       800.00      0.00   0.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16036E+00       825.00      0.00   0.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15390E+00       850.00      0.00   0.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14836E+00       875.00      0.00   0.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14272E+00       900.00      0.00   0.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13745E+00       925.00      0.00   0.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13250E+00       950.00      0.00   0.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.12786E+00       975.00      0.00   0.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.12348E+00      1000.00      0.00   0.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.11937E+00      1025.00      0.00   0.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.11548E+00      1050.00      0.00   5.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.11181E+00      1075.00      0.00   0.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.10834E+00      1100.00      0.00   0.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.10505E+00      1125.00      0.00   0.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.10193E+00      1150.00      0.00   5.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.98964E-01      1175.00      0.00   0.0         Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
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   0.96148E-01      1200.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.93466E-01      1225.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.90911E-01      1250.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.88473E-01      1275.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.86147E-01      1300.00      0.00  15.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.83924E-01      1325.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.81800E-01      1350.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.79766E-01      1375.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.77819E-01      1400.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.75952E-01      1425.00      0.00  15.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.74162E-01      1450.00      0.00  20.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.72443E-01      1475.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.70793E-01      1500.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.69206E-01      1525.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.67680E-01      1550.00      0.00  20.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.66211E-01      1574.99      0.00  25.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.64797E-01      1600.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
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310.0    2.0
   0.63434E-01      1625.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.62120E-01      1650.00      0.00  20.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.60853E-01      1675.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.59629E-01      1700.00      0.00  15.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.58448E-01      1725.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.57306E-01      1750.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.56203E-01      1775.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.55136E-01      1800.00      0.00  25.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.54104E-01      1824.99      0.00  15.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.53104E-01      1850.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.52136E-01      1875.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.51198E-01      1899.99      0.00  25.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.50289E-01      1924.99      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.49408E-01      1950.00      0.00  20.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.48553E-01      1975.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.47723E-01      2000.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.46918E-01      2025.00      0.00   5.0        Winter       0-360   10011001
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-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.46136E-01      2050.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.45376E-01      2075.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.44638E-01      2100.00      0.00  15.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.43920E-01      2124.99      0.00  25.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.43222E-01      2150.00      0.00  15.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.42543E-01      2175.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.41882E-01      2200.00      0.00  20.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.41239E-01      2225.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.40612E-01      2250.00      0.00  15.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.40002E-01      2275.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.39408E-01      2300.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.38828E-01      2325.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.38264E-01      2350.00      0.00  25.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.37713E-01      2375.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.37176E-01      2400.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.36653E-01      2425.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
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```
   0.36141E-01      2449.99      0.00  25.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.35642E-01      2475.00      0.00   5.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.35155E-01      2500.00      0.00  15.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.34679E-01      2525.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.34215E-01      2550.00      0.00  25.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.33761E-01      2575.00      0.00  25.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.33317E-01      2600.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.32883E-01      2625.00      0.00  20.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.32459E-01      2650.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.32045E-01      2675.00      0.00  15.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.31639E-01      2700.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.31242E-01      2725.00      0.00  10.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.30854E-01      2750.00      0.00  10.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.30474E-01      2775.00      0.00  15.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.30102E-01      2800.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.29738E-01      2825.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.29382E-01      2850.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
```

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310.0    2.0
   0.29032E-01      2875.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.28690E-01      2900.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.28355E-01      2925.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.28027E-01      2950.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.27705E-01      2975.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.27389E-01      3000.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.27080E-01      3025.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.26776E-01      3050.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.26479E-01      3074.99      0.00  20.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.26187E-01      3100.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.25901E-01      3125.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.25620E-01      3150.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.25344E-01      3174.99      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.25073E-01      3200.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.24808E-01      3225.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.24547E-01      3250.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.24291E-01      3275.00      0.00  20.0        Winter       0-360   10011001
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-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.24039E-01      3300.00      0.00   5.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.23792E-01      3325.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.23550E-01      3350.00      0.00   5.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.23311E-01      3375.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.23077E-01      3400.00      0.00   5.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.22847E-01      3425.00      0.00  25.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.22620E-01      3450.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.22398E-01      3475.00      0.00  15.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.22179E-01      3500.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.21964E-01      3525.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.21753E-01      3550.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.21545E-01      3575.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.21341E-01      3600.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.21139E-01      3625.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.20941E-01      3650.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.20747E-01      3675.00      0.00   0.0        Winter      0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
```

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   0.20555E-01      3700.00      0.00   0.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.20367E-01      3725.00      0.00  15.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.20181E-01      3750.00      0.00   0.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.19998E-01      3775.00      0.00   0.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.19819E-01      3800.00      0.00   0.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.19642E-01      3825.00      0.00   0.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.19467E-01      3849.99      0.00  15.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.19296E-01      3875.00      0.00   0.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.19127E-01      3900.00      0.00   0.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.18960E-01      3925.00      0.00   0.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.18796E-01      3950.00      0.00  10.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.18634E-01      3975.00      0.00   0.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.18475E-01      4000.00      0.00   0.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.18319E-01      4025.00      0.00   0.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.18164E-01      4050.00      0.00   0.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.18012E-01      4075.00      0.00   5.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17862E-01      4100.00      0.00  10.0         Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
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310.0    2.0
   0.17714E-01      4125.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17568E-01      4150.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17424E-01      4175.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17282E-01      4200.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17143E-01      4225.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.17005E-01      4250.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16869E-01      4275.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16735E-01      4300.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16603E-01      4325.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16472E-01      4350.00      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16344E-01      4375.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16217E-01      4400.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.16091E-01      4425.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15968E-01      4449.99      0.00  10.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15846E-01      4475.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15726E-01      4500.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15607E-01      4525.00      0.00   0.0        Winter       0-360   10011001
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-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15490E-01      4550.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15374E-01      4575.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15260E-01      4600.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15147E-01      4625.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.15036E-01      4650.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14926E-01      4675.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14817E-01      4700.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14710E-01      4725.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14604E-01      4750.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14500E-01      4775.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14397E-01      4800.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14295E-01      4825.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14194E-01      4850.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.14095E-01      4875.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13996E-01      4900.00      0.00   5.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13899E-01      4925.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.       6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
```

```
   0.13803E-01      4950.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13709E-01      4975.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
   0.13615E-01      5000.00      0.00   0.0        Winter       0-360   10011001
-1.30  0.043 -9.000  0.020 -999.   21.      6.0 1.000   1.50   0.35    0.50   10.0
310.0    2.0
```

# W3rd and Pacific - Full Buildout OY

**Los Angeles-South Coast County, Annual**

## 1.0 Project Characteristics

### 1.1 Land Usage

| Land Uses | Size | Metric | Lot Acreage | Floor Surface Area | Population |
|---|---|---|---|---|---|
| Enclosed Parking Structure | 565.00 | Space | 0.40 | 217,493.00 | 0 |
| Apartments High Rise | 203.00 | Dwelling Unit | 0.53 | 293,101.00 | 589 |
| Apartments Mid Rise | 142.00 | Dwelling Unit | 0.26 | 148,262.00 | 412 |
| Regional Shopping Center | 14.48 | 1000sqft | 0.03 | 14,481.00 | 12 |

### 1.2 Other Project Characteristics

**Urbanization** Urban

**Wind Speed (m/s)** 2.2

**Precipitation Freq (Days)** 33

**Climate Zone** 11

**Operational Year** 2021

**Utility Company** Southern California Edison

**CO2 Intensity (lb/MWhr)** 702.44

**CH4 Intensity (lb/MWhr)** 0.029

**N2O Intensity (lb/MWhr)** 0.006

### 1.3 User Entered Comments & Non-Default Data

Project Characteristics - See SWAPE comment about $CO_2$ intensity factor.

Land Use - Matches Addendum's model. See SWAPE comment about land use sizes.

Construction Phase - Matches Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Demolition - Matches Addendum's model.

Grading - Matches Addendum's model.

Vehicle Trips - See SWAPE comment about trip rates.

Woodstoves - Matches Addendum's model.

Energy Use -

| Table Name | Column Name | Default Value | New Value |
|---|---|---|---|
| tblConstructionPhase | NumDays | 10.00 | 63.00 |
| tblConstructionPhase | NumDays | 200.00 | 364.00 |
| tblConstructionPhase | NumDays | 20.00 | 42.00 |
| tblConstructionPhase | NumDays | 4.00 | 66.00 |
| tblConstructionPhase | NumDays | 10.00 | 63.00 |
| tblConstructionPhase | NumDays | 2.00 | 5.00 |
| tblFireplaces | NumberGas | 172.55 | 182.70 |
| tblFireplaces | NumberGas | 120.70 | 127.80 |
| tblFireplaces | NumberWood | 10.15 | 0.00 |
| tblFireplaces | NumberWood | 7.10 | 0.00 |
| tblGrading | AcresOfGrading | 2.50 | 0.00 |

| | | | |
|---|---|---|---|
| tblGrading | MaterialExported | 0.00 | 59,260.00 |
| tblLandUse | LandUseSquareFeet | 226,000.00 | 217,493.00 |
| tblLandUse | LandUseSquareFeet | 203,000.00 | 293,101.00 |
| tblLandUse | LandUseSquareFeet | 142,000.00 | 148,262.00 |
| tblLandUse | LandUseSquareFeet | 14,480.00 | 14,481.00 |
| tblLandUse | LotAcreage | 5.08 | 0.40 |
| tblLandUse | LotAcreage | 3.27 | 0.53 |
| tblLandUse | LotAcreage | 3.74 | 0.26 |
| tblLandUse | LotAcreage | 0.33 | 0.03 |
| tblLandUse | Population | 581.00 | 589.00 |
| tblLandUse | Population | 406.00 | 412.00 |
| tblLandUse | Population | 0.00 | 12.00 |
| tblVehicleTrips | ST_TR | 4.98 | 3.54 |
| tblVehicleTrips | ST_TR | 6.39 | 4.80 |
| tblVehicleTrips | ST_TR | 49.97 | 101.73 |
| tblVehicleTrips | SU_TR | 3.65 | 3.49 |
| tblVehicleTrips | SU_TR | 5.86 | 4.27 |
| tblVehicleTrips | SU_TR | 25.24 | 86.93 |
| tblVehicleTrips | WD_TR | 4.20 | 3.49 |
| tblVehicleTrips | WD_TR | 6.65 | 4.27 |
| tblVehicleTrips | WD_TR | 42.70 | 86.93 |
| tblWoodstoves | NumberCatalytic | 10.15 | 0.00 |
| tblWoodstoves | NumberCatalytic | 7.10 | 0.00 |
| tblWoodstoves | NumberNoncatalytic | 10.15 | 0.00 |
| tblWoodstoves | NumberNoncatalytic | 7.10 | 0.00 |
| tblWoodstoves | WoodstoveDayYear | 25.00 | 0.00 |
| tblWoodstoves | WoodstoveDayYear | 25.00 | 0.00 |

| | | | |
|---|---|---|---|
| tblWoodstoves | WoodstoveWoodMass | 999.60 | 0.00 |
| tblWoodstoves | WoodstoveWoodMass | 999.60 | 0.00 |

## 2.0 Emissions Summary

## 2.1 Overall Construction

**Unmitigated Construction**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | tons/yr | | | | | | | | | | MT/yr | | | | | |
| 2020 | 0.4185 | 3.8918 | 3.0076 | 9.9600e-003 | 0.5673 | 0.1168 | 0.6841 | 0.1954 | 0.1108 | 0.3062 | 0.0000 | 916.8297 | 916.8297 | 0.0881 | 0.0000 | 919.0328 |
| 2021 | 1.8996 | 2.6861 | 3.4348 | 9.2700e-003 | 0.4843 | 0.0948 | 0.5791 | 0.1298 | 0.0909 | 0.2207 | 0.0000 | 830.2492 | 830.2492 | 0.0708 | 0.0000 | 832.0204 |
| **Maximum** | **1.8996** | **3.8918** | **3.4348** | **9.9600e-003** | **0.5673** | **0.1168** | **0.6841** | **0.1954** | **0.1108** | **0.3062** | **0.0000** | **916.8297** | **916.8297** | **0.0881** | **0.0000** | **919.0328** |

**Mitigated Construction**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | tons/yr | | | | | | | | | | MT/yr | | | | | |
| 2020 | 0.4185 | 3.8918 | 3.0076 | 9.9600e-003 | 0.5673 | 0.1168 | 0.6841 | 0.1954 | 0.1108 | 0.3062 | 0.0000 | 916.8294 | 916.8294 | 0.0881 | 0.0000 | 919.0325 |
| 2021 | 1.8996 | 2.6861 | 3.4348 | 9.2700e-003 | 0.4843 | 0.0948 | 0.5791 | 0.1298 | 0.0909 | 0.2207 | 0.0000 | 830.2489 | 830.2489 | 0.0708 | 0.0000 | 832.0201 |
| **Maximum** | **1.8996** | **3.8918** | **3.4348** | **9.9600e-003** | **0.5673** | **0.1168** | **0.6841** | **0.1954** | **0.1108** | **0.3062** | **0.0000** | **916.8294** | **916.8294** | **0.0881** | **0.0000** | **919.0325** |

| | **ROG** | **NOx** | **CO** | **SO2** | **Fugitive PM10** | **Exhaust PM10** | **PM10 Total** | **Fugitive PM2.5** | **Exhaust PM2.5** | **PM2.5 Total** | **Bio- CO2** | **NBio-CO2** | **Total CO2** | **CH4** | **N20** | **CO2e** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Percent Reduction** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** |

| Quarter | Start Date | End Date | Maximum Unmitigated ROG + NOX (tons/quarter) | Maximum Mitigated ROG + NOX (tons/quarter) |
|---|---|---|---|---|
| 1 | 1-1-2020 | 3-31-2020 | 1.0001 | 1.0001 |
| 2 | 4-1-2020 | 6-30-2020 | 1.4009 | 1.4009 |
| 3 | 7-1-2020 | 9-30-2020 | 0.9125 | 0.9125 |
| 4 | 10-1-2020 | 12-31-2020 | 0.9226 | 0.9226 |
| 5 | 1-1-2021 | 3-31-2021 | 0.8266 | 0.8266 |
| 6 | 4-1-2021 | 6-30-2021 | 0.8270 | 0.8270 |
| 7 | 7-1-2021 | 9-30-2021 | 1.4552 | 1.4552 |
| | | Highest | 1.4552 | 1.4552 |

## 2.2 Overall Operational

**Unmitigated Operational**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Area | 1.9253 | 0.1056 | 3.6004 | 6.0000e-004 | | 0.0249 | 0.0249 | | 0.0249 | 0.0249 | 0.0000 | 80.3887 | 80.3887 | 7.1000e-003 | 1.3700e-003 | 80.9735 |
| Energy | 0.0173 | 0.1477 | 0.0633 | 9.4000e-004 | | 0.0119 | 0.0119 | | 0.0119 | 0.0119 | 0.0000 | 1,061.4730 | 1,061.4730 | 0.0400 | 0.0107 | 1,065.6748 |
| Mobile | 0.8025 | 4.0345 | 10.3720 | 0.0350 | 2.7795 | 0.0301 | 2.8095 | 0.7451 | 0.0281 | 0.7731 | 0.0000 | 3,225.5347 | 3,225.5347 | 0.1760 | 0.0000 | 3,229.9336 |
| Waste | | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 35.3001 | 0.0000 | 35.3001 | 2.0862 | 0.0000 | 87.4546 |
| Water | | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 7.4716 | 150.1972 | 157.6688 | 0.7736 | 0.0194 | 182.7909 |
| **Total** | **2.7451** | **4.2878** | **14.0357** | **0.0365** | **2.7795** | **0.0669** | **2.8464** | **0.7451** | **0.0649** | **0.8100** | **42.7717** | **4,517.5936** | **4,560.3653** | **3.0829** | **0.0315** | **4,646.8273** |

## 2.2 Overall Operational

**Mitigated Operational**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Area | 1.9253 | 0.1056 | 3.6004 | 6.0000e-004 | | 0.0249 | 0.0249 | | 0.0249 | 0.0249 | 0.0000 | 80.3887 | 80.3887 | 7.1000e-003 | 1.3700e-003 | 80.9735 |
| Energy | 0.0173 | 0.1477 | 0.0633 | 9.4000e-004 | | 0.0119 | 0.0119 | | 0.0119 | 0.0119 | 0.0000 | 1,061.4730 | 1,061.4730 | 0.0400 | 0.0107 | 1,065.6748 |
| Mobile | 0.8025 | 4.0345 | 10.3720 | 0.0350 | 2.7795 | 0.0301 | 2.8095 | 0.7451 | 0.0281 | 0.7731 | 0.0000 | 3,225.5347 | 3,225.5347 | 0.1760 | 0.0000 | 3,229.9336 |
| Waste | | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 35.3001 | 0.0000 | 35.3001 | 2.0862 | 0.0000 | 87.4546 |
| Water | | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 7.4716 | 150.1972 | 157.6688 | 0.7736 | 0.0194 | 182.7909 |
| **Total** | **2.7451** | **4.2878** | **14.0357** | **0.0365** | **2.7795** | **0.0669** | **2.8464** | **0.7451** | **0.0649** | **0.8100** | **42.7717** | **4,517.5936** | **4,560.3653** | **3.0829** | **0.0315** | **4,646.8273** |

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio-CO2 | Total CO2 | CH4 | N20 | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Percent Reduction** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

## 3.0 Construction Detail

**Construction Phase**

| Phase Number | Phase Name | Phase Type | Start Date | End Date | Num Days Week | Num Days | Phase Description |
|---|---|---|---|---|---|---|---|
| 1 | Demolition | Demolition | 1/1/2020 | 2/27/2020 | 5 | 42 | |
| 2 | Site Preparation | Site Preparation | 2/28/2020 | 3/5/2020 | 5 | 5 | |
| 3 | Grading | Grading | 3/6/2020 | 6/5/2020 | 5 | 66 | |
| 4 | Building Construction | Building Construction | 6/8/2020 | 10/28/2021 | 5 | 364 | |
| 5 | Paving | Paving | 9/1/2021 | 11/26/2021 | 5 | 63 | |
| 6 | Architectural Coating | Architectural Coating | 9/1/2021 | 11/26/2021 | 5 | 63 | |

**Acres of Grading (Site Preparation Phase): 0**

**Acres of Grading (Grading Phase): 24.75**

**Acres of Paving: 0.4**

**Residential Indoor: 893,760; Residential Outdoor: 297,920; Non-Residential Indoor: 21,722; Non-Residential Outdoor: 7,241; Striped Parking Area: 13,050 (Architectural Coating – sqft)**

**<u>OffRoad Equipment</u>**

| Phase Name | Offroad Equipment Type | Amount | Usage Hours | Horse Power | Load Factor |
|---|---|---|---|---|---|
| Demolition | Concrete/Industrial Saws | 1 | 8.00 | 81 | 0.73 |
| Demolition | Rubber Tired Dozers | 1 | 8.00 | 247 | 0.40 |
| Demolition | Tractors/Loaders/Backhoes | 3 | 8.00 | 97 | 0.37 |
| Site Preparation | Graders | 1 | 8.00 | 187 | 0.41 |
| Site Preparation | Rubber Tired Dozers | 1 | 7.00 | 247 | 0.40 |
| Site Preparation | Tractors/Loaders/Backhoes | 1 | 8.00 | 97 | 0.37 |
| Grading | Graders | 1 | 6.00 | 187 | 0.41 |
| Grading | Rubber Tired Dozers | 1 | 6.00 | 247 | 0.40 |
| Grading | Tractors/Loaders/Backhoes | 1 | 7.00 | 97 | 0.37 |
| Building Construction | Cranes | 1 | 6.00 | 231 | 0.29 |
| Building Construction | Forklifts | 1 | 6.00 | 89 | 0.20 |
| Building Construction | Generator Sets | 1 | 8.00 | 84 | 0.74 |
| Building Construction | Tractors/Loaders/Backhoes | 1 | 6.00 | 97 | 0.37 |
| Building Construction | Welders | 3 | 8.00 | 46 | 0.45 |
| Paving | Cement and Mortar Mixers | 1 | 6.00 | 9 | 0.56 |
| Paving | Pavers | 1 | 6.00 | 130 | 0.42 |
| Paving | Paving Equipment | 1 | 8.00 | 132 | 0.36 |
| Paving | Rollers | 1 | 7.00 | 80 | 0.38 |
| Paving | Tractors/Loaders/Backhoes | 1 | 8.00 | 97 | 0.37 |
| Architectural Coating | Air Compressors | 1 | 6.00 | 78 | 0.48 |

**Trips and VMT**

| Phase Name | Offroad Equipment Count | Worker Trip Number | Vendor Trip Number | Hauling Trip Number | Worker Trip Length | Vendor Trip Length | Hauling Trip Length | Worker Vehicle Class | Vendor Vehicle Class | Hauling Vehicle Class |
|---|---|---|---|---|---|---|---|---|---|---|
| Demolition | 5 | 13.00 | 0.00 | 24.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Site Preparation | 3 | 8.00 | 0.00 | 0.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Grading | 3 | 8.00 | 0.00 | 7,408.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Building Construction | 7 | 344.00 | 75.00 | 0.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Paving | 5 | 13.00 | 0.00 | 0.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Architectural Coating | 1 | 69.00 | 0.00 | 0.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |

## 3.1 Mitigation Measures Construction

## 3.2 Demolition - 2020

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Fugitive Dust | | | | | 2.5700e-003 | 0.0000 | 2.5700e-003 | 3.9000e-004 | 0.0000 | 3.9000e-004 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Off-Road | 0.0447 | 0.4399 | 0.3078 | 5.1000e-004 | | 0.0242 | 0.0242 | | 0.0226 | 0.0226 | 0.0000 | 44.2421 | 44.2421 | 0.0114 | 0.0000 | 44.5264 |
| **Total** | **0.0447** | **0.4399** | **0.3078** | **5.1000e-004** | **2.5700e-003** | **0.0242** | **0.0268** | **3.9000e-004** | **0.0226** | **0.0230** | **0.0000** | **44.2421** | **44.2421** | **0.0114** | **0.0000** | **44.5264** |

## 3.2 Demolition - 2020

### Unmitigated Construction Off-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Hauling | 1.1000e-004 | 3.5600e-003 | 7.9000e-004 | 1.0000e-005 | 2.1000e-004 | 1.0000e-005 | 2.2000e-004 | 6.0000e-005 | 1.0000e-005 | 7.0000e-005 | 0.0000 | 0.9249 | 0.9249 | 6.0000e-005 | 0.0000 | 0.9266 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Worker | 1.2600e-003 | 1.0200e-003 | 0.0112 | 3.0000e-005 | 2.9900e-003 | 3.0000e-005 | 3.0200e-003 | 7.9000e-004 | 2.0000e-005 | 8.2000e-004 | 0.0000 | 2.7883 | 2.7883 | 9.0000e-005 | 0.0000 | 2.7905 |
| **Total** | **1.3700e-003** | **4.5800e-003** | **0.0120** | **4.0000e-005** | **3.2000e-003** | **4.0000e-005** | **3.2400e-003** | **8.5000e-004** | **3.0000e-005** | **8.9000e-004** | **0.0000** | **3.7132** | **3.7132** | **1.5000e-004** | **0.0000** | **3.7170** |

### Mitigated Construction On-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Fugitive Dust | | | | | 2.5700e-003 | 0.0000 | 2.5700e-003 | 3.9000e-004 | 0.0000 | 3.9000e-004 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Off-Road | 0.0447 | 0.4399 | 0.3078 | 5.1000e-004 | | 0.0242 | 0.0242 | | 0.0226 | 0.0226 | 0.0000 | 44.2421 | 44.2421 | 0.0114 | 0.0000 | 44.5264 |
| **Total** | **0.0447** | **0.4399** | **0.3078** | **5.1000e-004** | **2.5700e-003** | **0.0242** | **0.0268** | **3.9000e-004** | **0.0226** | **0.0230** | **0.0000** | **44.2421** | **44.2421** | **0.0114** | **0.0000** | **44.5264** |

## 3.2 Demolition - 2020

### Mitigated Construction Off-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Hauling | 1.1000e-004 | 3.5600e-003 | 7.9000e-004 | 1.0000e-005 | 2.1000e-004 | 1.0000e-005 | 2.2000e-004 | 6.0000e-005 | 1.0000e-005 | 7.0000e-005 | 0.0000 | 0.9249 | 0.9249 | 6.0000e-005 | 0.0000 | 0.9266 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Worker | 1.2600e-003 | 1.0200e-003 | 0.0112 | 3.0000e-005 | 2.9900e-003 | 3.0000e-005 | 3.0200e-003 | 7.9000e-004 | 2.0000e-005 | 8.2000e-004 | 0.0000 | 2.7883 | 2.7883 | 9.0000e-005 | 0.0000 | 2.7905 |
| **Total** | **1.3700e-003** | **4.5800e-003** | **0.0120** | **4.0000e-005** | **3.2000e-003** | **4.0000e-005** | **3.2400e-003** | **8.5000e-004** | **3.0000e-005** | **8.9000e-004** | **0.0000** | **3.7132** | **3.7132** | **1.5000e-004** | **0.0000** | **3.7170** |

## 3.3 Site Preparation - 2020

### Unmitigated Construction On-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Fugitive Dust | | | | | 0.0132 | 0.0000 | 0.0132 | 7.2400e-003 | 0.0000 | 7.2400e-003 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Off-Road | 4.0700e-003 | 0.0459 | 0.0193 | 4.0000e-005 | | 2.0500e-003 | 2.0500e-003 | | 1.8900e-003 | 1.8900e-003 | 0.0000 | 3.7816 | 3.7816 | 1.2200e-003 | 0.0000 | 3.8122 |
| **Total** | **4.0700e-003** | **0.0459** | **0.0193** | **4.0000e-005** | **0.0132** | **2.0500e-003** | **0.0152** | **7.2400e-003** | **1.8900e-003** | **9.1300e-003** | **0.0000** | **3.7816** | **3.7816** | **1.2200e-003** | **0.0000** | **3.8122** |

## 3.3 Site Preparation - 2020

**Unmitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Worker | 9.0000e-005 | 7.0000e-005 | 8.2000e-004 | 0.0000 | 2.2000e-004 | 0.0000 | 2.2000e-004 | 6.0000e-005 | 0.0000 | 6.0000e-005 | 0.0000 | 0.2043 | 0.2043 | 1.0000e-005 | 0.0000 | 0.2044 |
| **Total** | **9.0000e-005** | **7.0000e-005** | **8.2000e-004** | **0.0000** | **2.2000e-004** | **0.0000** | **2.2000e-004** | **6.0000e-005** | **0.0000** | **6.0000e-005** | **0.0000** | **0.2043** | **0.2043** | **1.0000e-005** | **0.0000** | **0.2044** |

**Mitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Fugitive Dust | | | | | 0.0132 | 0.0000 | 0.0132 | 7.2400e-003 | 0.0000 | 7.2400e-003 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Off-Road | 4.0700e-003 | 0.0459 | 0.0193 | 4.0000e-005 | | 2.0500e-003 | 2.0500e-003 | | 1.8900e-003 | 1.8900e-003 | 0.0000 | 3.7816 | 3.7816 | 1.2200e-003 | 0.0000 | 3.8122 |
| **Total** | **4.0700e-003** | **0.0459** | **0.0193** | **4.0000e-005** | **0.0132** | **2.0500e-003** | **0.0152** | **7.2400e-003** | **1.8900e-003** | **9.1300e-003** | **0.0000** | **3.7816** | **3.7816** | **1.2200e-003** | **0.0000** | **3.8122** |

## 3.3 Site Preparation - 2020

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Worker | 9.0000e-005 | 7.0000e-005 | 8.2000e-004 | 0.0000 | 2.2000e-004 | 0.0000 | 2.2000e-004 | 6.0000e-005 | 0.0000 | 6.0000e-005 | 0.0000 | 0.2043 | 0.2043 | 1.0000e-005 | 0.0000 | 0.2044 |
| **Total** | **9.0000e-005** | **7.0000e-005** | **8.2000e-004** | **0.0000** | **2.2000e-004** | **0.0000** | **2.2000e-004** | **6.0000e-005** | **0.0000** | **6.0000e-005** | **0.0000** | **0.2043** | **0.2043** | **1.0000e-005** | **0.0000** | **0.2044** |

## 3.4 Grading - 2020

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Fugitive Dust | | | | | 0.1655 | 0.0000 | 0.1655 | 0.0839 | 0.0000 | 0.0839 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Off-Road | 0.0445 | 0.4978 | 0.2130 | 4.6000e-004 | | 0.0226 | 0.0226 | | 0.0208 | 0.0208 | 0.0000 | 40.8856 | 40.8856 | 0.0132 | 0.0000 | 41.2162 |
| **Total** | **0.0445** | **0.4978** | **0.2130** | **4.6000e-004** | **0.1655** | **0.0226** | **0.1881** | **0.0839** | **0.0208** | **0.1046** | **0.0000** | **40.8856** | **40.8856** | **0.0132** | **0.0000** | **41.2162** |

## 3.4 Grading - 2020

**Unmitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Hauling | 0.0327 | 1.1000 | 0.2425 | 2.9000e-003 | 0.0637 | 3.4200e-003 | 0.0671 | 0.0175 | 3.2700e-003 | 0.0208 | 0.0000 | 285.4977 | 285.4977 | 0.0199 | 0.0000 | 285.9949 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Worker | 1.2200e-003 | 9.8000e-004 | 0.0109 | 3.0000e-005 | 2.8900e-003 | 2.0000e-005 | 2.9200e-003 | 7.7000e-004 | 2.0000e-005 | 7.9000e-004 | 0.0000 | 2.6964 | 2.6964 | 8.0000e-005 | 0.0000 | 2.6985 |
| **Total** | **0.0339** | **1.1010** | **0.2533** | **2.9300e-003** | **0.0666** | **3.4400e-003** | **0.0700** | **0.0183** | **3.2900e-003** | **0.0215** | **0.0000** | **288.1941** | **288.1941** | **0.0200** | **0.0000** | **288.6934** |

**Mitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Fugitive Dust | | | | | 0.1655 | 0.0000 | 0.1655 | 0.0839 | 0.0000 | 0.0839 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Off-Road | 0.0445 | 0.4978 | 0.2130 | 4.6000e-004 | | 0.0226 | 0.0226 | | 0.0208 | 0.0208 | 0.0000 | 40.8856 | 40.8856 | 0.0132 | 0.0000 | 41.2162 |
| **Total** | **0.0445** | **0.4978** | **0.2130** | **4.6000e-004** | **0.1655** | **0.0226** | **0.1881** | **0.0839** | **0.0208** | **0.1046** | **0.0000** | **40.8856** | **40.8856** | **0.0132** | **0.0000** | **41.2162** |

### 3.4 Grading - 2020

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Hauling | 0.0327 | 1.1000 | 0.2425 | 2.9000e-003 | 0.0637 | 3.4200e-003 | 0.0671 | 0.0175 | 3.2700e-003 | 0.0208 | 0.0000 | 285.4977 | 285.4977 | 0.0199 | 0.0000 | 285.9949 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Worker | 1.2200e-003 | 9.8000e-004 | 0.0109 | 3.0000e-005 | 2.8900e-003 | 2.0000e-005 | 2.9200e-003 | 7.7000e-004 | 2.0000e-005 | 7.9000e-004 | 0.0000 | 2.6964 | 2.6964 | 8.0000e-005 | 0.0000 | 2.6985 |
| **Total** | **0.0339** | **1.1010** | **0.2533** | **2.9300e-003** | **0.0666** | **3.4400e-003** | **0.0700** | **0.0183** | **3.2900e-003** | **0.0215** | **0.0000** | **288.1941** | **288.1941** | **0.0200** | **0.0000** | **288.6934** |

### 3.5 Building Construction - 2020

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Off-Road | 0.1513 | 1.1017 | 0.9825 | 1.6400e-003 | | 0.0593 | 0.0593 | | 0.0573 | 0.0573 | 0.0000 | 135.2489 | 135.2489 | 0.0251 | 0.0000 | 135.8766 |
| **Total** | **0.1513** | **1.1017** | **0.9825** | **1.6400e-003** | | **0.0593** | **0.0593** | | **0.0573** | **0.0573** | **0.0000** | **135.2489** | **135.2489** | **0.0251** | **0.0000** | **135.8766** |

## 3.5 Building Construction - 2020

### Unmitigated Construction Off-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Vendor | 0.0203 | 0.6055 | 0.1639 | 1.4300e-003 | 0.0352 | 2.8200e-003 | 0.0380 | 0.0102 | 2.6900e-003 | 0.0129 | 0.0000 | 138.8081 | 138.8081 | 8.8200e-003 | 0.0000 | 139.0287 |
| Worker | 0.1183 | 0.0954 | 1.0549 | 2.9000e-003 | 0.2808 | 2.3900e-003 | 0.2832 | 0.0746 | 2.2100e-003 | 0.0768 | 0.0000 | 261.7517 | 261.7517 | 8.2500e-003 | 0.0000 | 261.9579 |
| **Total** | **0.1386** | **0.7009** | **1.2188** | **4.3300e-003** | **0.3160** | **5.2100e-003** | **0.3212** | **0.0848** | **4.9000e-003** | **0.0897** | **0.0000** | **400.5599** | **400.5599** | **0.0171** | **0.0000** | **400.9866** |

### Mitigated Construction On-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Off-Road | 0.1513 | 1.1017 | 0.9825 | 1.6400e-003 | | 0.0593 | 0.0593 | | 0.0573 | 0.0573 | 0.0000 | 135.2487 | 135.2487 | 0.0251 | 0.0000 | 135.8764 |
| **Total** | **0.1513** | **1.1017** | **0.9825** | **1.6400e-003** | | **0.0593** | **0.0593** | | **0.0573** | **0.0573** | **0.0000** | **135.2487** | **135.2487** | **0.0251** | **0.0000** | **135.8764** |

## 3.5 Building Construction - 2020

### Mitigated Construction Off-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Vendor | 0.0203 | 0.6055 | 0.1639 | 1.4300e-003 | 0.0352 | 2.8200e-003 | 0.0380 | 0.0102 | 2.6900e-003 | 0.0129 | 0.0000 | 138.8081 | 138.8081 | 8.8200e-003 | 0.0000 | 139.0287 |
| Worker | 0.1183 | 0.0954 | 1.0549 | 2.9000e-003 | 0.2808 | 2.3900e-003 | 0.2832 | 0.0746 | 2.2100e-003 | 0.0768 | 0.0000 | 261.7517 | 261.7517 | 8.2500e-003 | 0.0000 | 261.9579 |
| **Total** | **0.1386** | **0.7009** | **1.2188** | **4.3300e-003** | **0.3160** | **5.2100e-003** | **0.3212** | **0.0848** | **4.9000e-003** | **0.0897** | **0.0000** | **400.5599** | **400.5599** | **0.0171** | **0.0000** | **400.9866** |

## 3.5 Building Construction - 2021

### Unmitigated Construction On-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Off-Road | 0.1948 | 1.4659 | 1.3867 | 2.3700e-003 | | 0.0736 | 0.0736 | | 0.0710 | 0.0710 | 0.0000 | 195.1637 | 195.1637 | 0.0348 | 0.0000 | 196.0347 |
| **Total** | **0.1948** | **1.4659** | **1.3867** | **2.3700e-003** | | **0.0736** | **0.0736** | | **0.0710** | **0.0710** | **0.0000** | **195.1637** | **195.1637** | **0.0348** | **0.0000** | **196.0347** |

## 3.5 Building Construction - 2021

### Unmitigated Construction Off-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Vendor | 0.0250 | 0.7957 | 0.2157 | 2.0500e-003 | 0.0508 | 1.6200e-003 | 0.0524 | 0.0147 | 1.5500e-003 | 0.0162 | 0.0000 | 198.7379 | 198.7379 | 0.0122 | 0.0000 | 199.0426 |
| Worker | 0.1591 | 0.1239 | 1.3984 | 4.0500e-003 | 0.4052 | 3.3400e-003 | 0.4086 | 0.1076 | 3.0800e-003 | 0.1107 | 0.0000 | 365.7015 | 365.7015 | 0.0108 | 0.0000 | 365.9706 |
| **Total** | **0.1842** | **0.9196** | **1.6142** | **6.1000e-003** | **0.4560** | **4.9600e-003** | **0.4610** | **0.1223** | **4.6300e-003** | **0.1269** | **0.0000** | **564.4394** | **564.4394** | **0.0230** | **0.0000** | **565.0132** |

### Mitigated Construction On-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Off-Road | 0.1948 | 1.4659 | 1.3867 | 2.3700e-003 | | 0.0736 | 0.0736 | | 0.0710 | 0.0710 | 0.0000 | 195.1635 | 195.1635 | 0.0348 | 0.0000 | 196.0345 |
| **Total** | **0.1948** | **1.4659** | **1.3867** | **2.3700e-003** | | **0.0736** | **0.0736** | | **0.0710** | **0.0710** | **0.0000** | **195.1635** | **195.1635** | **0.0348** | **0.0000** | **196.0345** |

## 3.5 Building Construction - 2021

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Vendor | 0.0250 | 0.7957 | 0.2157 | 2.0500e-003 | 0.0508 | 1.6200e-003 | 0.0524 | 0.0147 | 1.5500e-003 | 0.0162 | 0.0000 | 198.7379 | 198.7379 | 0.0122 | 0.0000 | 199.0426 |
| Worker | 0.1591 | 0.1239 | 1.3984 | 4.0500e-003 | 0.4052 | 3.3400e-003 | 0.4086 | 0.1076 | 3.0800e-003 | 0.1107 | 0.0000 | 365.7015 | 365.7015 | 0.0108 | 0.0000 | 365.9706 |
| **Total** | **0.1842** | **0.9196** | **1.6142** | **6.1000e-003** | **0.4560** | **4.9600e-003** | **0.4610** | **0.1223** | **4.6300e-003** | **0.1269** | **0.0000** | **564.4394** | **564.4394** | **0.0230** | **0.0000** | **565.0132** |

## 3.6 Paving - 2021

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Off-Road | 0.0244 | 0.2439 | 0.2790 | 4.3000e-004 | | 0.0131 | 0.0131 | | 0.0121 | 0.0121 | 0.0000 | 37.0597 | 37.0597 | 0.0118 | 0.0000 | 37.3534 |
| Paving | 0.0000 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| **Total** | **0.0244** | **0.2439** | **0.2790** | **4.3000e-004** | | **0.0131** | **0.0131** | | **0.0121** | **0.0121** | **0.0000** | **37.0597** | **37.0597** | **0.0118** | **0.0000** | **37.3534** |

## 3.6 Paving - 2021

**Unmitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Worker | 1.7600e-003 | 1.3700e-003 | 0.0155 | 4.0000e-005 | 4.4900e-003 | 4.0000e-005 | 4.5200e-003 | 1.1900e-003 | 3.0000e-005 | 1.2300e-003 | 0.0000 | 4.0496 | 4.0496 | 1.2000e-004 | 0.0000 | 4.0526 |
| **Total** | **1.7600e-003** | **1.3700e-003** | **0.0155** | **4.0000e-005** | **4.4900e-003** | **4.0000e-005** | **4.5200e-003** | **1.1900e-003** | **3.0000e-005** | **1.2300e-003** | **0.0000** | **4.0496** | **4.0496** | **1.2000e-004** | **0.0000** | **4.0526** |

**Mitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Off-Road | 0.0244 | 0.2439 | 0.2790 | 4.3000e-004 | | 0.0131 | 0.0131 | | 0.0121 | 0.0121 | 0.0000 | 37.0596 | 37.0596 | 0.0118 | 0.0000 | 37.3533 |
| Paving | 0.0000 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| **Total** | **0.0244** | **0.2439** | **0.2790** | **4.3000e-004** | | **0.0131** | **0.0131** | | **0.0121** | **0.0121** | **0.0000** | **37.0596** | **37.0596** | **0.0118** | **0.0000** | **37.3533** |

## 3.6 Paving - 2021

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Worker | 1.7600e-003 | 1.3700e-003 | 0.0155 | 4.0000e-005 | 4.4900e-003 | 4.0000e-005 | 4.5200e-003 | 1.1900e-003 | 3.0000e-005 | 1.2300e-003 | 0.0000 | 4.0496 | 4.0496 | 1.2000e-004 | 0.0000 | 4.0526 |
| **Total** | **1.7600e-003** | **1.3700e-003** | **0.0155** | **4.0000e-005** | **4.4900e-003** | **4.0000e-005** | **4.5200e-003** | **1.1900e-003** | **3.0000e-005** | **1.2300e-003** | **0.0000** | **4.0496** | **4.0496** | **1.2000e-004** | **0.0000** | **4.0526** |

## 3.7 Architectural Coating - 2021

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Archit. Coating | 1.4782 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Off-Road | 6.9000e-003 | 0.0481 | 0.0573 | 9.0000e-005 | | 2.9600e-003 | 2.9600e-003 | | 2.9600e-003 | 2.9600e-003 | 0.0000 | 8.0428 | 8.0428 | 5.5000e-004 | 0.0000 | 8.0566 |
| **Total** | **1.4851** | **0.0481** | **0.0573** | **9.0000e-005** | | **2.9600e-003** | **2.9600e-003** | | **2.9600e-003** | **2.9600e-003** | **0.0000** | **8.0428** | **8.0428** | **5.5000e-004** | **0.0000** | **8.0566** |

## 3.7 Architectural Coating - 2021

**Unmitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Worker | 9.3500e-003 | 7.2800e-003 | 0.0822 | 2.4000e-004 | 0.0238 | 2.0000e-004 | 0.0240 | 6.3300e-003 | 1.8000e-004 | 6.5100e-003 | 0.0000 | 21.4941 | 21.4941 | 6.3000e-004 | 0.0000 | 21.5099 |
| **Total** | **9.3500e-003** | **7.2800e-003** | **0.0822** | **2.4000e-004** | **0.0238** | **2.0000e-004** | **0.0240** | **6.3300e-003** | **1.8000e-004** | **6.5100e-003** | **0.0000** | **21.4941** | **21.4941** | **6.3000e-004** | **0.0000** | **21.5099** |

**Mitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Archit. Coating | 1.4782 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Off-Road | 6.9000e-003 | 0.0481 | 0.0573 | 9.0000e-005 | | 2.9600e-003 | 2.9600e-003 | | 2.9600e-003 | 2.9600e-003 | 0.0000 | 8.0427 | 8.0427 | 5.5000e-004 | 0.0000 | 8.0565 |
| **Total** | **1.4851** | **0.0481** | **0.0573** | **9.0000e-005** | | **2.9600e-003** | **2.9600e-003** | | **2.9600e-003** | **2.9600e-003** | **0.0000** | **8.0427** | **8.0427** | **5.5000e-004** | **0.0000** | **8.0565** |

## 3.7 Architectural Coating - 2021

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Worker | 9.3500e-003 | 7.2800e-003 | 0.0822 | 2.4000e-004 | 0.0238 | 2.0000e-004 | 0.0240 | 6.3300e-003 | 1.8000e-004 | 6.5100e-003 | 0.0000 | 21.4941 | 21.4941 | 6.3000e-004 | 0.0000 | 21.5099 |
| **Total** | **9.3500e-003** | **7.2800e-003** | **0.0822** | **2.4000e-004** | **0.0238** | **2.0000e-004** | **0.0240** | **6.3300e-003** | **1.8000e-004** | **6.5100e-003** | **0.0000** | **21.4941** | **21.4941** | **6.3000e-004** | **0.0000** | **21.5099** |

# 4.0 Operational Detail - Mobile

## 4.1 Mitigation Measures Mobile

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Mitigated | 0.8025 | 4.0345 | 10.3720 | 0.0350 | 2.7795 | 0.0301 | 2.8095 | 0.7451 | 0.0281 | 0.7731 | 0.0000 | 3,225.5347 | 3,225.5347 | 0.1760 | 0.0000 | 3,229.9336 |
| Unmitigated | 0.8025 | 4.0345 | 10.3720 | 0.0350 | 2.7795 | 0.0301 | 2.8095 | 0.7451 | 0.0281 | 0.7731 | 0.0000 | 3,225.5347 | 3,225.5347 | 0.1760 | 0.0000 | 3,229.9336 |

## 4.2 Trip Summary Information

| | Average Daily Trip Rate | | | Unmitigated | Mitigated |
|---|---|---|---|---|---|
| Land Use | Weekday | Saturday | Sunday | Annual VMT | Annual VMT |
| Apartments High Rise | 708.47 | 718.62 | 708.47 | 2,425,904 | 2,425,904 |
| Apartments Mid Rise | 606.34 | 681.60 | 606.34 | 2,108,695 | 2,108,695 |
| Enclosed Parking Structure | 0.00 | 0.00 | 0.00 | | |
| Regional Shopping Center | 1,258.75 | 1,473.05 | 1258.75 | 2,788,687 | 2,788,687 |
| Total | 2,573.56 | 2,873.27 | 2,573.56 | 7,323,287 | 7,323,287 |

## 4.3 Trip Type Information

| | Miles | | | Trip % | | | Trip Purpose % | | |
|---|---|---|---|---|---|---|---|---|---|
| Land Use | H-W or C-W | H-S or C-C | H-O or C-NW | H-W or C-W | H-S or C-C | H-O or C-NW | Primary | Diverted | Pass-by |
| Apartments High Rise | 14.70 | 5.90 | 8.70 | 40.20 | 19.20 | 40.60 | 86 | 11 | 3 |
| Apartments Mid Rise | 14.70 | 5.90 | 8.70 | 40.20 | 19.20 | 40.60 | 86 | 11 | 3 |
| Enclosed Parking Structure | 16.60 | 8.40 | 6.90 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Regional Shopping Center | 16.60 | 8.40 | 6.90 | 16.30 | 64.70 | 19.00 | 54 | 35 | 11 |

## 4.4 Fleet Mix

| Land Use | LDA | LDT1 | LDT2 | MDV | LHD1 | LHD2 | MHD | HHD | OBUS | UBUS | MCY | SBUS | MH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apartments High Rise | 0.547192 | 0.045177 | 0.202743 | 0.121510 | 0.016147 | 0.006143 | 0.019743 | 0.029945 | 0.002479 | 0.002270 | 0.005078 | 0.000682 | 0.000891 |
| Apartments Mid Rise | 0.547192 | 0.045177 | 0.202743 | 0.121510 | 0.016147 | 0.006143 | 0.019743 | 0.029945 | 0.002479 | 0.002270 | 0.005078 | 0.000682 | 0.000891 |
| Enclosed Parking Structure | 0.547192 | 0.045177 | 0.202743 | 0.121510 | 0.016147 | 0.006143 | 0.019743 | 0.029945 | 0.002479 | 0.002270 | 0.005078 | 0.000682 | 0.000891 |
| Regional Shopping Center | 0.547192 | 0.045177 | 0.202743 | 0.121510 | 0.016147 | 0.006143 | 0.019743 | 0.029945 | 0.002479 | 0.002270 | 0.005078 | 0.000682 | 0.000891 |

## 5.0 Energy Detail

Historical Energy Use: N

### 5.1 Mitigation Measures Energy

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Electricity Mitigated | | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 890.5171 | 890.5171 | 0.0368 | 7.6100e-003 | 893.7029 |
| Electricity Unmitigated | | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 890.5171 | 890.5171 | 0.0368 | 7.6100e-003 | 893.7029 |
| NaturalGas Mitigated | 0.0173 | 0.1477 | 0.0633 | 9.4000e-004 | | 0.0119 | 0.0119 | | 0.0119 | 0.0119 | 0.0000 | 170.9559 | 170.9559 | 3.2800e-003 | 3.1300e-003 | 171.9718 |
| NaturalGas Unmitigated | 0.0173 | 0.1477 | 0.0633 | 9.4000e-004 | | 0.0119 | 0.0119 | | 0.0119 | 0.0119 | 0.0000 | 170.9559 | 170.9559 | 3.2800e-003 | 3.1300e-003 | 171.9718 |

## 5.2 Energy by Land Use - NaturalGas

**Unmitigated**

| | NaturalGas Use | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Use | kBTU/yr | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Apartments High Rise | 1.87104e+006 | 0.0101 | 0.0862 | 0.0367 | 5.5000e-004 | | 6.9700e-003 | 6.9700e-003 | | 6.9700e-003 | 6.9700e-003 | 0.0000 | 99.8458 | 99.8458 | 1.9100e-003 | 1.8300e-003 | 100.4391 |
| Apartments Mid Rise | 1.30881e+006 | 7.0600e-003 | 0.0603 | 0.0257 | 3.8000e-004 | | 4.8800e-003 | 4.8800e-003 | | 4.8800e-003 | 4.8800e-003 | 0.0000 | 69.8428 | 69.8428 | 1.3400e-003 | 1.2800e-003 | 70.2579 |
| Enclosed Parking Structure | 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Regional Shopping Center | 23748.8 | 1.3000e-004 | 1.1600e-003 | 9.8000e-004 | 1.0000e-005 | | 9.0000e-005 | 9.0000e-005 | | 9.0000e-005 | 9.0000e-005 | 0.0000 | 1.2673 | 1.2673 | 2.0000e-005 | 2.0000e-005 | 1.2749 |
| **Total** | | **0.0173** | **0.1477** | **0.0633** | **9.4000e-004** | | **0.0119** | **0.0119** | | **0.0119** | **0.0119** | **0.0000** | **170.9559** | **170.9559** | **3.2700e-003** | **3.1300e-003** | **171.9718** |

## 5.2 Energy by Land Use - NaturalGas

**Mitigated**

| | NaturalGas Use | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Use | kBTU/yr | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Apartments High Rise | 1.87104e+006 | 0.0101 | 0.0862 | 0.0367 | 5.5000e-004 | | 6.9700e-003 | 6.9700e-003 | | 6.9700e-003 | 6.9700e-003 | 0.0000 | 99.8458 | 99.8458 | 1.9100e-003 | 1.8300e-003 | 100.4391 |
| Apartments Mid Rise | 1.30881e+006 | 7.0600e-003 | 0.0603 | 0.0257 | 3.8000e-004 | | 4.8800e-003 | 4.8800e-003 | | 4.8800e-003 | 4.8800e-003 | 0.0000 | 69.8428 | 69.8428 | 1.3400e-003 | 1.2800e-003 | 70.2579 |
| Enclosed Parking Structure | 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Regional Shopping Center | 23748.8 | 1.3000e-004 | 1.1600e-003 | 9.8000e-004 | 1.0000e-005 | | 9.0000e-005 | 9.0000e-005 | | 9.0000e-005 | 9.0000e-005 | 0.0000 | 1.2673 | 1.2673 | 2.0000e-005 | 2.0000e-005 | 1.2749 |
| **Total** | | **0.0173** | **0.1477** | **0.0633** | **9.4000e-004** | | **0.0119** | **0.0119** | | **0.0119** | **0.0119** | **0.0000** | **170.9559** | **170.9559** | **3.2700e-003** | **3.1300e-003** | **171.9718** |

## 5.3 Energy by Land Use - Electricity

**Unmitigated**

| | Electricity Use | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|
| Land Use | kWh/yr | MT/yr | | | |
| Apartments High Rise | 803896 | 256.1386 | 0.0106 | 2.1900e-003 | 257.0549 |
| Apartments Mid Rise | 562331 | 179.1708 | 7.4000e-003 | 1.5300e-003 | 179.8118 |
| Enclosed Parking Structure | 1.23319e+006 | 392.9193 | 0.0162 | 3.3600e-003 | 394.3249 |
| Regional Shopping Center | 195494 | 62.2884 | 2.5700e-003 | 5.3000e-004 | 62.5113 |
| **Total** | | **890.5171** | **0.0368** | **7.6100e-003** | **893.7029** |

### 5.3 Energy by Land Use - Electricity

**Mitigated**

| | Electricity Use | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|
| Land Use | kWh/yr | MT/yr | | | |
| Apartments High Rise | 803896 | 256.1386 | 0.0106 | 2.1900e-003 | 257.0549 |
| Apartments Mid Rise | 562331 | 179.1708 | 7.4000e-003 | 1.5300e-003 | 179.8118 |
| Enclosed Parking Structure | 1.23319e+006 | 392.9193 | 0.0162 | 3.3600e-003 | 394.3249 |
| Regional Shopping Center | 195494 | 62.2884 | 2.5700e-003 | 5.3000e-004 | 62.5113 |
| **Total** | | **890.5171** | **0.0368** | **7.6100e-003** | **893.7029** |

## 6.0 Area Detail

### 6.1 Mitigation Measures Area

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Mitigated | 1.9253 | 0.1056 | 3.6004 | 6.0000e-004 | | 0.0249 | 0.0249 | | 0.0249 | 0.0249 | 0.0000 | 80.3887 | 80.3887 | 7.1000e-003 | 1.3700e-003 | 80.9735 |
| Unmitigated | 1.9253 | 0.1056 | 3.6004 | 6.0000e-004 | | 0.0249 | 0.0249 | | 0.0249 | 0.0249 | 0.0000 | 80.3887 | 80.3887 | 7.1000e-003 | 1.3700e-003 | 80.9735 |

## 6.2 Area by SubCategory

**Unmitigated**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SubCategory | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Architectural Coating | 0.1478 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Consumer Products | 1.6613 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Hearth | 7.5300e-003 | 0.0644 | 0.0274 | 4.1000e-004 | | 5.2100e-003 | 5.2100e-003 | | 5.2100e-003 | 5.2100e-003 | 0.0000 | 74.5626 | 74.5626 | 1.4300e-003 | 1.3700e-003 | 75.0057 |
| Landscaping | 0.1087 | 0.0412 | 3.5730 | 1.9000e-004 | | 0.0197 | 0.0197 | | 0.0197 | 0.0197 | 0.0000 | 5.8261 | 5.8261 | 5.6700e-003 | 0.0000 | 5.9679 |
| **Total** | **1.9253** | **0.1056** | **3.6004** | **6.0000e-004** | | **0.0249** | **0.0249** | | **0.0249** | **0.0249** | **0.0000** | **80.3887** | **80.3887** | **7.1000e-003** | **1.3700e-003** | **80.9735** |

## 6.2 Area by SubCategory

**Mitigated**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SubCategory | tons/yr | | | | | | | | | | MT/yr | | | | | |
| Architectural Coating | 0.1478 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Consumer Products | 1.6613 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Hearth | 7.5300e-003 | 0.0644 | 0.0274 | 4.1000e-004 | | 5.2100e-003 | 5.2100e-003 | | 5.2100e-003 | 5.2100e-003 | 0.0000 | 74.5626 | 74.5626 | 1.4300e-003 | 1.3700e-003 | 75.0057 |
| Landscaping | 0.1087 | 0.0412 | 3.5730 | 1.9000e-004 | | 0.0197 | 0.0197 | | 0.0197 | 0.0197 | 0.0000 | 5.8261 | 5.8261 | 5.6700e-003 | 0.0000 | 5.9679 |
| **Total** | **1.9253** | **0.1056** | **3.6004** | **6.0000e-004** | | **0.0249** | **0.0249** | | **0.0249** | **0.0249** | **0.0000** | **80.3887** | **80.3887** | **7.1000e-003** | **1.3700e-003** | **80.9735** |

# 7.0 Water Detail

## 7.1 Mitigation Measures Water

| | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|
| Category | MT/yr | | | |
| Mitigated | 157.6688 | 0.7736 | 0.0194 | 182.7909 |
| Unmitigated | 157.6688 | 0.7736 | 0.0194 | 182.7909 |

## 7.2 Water by Land Use

**Unmitigated**

| | Indoor/Outdoor Use | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|
| Land Use | Mgal | MT/yr | | | |
| Apartments High Rise | 13.2263 / 8.3383 | 88.5854 | 0.4345 | 0.0109 | 102.6943 |
| Apartments Mid Rise | 9.25187 / 5.8327 | 61.9662 | 0.3039 | 7.6200e-003 | 71.8355 |
| Enclosed Parking Structure | 0 / 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Regional Shopping Center | 1.07257 / 0.657382 | 7.1172 | 0.0352 | 8.8000e-004 | 8.2611 |
| **Total** | | **157.6688** | **0.7736** | **0.0194** | **182.7909** |

## 7.2 Water by Land Use

**Mitigated**

| | Indoor/Outdoor Use | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|
| Land Use | Mgal | MT/yr | | | |
| Apartments High Rise | 13.2263 / 8.3383 | 88.5854 | 0.4345 | 0.0109 | 102.6943 |
| Apartments Mid Rise | 9.25187 / 5.8327 | 61.9662 | 0.3039 | 7.6200e-003 | 71.8355 |
| Enclosed Parking Structure | 0 / 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Regional Shopping Center | 1.07257 / 0.657382 | 7.1172 | 0.0352 | 8.8000e-004 | 8.2611 |
| **Total** | | **157.6688** | **0.7736** | **0.0194** | **182.7909** |

# 8.0 Waste Detail

## 8.1 Mitigation Measures Waste

**Category/Year**

| | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|
| | MT/yr | | | |
| Mitigated | 35.3001 | 2.0862 | 0.0000 | 87.4546 |
| Unmitigated | 35.3001 | 2.0862 | 0.0000 | 87.4546 |

## 8.2 Waste by Land Use

**Unmitigated**

| | Waste Disposed | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|
| Land Use | tons | MT/yr | | | |
| Apartments High Rise | 93.38 | 18.9553 | 1.1202 | 0.0000 | 46.9609 |
| Apartments Mid Rise | 65.32 | 13.2594 | 0.7836 | 0.0000 | 32.8495 |
| Enclosed Parking Structure | 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Regional Shopping Center | 15.2 | 3.0855 | 0.1824 | 0.0000 | 7.6441 |
| **Total** | | **35.3001** | **2.0862** | **0.0000** | **87.4546** |

## 8.2 Waste by Land Use

**Mitigated**

| | Waste Disposed | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|
| Land Use | tons | MT/yr | | | |
| Apartments High Rise | 93.38 | 18.9553 | 1.1202 | 0.0000 | 46.9609 |
| Apartments Mid Rise | 65.32 | 13.2594 | 0.7836 | 0.0000 | 32.8495 |
| Enclosed Parking Structure | 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Regional Shopping Center | 15.2 | 3.0855 | 0.1824 | 0.0000 | 7.6441 |
| **Total** | | **35.3001** | **2.0862** | **0.0000** | **87.4546** |

# 9.0 Operational Offroad

| Equipment Type | Number | Hours/Day | Days/Year | Horse Power | Load Factor | Fuel Type |
|---|---|---|---|---|---|---|

# 10.0 Stationary Equipment

**Fire Pumps and Emergency Generators**

| Equipment Type | Number | Hours/Day | Hours/Year | Horse Power | Load Factor | Fuel Type |
|---|---|---|---|---|---|---|

**Boilers**

| Equipment Type | Number | Heat Input/Day | Heat Input/Year | Boiler Rating | Fuel Type |
|---|---|---|---|---|---|

**User Defined Equipment**

| Equipment Type | Number |
| --- | --- |

## 11.0 Vegetation

# W3rd and Pacific - Full Buildout OY

**Los Angeles-South Coast County, Winter**

## 1.0 Project Characteristics

### 1.1 Land Usage

| Land Uses | Size | Metric | Lot Acreage | Floor Surface Area | Population |
|---|---|---|---|---|---|
| Enclosed Parking Structure | 565.00 | Space | 0.40 | 217,493.00 | 0 |
| Apartments High Rise | 203.00 | Dwelling Unit | 0.53 | 293,101.00 | 589 |
| Apartments Mid Rise | 142.00 | Dwelling Unit | 0.26 | 148,262.00 | 412 |
| Regional Shopping Center | 14.48 | 1000sqft | 0.03 | 14,481.00 | 12 |

### 1.2 Other Project Characteristics

| | | | | | |
|---|---|---|---|---|---|
| **Urbanization** | Urban | **Wind Speed (m/s)** | 2.2 | **Precipitation Freq (Days)** | 33 |
| **Climate Zone** | 11 | | | **Operational Year** | 2021 |
| **Utility Company** | Southern California Edison | | | | |
| **CO2 Intensity (lb/MWhr)** | 702.44 | **CH4 Intensity (lb/MWhr)** | 0.029 | **N2O Intensity (lb/MWhr)** | 0.006 |

### 1.3 User Entered Comments & Non-Default Data

Project Characteristics - See SWAPE comment about CO2 intensity factor.

Land Use - Matches Addendum's model. See SWAPE comment about land use sizes.

Construction Phase - Matches Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Demolition - Matches Addendum's model.

Grading - Matches Addendum's model.

Vehicle Trips - See SWAPE comment about trip rates.

Woodstoves - Matches Addendum's model.

Energy Use -

| Table Name | Column Name | Default Value | New Value |
|---|---|---|---|
| tblConstructionPhase | NumDays | 10.00 | 63.00 |
| tblConstructionPhase | NumDays | 200.00 | 364.00 |
| tblConstructionPhase | NumDays | 20.00 | 42.00 |
| tblConstructionPhase | NumDays | 4.00 | 66.00 |
| tblConstructionPhase | NumDays | 10.00 | 63.00 |
| tblConstructionPhase | NumDays | 2.00 | 5.00 |
| tblFireplaces | NumberGas | 172.55 | 182.70 |
| tblFireplaces | NumberGas | 120.70 | 127.80 |
| tblFireplaces | NumberWood | 10.15 | 0.00 |
| tblFireplaces | NumberWood | 7.10 | 0.00 |
| tblGrading | AcresOfGrading | 2.50 | 0.00 |

| | | | |
|---|---|---|---|
| tblGrading | MaterialExported | 0.00 | 59,260.00 |
| tblLandUse | LandUseSquareFeet | 226,000.00 | 217,493.00 |
| tblLandUse | LandUseSquareFeet | 203,000.00 | 293,101.00 |
| tblLandUse | LandUseSquareFeet | 142,000.00 | 148,262.00 |
| tblLandUse | LandUseSquareFeet | 14,480.00 | 14,481.00 |
| tblLandUse | LotAcreage | 5.08 | 0.40 |
| tblLandUse | LotAcreage | 3.27 | 0.53 |
| tblLandUse | LotAcreage | 3.74 | 0.26 |
| tblLandUse | LotAcreage | 0.33 | 0.03 |
| tblLandUse | Population | 581.00 | 589.00 |
| tblLandUse | Population | 406.00 | 412.00 |
| tblLandUse | Population | 0.00 | 12.00 |
| tblVehicleTrips | ST_TR | 4.98 | 3.54 |
| tblVehicleTrips | ST_TR | 6.39 | 4.80 |
| tblVehicleTrips | ST_TR | 49.97 | 101.73 |
| tblVehicleTrips | SU_TR | 3.65 | 3.49 |
| tblVehicleTrips | SU_TR | 5.86 | 4.27 |
| tblVehicleTrips | SU_TR | 25.24 | 86.93 |
| tblVehicleTrips | WD_TR | 4.20 | 3.49 |
| tblVehicleTrips | WD_TR | 6.65 | 4.27 |
| tblVehicleTrips | WD_TR | 42.70 | 86.93 |
| tblWoodstoves | NumberCatalytic | 10.15 | 0.00 |
| tblWoodstoves | NumberCatalytic | 7.10 | 0.00 |
| tblWoodstoves | NumberNoncatalytic | 10.15 | 0.00 |
| tblWoodstoves | NumberNoncatalytic | 7.10 | 0.00 |
| tblWoodstoves | WoodstoveDayYear | 25.00 | 0.00 |
| tblWoodstoves | WoodstoveDayYear | 25.00 | 0.00 |

| | | | |
|---|---|---|---|
| tblWoodstoves | WoodstoveWoodMass | 999.60 | 0.00 |
| tblWoodstoves | WoodstoveWoodMass | 999.60 | 0.00 |

## 2.0 Emissions Summary

## 2.1 Overall Construction (Maximum Daily Emission)

**Unmitigated Construction**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | lb/day | | | | | | | | | | lb/day | | | | | |
| 2020 | 4.0673 | 47.8064 | 29.2882 | 0.1021 | 7.0677 | 1.1542 | 7.8574 | 3.1027 | 1.0778 | 3.8330 | 0.0000 | 10,894.9557 | 10,894.9557 | 1.1221 | 0.0000 | 10,923.0086 |
| 2021 | 52.0036 | 31.5612 | 41.3673 | 0.1032 | 5.2418 | 1.2476 | 6.4894 | 1.4011 | 1.1880 | 2.5891 | 0.0000 | 10,152.4156 | 10,152.4156 | 1.0515 | 0.0000 | 10,178.7043 |
| **Maximum** | **52.0036** | **47.8064** | **41.3673** | **0.1032** | **7.0677** | **1.2476** | **7.8574** | **3.1027** | **1.1880** | **3.8330** | **0.0000** | **10,894.9557** | **10,894.9557** | **1.1221** | **0.0000** | **10,923.0086** |

**Mitigated Construction**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | lb/day | | | | | | | | | | lb/day | | | | | |
| 2020 | 4.0673 | 47.8064 | 29.2882 | 0.1021 | 7.0677 | 1.1542 | 7.8574 | 3.1027 | 1.0778 | 3.8330 | 0.0000 | 10,894.9557 | 10,894.9557 | 1.1221 | 0.0000 | 10,923.0086 |
| 2021 | 52.0036 | 31.5612 | 41.3673 | 0.1032 | 5.2418 | 1.2476 | 6.4894 | 1.4011 | 1.1880 | 2.5891 | 0.0000 | 10,152.4156 | 10,152.4156 | 1.0515 | 0.0000 | 10,178.7043 |
| **Maximum** | **52.0036** | **47.8064** | **41.3673** | **0.1032** | **7.0677** | **1.2476** | **7.8574** | **3.1027** | **1.1880** | **3.8330** | **0.0000** | **10,894.9557** | **10,894.9557** | **1.1221** | **0.0000** | **10,923.0086** |

| | **ROG** | **NOx** | **CO** | **SO2** | **Fugitive PM10** | **Exhaust PM10** | **PM10 Total** | **Fugitive PM2.5** | **Exhaust PM2.5** | **PM2.5 Total** | **Bio- CO2** | **NBio-CO2** | **Total CO2** | **CH4** | **N20** | **CO2e** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Percent Reduction** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** |

## 2.2 Overall Operational

### Unmitigated Operational

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Area | 11.3853 | 5.4805 | 30.7759 | 0.0344 | | 0.5739 | 0.5739 | | 0.5739 | 0.5739 | 0.0000 | 6,626.6715 | 6,626.6715 | 0.1760 | 0.1206 | 6,666.9952 |
| Energy | 0.0947 | 0.8092 | 0.3470 | 5.1600e-003 | | 0.0654 | 0.0654 | | 0.0654 | 0.0654 | | 1,032.5844 | 1,032.5844 | 0.0198 | 0.0189 | 1,038.7206 |
| Mobile | 4.9496 | 23.7781 | 61.3812 | 0.2061 | 16.9492 | 0.1808 | 17.1300 | 4.5361 | 0.1688 | 4.7049 | | 20,970.9599 | 20,970.9599 | 1.1678 | | 21,000.1550 |
| **Total** | **16.4296** | **30.0678** | **92.5041** | **0.2457** | **16.9492** | **0.8201** | **17.7693** | **4.5361** | **0.8081** | **5.3442** | **0.0000** | **28,630.2158** | **28,630.2158** | **1.3636** | **0.1395** | **28,705.8708** |

### Mitigated Operational

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Area | 11.3853 | 5.4805 | 30.7759 | 0.0344 | | 0.5739 | 0.5739 | | 0.5739 | 0.5739 | 0.0000 | 6,626.6715 | 6,626.6715 | 0.1760 | 0.1206 | 6,666.9952 |
| Energy | 0.0947 | 0.8092 | 0.3470 | 5.1600e-003 | | 0.0654 | 0.0654 | | 0.0654 | 0.0654 | | 1,032.5844 | 1,032.5844 | 0.0198 | 0.0189 | 1,038.7206 |
| Mobile | 4.9496 | 23.7781 | 61.3812 | 0.2061 | 16.9492 | 0.1808 | 17.1300 | 4.5361 | 0.1688 | 4.7049 | | 20,970.9599 | 20,970.9599 | 1.1678 | | 21,000.1550 |
| **Total** | **16.4296** | **30.0678** | **92.5041** | **0.2457** | **16.9492** | **0.8201** | **17.7693** | **4.5361** | **0.8081** | **5.3442** | **0.0000** | **28,630.2158** | **28,630.2158** | **1.3636** | **0.1395** | **28,705.8708** |

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio-CO2 | Total CO2 | CH4 | N20 | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Percent Reduction** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** |

## 3.0 Construction Detail

**Construction Phase**

| Phase Number | Phase Name | Phase Type | Start Date | End Date | Num Days Week | Num Days | Phase Description |
|---|---|---|---|---|---|---|---|
| 1 | Demolition | Demolition | 1/1/2020 | 2/27/2020 | 5 | 42 | |
| 2 | Site Preparation | Site Preparation | 2/28/2020 | 3/5/2020 | 5 | 5 | |
| 3 | Grading | Grading | 3/6/2020 | 6/5/2020 | 5 | 66 | |
| 4 | Building Construction | Building Construction | 6/8/2020 | 10/28/2021 | 5 | 364 | |
| 5 | Paving | Paving | 9/1/2021 | 11/26/2021 | 5 | 63 | |
| 6 | Architectural Coating | Architectural Coating | 9/1/2021 | 11/26/2021 | 5 | 63 | |

**Acres of Grading (Site Preparation Phase): 0**

**Acres of Grading (Grading Phase): 24.75**

**Acres of Paving: 0.4**

**Residential Indoor: 893,760; Residential Outdoor: 297,920; Non-Residential Indoor: 21,722; Non-Residential Outdoor: 7,241; Striped Parking Area: 13,050 (Architectural Coating – sqft)**

**OffRoad Equipment**

| Phase Name | Offroad Equipment Type | Amount | Usage Hours | Horse Power | Load Factor |
|---|---|---|---|---|---|
| Demolition | Concrete/Industrial Saws | 1 | 8.00 | 81 | 0.73 |
| Demolition | Rubber Tired Dozers | 1 | 8.00 | 247 | 0.40 |
| Demolition | Tractors/Loaders/Backhoes | 3 | 8.00 | 97 | 0.37 |
| Site Preparation | Graders | 1 | 8.00 | 187 | 0.41 |
| Site Preparation | Rubber Tired Dozers | 1 | 7.00 | 247 | 0.40 |
| Site Preparation | Tractors/Loaders/Backhoes | 1 | 8.00 | 97 | 0.37 |
| Grading | Graders | 1 | 6.00 | 187 | 0.41 |
| Grading | Rubber Tired Dozers | 1 | 6.00 | 247 | 0.40 |
| Grading | Tractors/Loaders/Backhoes | 1 | 7.00 | 97 | 0.37 |
| Building Construction | Cranes | 1 | 6.00 | 231 | 0.29 |
| Building Construction | Forklifts | 1 | 6.00 | 89 | 0.20 |
| Building Construction | Generator Sets | 1 | 8.00 | 84 | 0.74 |
| Building Construction | Tractors/Loaders/Backhoes | 1 | 6.00 | 97 | 0.37 |
| Building Construction | Welders | 3 | 8.00 | 46 | 0.45 |
| Paving | Cement and Mortar Mixers | 1 | 6.00 | 9 | 0.56 |
| Paving | Pavers | 1 | 6.00 | 130 | 0.42 |
| Paving | Paving Equipment | 1 | 8.00 | 132 | 0.36 |
| Paving | Rollers | 1 | 7.00 | 80 | 0.38 |
| Paving | Tractors/Loaders/Backhoes | 1 | 8.00 | 97 | 0.37 |
| Architectural Coating | Air Compressors | 1 | 6.00 | 78 | 0.48 |

## Trips and VMT

| Phase Name | Offroad Equipment Count | Worker Trip Number | Vendor Trip Number | Hauling Trip Number | Worker Trip Length | Vendor Trip Length | Hauling Trip Length | Worker Vehicle Class | Vendor Vehicle Class | Hauling Vehicle Class |
|---|---|---|---|---|---|---|---|---|---|---|
| Demolition | 5 | 13.00 | 0.00 | 24.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Site Preparation | 3 | 8.00 | 0.00 | 0.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Grading | 3 | 8.00 | 0.00 | 7,408.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Building Construction | 7 | 344.00 | 75.00 | 0.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Paving | 5 | 13.00 | 0.00 | 0.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Architectural Coating | 1 | 69.00 | 0.00 | 0.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |

## 3.1 Mitigation Measures Construction

## 3.2 Demolition - 2020

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Fugitive Dust | | | | | 0.1223 | 0.0000 | 0.1223 | 0.0185 | 0.0000 | 0.0185 | | | 0.0000 | | | 0.0000 |
| Off-Road | 2.1262 | 20.9463 | 14.6573 | 0.0241 | | 1.1525 | 1.1525 | | 1.0761 | 1.0761 | | 2,322.3127 | 2,322.3127 | 0.5970 | | 2,337.2363 |
| **Total** | **2.1262** | **20.9463** | **14.6573** | **0.0241** | **0.1223** | **1.1525** | **1.2748** | **0.0185** | **1.0761** | **1.0947** | | **2,322.3127** | **2,322.3127** | **0.5970** | | **2,337.2363** |

## 3.2 Demolition - 2020

### Unmitigated Construction Off-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 5.1100e-003 | 0.1664 | 0.0387 | 4.4000e-004 | 9.9900e-003 | 5.3000e-004 | 0.0105 | 2.7400e-003 | 5.1000e-004 | 3.2500e-003 | | 48.0625 | 48.0625 | 3.4500e-003 | | 48.1488 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0664 | 0.0471 | 0.5213 | 1.4500e-003 | 0.1453 | 1.2100e-003 | 0.1465 | 0.0385 | 1.1200e-003 | 0.0397 | | 143.9647 | 143.9647 | 4.5400e-003 | | 144.0781 |
| **Total** | **0.0715** | **0.2136** | **0.5600** | **1.8900e-003** | **0.1553** | **1.7400e-003** | **0.1570** | **0.0413** | **1.6300e-003** | **0.0429** | | **192.0272** | **192.0272** | **7.9900e-003** | | **192.2269** |

### Mitigated Construction On-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Fugitive Dust | | | | | 0.1223 | 0.0000 | 0.1223 | 0.0185 | 0.0000 | 0.0185 | | | 0.0000 | | | 0.0000 |
| Off-Road | 2.1262 | 20.9463 | 14.6573 | 0.0241 | | 1.1525 | 1.1525 | | 1.0761 | 1.0761 | 0.0000 | 2,322.3127 | 2,322.3127 | 0.5970 | | 2,337.2363 |
| **Total** | **2.1262** | **20.9463** | **14.6573** | **0.0241** | **0.1223** | **1.1525** | **1.2748** | **0.0185** | **1.0761** | **1.0947** | **0.0000** | **2,322.3127** | **2,322.3127** | **0.5970** | | **2,337.2363** |

## 3.2 Demolition - 2020

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 5.1100e-003 | 0.1664 | 0.0387 | 4.4000e-004 | 9.9900e-003 | 5.3000e-004 | 0.0105 | 2.7400e-003 | 5.1000e-004 | 3.2500e-003 | | 48.0625 | 48.0625 | 3.4500e-003 | | 48.1488 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0664 | 0.0471 | 0.5213 | 1.4500e-003 | 0.1453 | 1.2100e-003 | 0.1465 | 0.0385 | 1.1200e-003 | 0.0397 | | 143.9647 | 143.9647 | 4.5400e-003 | | 144.0781 |
| **Total** | **0.0715** | **0.2136** | **0.5600** | **1.8900e-003** | **0.1553** | **1.7400e-003** | **0.1570** | **0.0413** | **1.6300e-003** | **0.0429** | | **192.0272** | **192.0272** | **7.9900e-003** | | **192.2269** |

## 3.3 Site Preparation - 2020

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Fugitive Dust | | | | | 5.2693 | 0.0000 | 5.2693 | 2.8965 | 0.0000 | 2.8965 | | | 0.0000 | | | 0.0000 |
| Off-Road | 1.6299 | 18.3464 | 7.7093 | 0.0172 | | 0.8210 | 0.8210 | | 0.7553 | 0.7553 | | 1,667.4119 | 1,667.4119 | 0.5393 | | 1,680.8937 |
| **Total** | **1.6299** | **18.3464** | **7.7093** | **0.0172** | **5.2693** | **0.8210** | **6.0903** | **2.8965** | **0.7553** | **3.6517** | | **1,667.4119** | **1,667.4119** | **0.5393** | | **1,680.8937** |

## 3.3 Site Preparation - 2020

**Unmitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0409 | 0.0290 | 0.3208 | 8.9000e-004 | 0.0894 | 7.5000e-004 | 0.0902 | 0.0237 | 6.9000e-004 | 0.0244 | | 88.5936 | 88.5936 | 2.7900e-003 | | 88.6634 |
| **Total** | **0.0409** | **0.0290** | **0.3208** | **8.9000e-004** | **0.0894** | **7.5000e-004** | **0.0902** | **0.0237** | **6.9000e-004** | **0.0244** | | **88.5936** | **88.5936** | **2.7900e-003** | | **88.6634** |

**Mitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Fugitive Dust | | | | | 5.2693 | 0.0000 | 5.2693 | 2.8965 | 0.0000 | 2.8965 | | | 0.0000 | | | 0.0000 |
| Off-Road | 1.6299 | 18.3464 | 7.7093 | 0.0172 | | 0.8210 | 0.8210 | | 0.7553 | 0.7553 | 0.0000 | 1,667.4119 | 1,667.4119 | 0.5393 | | 1,680.8937 |
| **Total** | **1.6299** | **18.3464** | **7.7093** | **0.0172** | **5.2693** | **0.8210** | **6.0903** | **2.8965** | **0.7553** | **3.6517** | **0.0000** | **1,667.4119** | **1,667.4119** | **0.5393** | | **1,680.8937** |

## 3.3 Site Preparation - 2020

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0409 | 0.0290 | 0.3208 | 8.9000e-004 | 0.0894 | 7.5000e-004 | 0.0902 | 0.0237 | 6.9000e-004 | 0.0244 | | 88.5936 | 88.5936 | 2.7900e-003 | | 88.6634 |
| **Total** | **0.0409** | **0.0290** | **0.3208** | **8.9000e-004** | **0.0894** | **7.5000e-004** | **0.0902** | **0.0237** | **6.9000e-004** | **0.0244** | | **88.5936** | **88.5936** | **2.7900e-003** | | **88.6634** |

## 3.4 Grading - 2020

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Fugitive Dust | | | | | 5.0158 | 0.0000 | 5.0158 | 2.5410 | 0.0000 | 2.5410 | | | 0.0000 | | | 0.0000 |
| Off-Road | 1.3498 | 15.0854 | 6.4543 | 0.0141 | | 0.6844 | 0.6844 | | 0.6296 | 0.6296 | | 1,365.7183 | 1,365.7183 | 0.4417 | | 1,376.7609 |
| **Total** | **1.3498** | **15.0854** | **6.4543** | **0.0141** | **5.0158** | **0.6844** | **5.7002** | **2.5410** | **0.6296** | **3.1706** | | **1,365.7183** | **1,365.7183** | **0.4417** | | **1,376.7609** |

## 3.4 Grading - 2020

**Unmitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 1.0043 | 32.6920 | 7.6005 | 0.0871 | 1.9625 | 0.1046 | 2.0671 | 0.5380 | 0.1001 | 0.6380 | | 9,440.643 7 | 9,440.643 7 | 0.6776 | | 9,457.584 3 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0409 | 0.0290 | 0.3208 | 8.9000e-004 | 0.0894 | 7.5000e-004 | 0.0902 | 0.0237 | 6.9000e-004 | 0.0244 | | 88.5936 | 88.5936 | 2.7900e-003 | | 88.6634 |
| **Total** | **1.0451** | **32.7210** | **7.9213** | **0.0880** | **2.0519** | **0.1053** | **2.1573** | **0.5617** | **0.1008** | **0.6624** | | **9,529.237 3** | **9,529.237 3** | **0.6804** | | **9,546.247 7** |

**Mitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Fugitive Dust | | | | | 5.0158 | 0.0000 | 5.0158 | 2.5410 | 0.0000 | 2.5410 | | | 0.0000 | | | 0.0000 |
| Off-Road | 1.3498 | 15.0854 | 6.4543 | 0.0141 | | 0.6844 | 0.6844 | | 0.6296 | 0.6296 | 0.0000 | 1,365.718 3 | 1,365.718 3 | 0.4417 | | 1,376.760 9 |
| **Total** | **1.3498** | **15.0854** | **6.4543** | **0.0141** | **5.0158** | **0.6844** | **5.7002** | **2.5410** | **0.6296** | **3.1706** | **0.0000** | **1,365.718 3** | **1,365.718 3** | **0.4417** | | **1,376.760 9** |

## 3.4 Grading - 2020

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 1.0043 | 32.6920 | 7.6005 | 0.0871 | 1.9625 | 0.1046 | 2.0671 | 0.5380 | 0.1001 | 0.6380 | | 9,440.643 7 | 9,440.643 7 | 0.6776 | | 9,457.584 3 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0409 | 0.0290 | 0.3208 | 8.9000e-004 | 0.0894 | 7.5000e-004 | 0.0902 | 0.0237 | 6.9000e-004 | 0.0244 | | 88.5936 | 88.5936 | 2.7900e-003 | | 88.6634 |
| **Total** | **1.0451** | **32.7210** | **7.9213** | **0.0880** | **2.0519** | **0.1053** | **2.1573** | **0.5617** | **0.1008** | **0.6624** | | **9,529.237 3** | **9,529.237 3** | **0.6804** | | **9,546.247 7** |

## 3.5 Building Construction - 2020

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Off-Road | 2.0305 | 14.7882 | 13.1881 | 0.0220 | | 0.7960 | 0.7960 | | 0.7688 | 0.7688 | | 2,001.159 5 | 2,001.159 5 | 0.3715 | | 2,010.446 7 |
| **Total** | **2.0305** | **14.7882** | **13.1881** | **0.0220** | | **0.7960** | **0.7960** | | **0.7688** | **0.7688** | | **2,001.159 5** | **2,001.159 5** | **0.3715** | | **2,010.446 7** |

## 3.5 Building Construction - 2020

### Unmitigated Construction Off-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.2789 | 7.9763 | 2.3054 | 0.0189 | 0.4802 | 0.0382 | 0.5183 | 0.1382 | 0.0365 | 0.1747 | | 2,020.868 0 | 2,020.868 0 | 0.1351 | | 2,024.246 3 |
| Worker | 1.7579 | 1.2469 | 13.7948 | 0.0383 | 3.8451 | 0.0321 | 3.8773 | 1.0197 | 0.0296 | 1.0494 | | 3,809.526 1 | 3,809.526 1 | 0.1201 | | 3,812.528 0 |
| **Total** | **2.0368** | **9.2232** | **16.1002** | **0.0572** | **4.3253** | **0.0703** | **4.3956** | **1.1580** | **0.0661** | **1.2241** | | **5,830.394 1** | **5,830.394 1** | **0.2552** | | **5,836.774 3** |

### Mitigated Construction On-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Off-Road | 2.0305 | 14.7882 | 13.1881 | 0.0220 | | 0.7960 | 0.7960 | | 0.7688 | 0.7688 | 0.0000 | 2,001.159 5 | 2,001.159 5 | 0.3715 | | 2,010.446 7 |
| **Total** | **2.0305** | **14.7882** | **13.1881** | **0.0220** | | **0.7960** | **0.7960** | | **0.7688** | **0.7688** | **0.0000** | **2,001.159 5** | **2,001.159 5** | **0.3715** | | **2,010.446 7** |

## 3.5 Building Construction - 2020

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.2789 | 7.9763 | 2.3054 | 0.0189 | 0.4802 | 0.0382 | 0.5183 | 0.1382 | 0.0365 | 0.1747 | | 2,020.868 0 | 2,020.868 0 | 0.1351 | | 2,024.246 3 |
| Worker | 1.7579 | 1.2469 | 13.7948 | 0.0383 | 3.8451 | 0.0321 | 3.8773 | 1.0197 | 0.0296 | 1.0494 | | 3,809.526 1 | 3,809.526 1 | 0.1201 | | 3,812.528 0 |
| **Total** | **2.0368** | **9.2232** | **16.1002** | **0.0572** | **4.3253** | **0.0703** | **4.3956** | **1.1580** | **0.0661** | **1.2241** | | **5,830.394 1** | **5,830.394 1** | **0.2552** | | **5,836.774 3** |

## 3.5 Building Construction - 2021

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Off-Road | 1.8125 | 13.6361 | 12.8994 | 0.0221 | | 0.6843 | 0.6843 | | 0.6608 | 0.6608 | | 2,001.220 0 | 2,001.220 0 | 0.3573 | | 2,010.151 7 |
| **Total** | **1.8125** | **13.6361** | **12.8994** | **0.0221** | | **0.6843** | **0.6843** | | **0.6608** | **0.6608** | | **2,001.220 0** | **2,001.220 0** | **0.3573** | | **2,010.151 7** |

## 3.5 Building Construction - 2021

### Unmitigated Construction Off-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.2393 | 7.2667 | 2.1058 | 0.0188 | 0.4802 | 0.0154 | 0.4955 | 0.1383 | 0.0147 | 0.1529 | | 2,005.091 4 | 2,005.091 4 | 0.1294 | | 2,008.327 5 |
| Worker | 1.6403 | 1.1220 | 12.6680 | 0.0370 | 3.8451 | 0.0311 | 3.8762 | 1.0197 | 0.0286 | 1.0484 | | 3,688.543 8 | 3,688.543 8 | 0.1085 | | 3,691.257 3 |
| **Total** | **1.8796** | **8.3886** | **14.7738** | **0.0558** | **4.3253** | **0.0464** | **4.3717** | **1.1580** | **0.0433** | **1.2013** | | **5,693.635 2** | **5,693.635 2** | **0.2380** | | **5,699.584 7** |

### Mitigated Construction On-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Off-Road | 1.8125 | 13.6361 | 12.8994 | 0.0221 | | 0.6843 | 0.6843 | | 0.6608 | 0.6608 | 0.0000 | 2,001.220 0 | 2,001.220 0 | 0.3573 | | 2,010.151 7 |
| **Total** | **1.8125** | **13.6361** | **12.8994** | **0.0221** | | **0.6843** | **0.6843** | | **0.6608** | **0.6608** | **0.0000** | **2,001.220 0** | **2,001.220 0** | **0.3573** | | **2,010.151 7** |

## 3.5 Building Construction - 2021

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.2393 | 7.2667 | 2.1058 | 0.0188 | 0.4802 | 0.0154 | 0.4955 | 0.1383 | 0.0147 | 0.1529 | | 2,005.091 4 | 2,005.091 4 | 0.1294 | | 2,008.327 5 |
| Worker | 1.6403 | 1.1220 | 12.6680 | 0.0370 | 3.8451 | 0.0311 | 3.8762 | 1.0197 | 0.0286 | 1.0484 | | 3,688.543 8 | 3,688.543 8 | 0.1085 | | 3,691.257 3 |
| **Total** | **1.8796** | **8.3886** | **14.7738** | **0.0558** | **4.3253** | **0.0464** | **4.3717** | **1.1580** | **0.0433** | **1.2013** | | **5,693.635 2** | **5,693.635 2** | **0.2380** | | **5,699.584 7** |

## 3.6 Paving - 2021

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Off-Road | 0.7739 | 7.7422 | 8.8569 | 0.0135 | | 0.4153 | 0.4153 | | 0.3830 | 0.3830 | | 1,296.866 4 | 1,296.866 4 | 0.4111 | | 1,307.144 2 |
| Paving | 0.0000 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| **Total** | **0.7739** | **7.7422** | **8.8569** | **0.0135** | | **0.4153** | **0.4153** | | **0.3830** | **0.3830** | | **1,296.866 4** | **1,296.866 4** | **0.4111** | | **1,307.144 2** |

## 3.6 Paving - 2021

**Unmitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0620 | 0.0424 | 0.4787 | 1.4000e-003 | 0.1453 | 1.1700e-003 | 0.1465 | 0.0385 | 1.0800e-003 | 0.0396 | | 139.3926 | 139.3926 | 4.1000e-003 | | 139.4952 |
| **Total** | **0.0620** | **0.0424** | **0.4787** | **1.4000e-003** | **0.1453** | **1.1700e-003** | **0.1465** | **0.0385** | **1.0800e-003** | **0.0396** | | **139.3926** | **139.3926** | **4.1000e-003** | | **139.4952** |

**Mitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Off-Road | 0.7739 | 7.7422 | 8.8569 | 0.0135 | | 0.4153 | 0.4153 | | 0.3830 | 0.3830 | 0.0000 | 1,296.8664 | 1,296.8664 | 0.4111 | | 1,307.1442 |
| Paving | 0.0000 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| **Total** | **0.7739** | **7.7422** | **8.8569** | **0.0135** | | **0.4153** | **0.4153** | | **0.3830** | **0.3830** | **0.0000** | **1,296.8664** | **1,296.8664** | **0.4111** | | **1,307.1442** |

## 3.6 Paving - 2021

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0620 | 0.0424 | 0.4787 | 1.4000e-003 | 0.1453 | 1.1700e-003 | 0.1465 | 0.0385 | 1.0800e-003 | 0.0396 | | 139.3926 | 139.3926 | 4.1000e-003 | | 139.4952 |
| **Total** | **0.0620** | **0.0424** | **0.4787** | **1.4000e-003** | **0.1453** | **1.1700e-003** | **0.1465** | **0.0385** | **1.0800e-003** | **0.0396** | | **139.3926** | **139.3926** | **4.1000e-003** | | **139.4952** |

## 3.7 Architectural Coating - 2021

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Archit. Coating | 46.9278 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| Off-Road | 0.2189 | 1.5268 | 1.8176 | 2.9700e-003 | | 0.0941 | 0.0941 | | 0.0941 | 0.0941 | | 281.4481 | 281.4481 | 0.0193 | | 281.9309 |
| **Total** | **47.1467** | **1.5268** | **1.8176** | **2.9700e-003** | | **0.0941** | **0.0941** | | **0.0941** | **0.0941** | | **281.4481** | **281.4481** | **0.0193** | | **281.9309** |

## 3.7 Architectural Coating - 2021

**Unmitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.3290 | 0.2250 | 2.5410 | 7.4300e-003 | 0.7713 | 6.2300e-003 | 0.7775 | 0.2045 | 5.7400e-003 | 0.2103 | | 739.8533 | 739.8533 | 0.0218 | | 740.3975 |
| **Total** | **0.3290** | **0.2250** | **2.5410** | **7.4300e-003** | **0.7713** | **6.2300e-003** | **0.7775** | **0.2045** | **5.7400e-003** | **0.2103** | | **739.8533** | **739.8533** | **0.0218** | | **740.3975** |

**Mitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Archit. Coating | 46.9278 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| Off-Road | 0.2189 | 1.5268 | 1.8176 | 2.9700e-003 | | 0.0941 | 0.0941 | | 0.0941 | 0.0941 | 0.0000 | 281.4481 | 281.4481 | 0.0193 | | 281.9309 |
| **Total** | **47.1467** | **1.5268** | **1.8176** | **2.9700e-003** | | **0.0941** | **0.0941** | | **0.0941** | **0.0941** | **0.0000** | **281.4481** | **281.4481** | **0.0193** | | **281.9309** |

### 3.7 Architectural Coating - 2021

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.3290 | 0.2250 | 2.5410 | 7.4300e-003 | 0.7713 | 6.2300e-003 | 0.7775 | 0.2045 | 5.7400e-003 | 0.2103 | | 739.8533 | 739.8533 | 0.0218 | | 740.3975 |
| **Total** | **0.3290** | **0.2250** | **2.5410** | **7.4300e-003** | **0.7713** | **6.2300e-003** | **0.7775** | **0.2045** | **5.7400e-003** | **0.2103** | | **739.8533** | **739.8533** | **0.0218** | | **740.3975** |

## 4.0 Operational Detail - Mobile

### 4.1 Mitigation Measures Mobile

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Mitigated | 4.9496 | 23.7781 | 61.3812 | 0.2061 | 16.9492 | 0.1808 | 17.1300 | 4.5361 | 0.1688 | 4.7049 | | 20,970.95 99 | 20,970.95 99 | 1.1678 | | 21,000.15 50 |
| Unmitigated | 4.9496 | 23.7781 | 61.3812 | 0.2061 | 16.9492 | 0.1808 | 17.1300 | 4.5361 | 0.1688 | 4.7049 | | 20,970.95 99 | 20,970.95 99 | 1.1678 | | 21,000.15 50 |

## 4.2 Trip Summary Information

| | Average Daily Trip Rate | | | Unmitigated | Mitigated |
|---|---|---|---|---|---|
| Land Use | Weekday | Saturday | Sunday | Annual VMT | Annual VMT |
| Apartments High Rise | 708.47 | 718.62 | 708.47 | 2,425,904 | 2,425,904 |
| Apartments Mid Rise | 606.34 | 681.60 | 606.34 | 2,108,695 | 2,108,695 |
| Enclosed Parking Structure | 0.00 | 0.00 | 0.00 | | |
| Regional Shopping Center | 1,258.75 | 1,473.05 | 1258.75 | 2,788,687 | 2,788,687 |
| Total | 2,573.56 | 2,873.27 | 2,573.56 | 7,323,287 | 7,323,287 |

## 4.3 Trip Type Information

| | Miles | | | Trip % | | | Trip Purpose % | | |
|---|---|---|---|---|---|---|---|---|---|
| Land Use | H-W or C-W | H-S or C-C | H-O or C-NW | H-W or C-W | H-S or C-C | H-O or C-NW | Primary | Diverted | Pass-by |
| Apartments High Rise | 14.70 | 5.90 | 8.70 | 40.20 | 19.20 | 40.60 | 86 | 11 | 3 |
| Apartments Mid Rise | 14.70 | 5.90 | 8.70 | 40.20 | 19.20 | 40.60 | 86 | 11 | 3 |
| Enclosed Parking Structure | 16.60 | 8.40 | 6.90 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Regional Shopping Center | 16.60 | 8.40 | 6.90 | 16.30 | 64.70 | 19.00 | 54 | 35 | 11 |

## 4.4 Fleet Mix

| Land Use | LDA | LDT1 | LDT2 | MDV | LHD1 | LHD2 | MHD | HHD | OBUS | UBUS | MCY | SBUS | MH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apartments High Rise | 0.547192 | 0.045177 | 0.202743 | 0.121510 | 0.016147 | 0.006143 | 0.019743 | 0.029945 | 0.002479 | 0.002270 | 0.005078 | 0.000682 | 0.000891 |
| Apartments Mid Rise | 0.547192 | 0.045177 | 0.202743 | 0.121510 | 0.016147 | 0.006143 | 0.019743 | 0.029945 | 0.002479 | 0.002270 | 0.005078 | 0.000682 | 0.000891 |
| Enclosed Parking Structure | 0.547192 | 0.045177 | 0.202743 | 0.121510 | 0.016147 | 0.006143 | 0.019743 | 0.029945 | 0.002479 | 0.002270 | 0.005078 | 0.000682 | 0.000891 |
| Regional Shopping Center | 0.547192 | 0.045177 | 0.202743 | 0.121510 | 0.016147 | 0.006143 | 0.019743 | 0.029945 | 0.002479 | 0.002270 | 0.005078 | 0.000682 | 0.000891 |

## 5.0 Energy Detail

Historical Energy Use: N

### 5.1 Mitigation Measures Energy

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| NaturalGas Mitigated | 0.0947 | 0.8092 | 0.3470 | 5.1600e-003 | | 0.0654 | 0.0654 | | 0.0654 | 0.0654 | | 1,032.5844 | 1,032.5844 | 0.0198 | 0.0189 | 1,038.7206 |
| NaturalGas Unmitigated | 0.0947 | 0.8092 | 0.3470 | 5.1600e-003 | | 0.0654 | 0.0654 | | 0.0654 | 0.0654 | | 1,032.5844 | 1,032.5844 | 0.0198 | 0.0189 | 1,038.7206 |

## 5.2 Energy by Land Use - NaturalGas

**Unmitigated**

| | NaturalGas Use | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Use | kBTU/yr | lb/day | | | | | | | | | | lb/day | | | | | |
| Apartments High Rise | 5126.13 | 0.0553 | 0.4724 | 0.2010 | 3.0200e-003 | | 0.0382 | 0.0382 | | 0.0382 | 0.0382 | | 603.0746 | 603.0746 | 0.0116 | 0.0111 | 606.6583 |
| Apartments Mid Rise | 3585.77 | 0.0387 | 0.3305 | 0.1406 | 2.1100e-003 | | 0.0267 | 0.0267 | | 0.0267 | 0.0267 | | 421.8551 | 421.8551 | 8.0900e-003 | 7.7300e-003 | 424.3620 |
| Enclosed Parking Structure | 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Regional Shopping Center | 65.0653 | 7.0000e-004 | 6.3800e-003 | 5.3600e-003 | 4.0000e-005 | | 4.8000e-004 | 4.8000e-004 | | 4.8000e-004 | 4.8000e-004 | | 7.6547 | 7.6547 | 1.5000e-004 | 1.4000e-004 | 7.7002 |
| **Total** | | **0.0947** | **0.8092** | **0.3470** | **5.1700e-003** | | **0.0654** | **0.0654** | | **0.0654** | **0.0654** | | **1,032.5844** | **1,032.5844** | **0.0198** | **0.0189** | **1,038.7205** |

## 5.2 Energy by Land Use - NaturalGas

**Mitigated**

| | NaturalGas Use | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Use | kBTU/yr | lb/day | | | | | | | | | | lb/day | | | | | |
| Apartments High Rise | 5.12613 | 0.0553 | 0.4724 | 0.2010 | 3.0200e-003 | | 0.0382 | 0.0382 | | 0.0382 | 0.0382 | | 603.0746 | 603.0746 | 0.0116 | 0.0111 | 606.6583 |
| Apartments Mid Rise | 3.58577 | 0.0387 | 0.3305 | 0.1406 | 2.1100e-003 | | 0.0267 | 0.0267 | | 0.0267 | 0.0267 | | 421.8551 | 421.8551 | 8.0900e-003 | 7.7300e-003 | 424.3620 |
| Enclosed Parking Structure | 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Regional Shopping Center | 0.0650653 | 7.0000e-004 | 6.3800e-003 | 5.3600e-003 | 4.0000e-005 | | 4.8000e-004 | 4.8000e-004 | | 4.8000e-004 | 4.8000e-004 | | 7.6547 | 7.6547 | 1.5000e-004 | 1.4000e-004 | 7.7002 |
| **Total** | | **0.0947** | **0.8092** | **0.3470** | **5.1700e-003** | | **0.0654** | **0.0654** | | **0.0654** | **0.0654** | | **1,032.5844** | **1,032.5844** | **0.0198** | **0.0189** | **1,038.7205** |

# 6.0 Area Detail

## 6.1 Mitigation Measures Area

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Mitigated | 11.3853 | 5.4805 | 30.7759 | 0.0344 | | 0.5739 | 0.5739 | | 0.5739 | 0.5739 | 0.0000 | 6,626.6715 | 6,626.6715 | 0.1760 | 0.1206 | 6,666.9952 |
| Unmitigated | 11.3853 | 5.4805 | 30.7759 | 0.0344 | | 0.5739 | 0.5739 | | 0.5739 | 0.5739 | 0.0000 | 6,626.6715 | 6,626.6715 | 0.1760 | 0.1206 | 6,666.9952 |

## 6.2 Area by SubCategory

**Unmitigated**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SubCategory | lb/day | | | | | | | | | | lb/day | | | | | |
| Architectural Coating | 0.8100 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| Consumer Products | 9.1028 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| Hearth | 0.6027 | 5.1507 | 2.1918 | 0.0329 | | 0.4164 | 0.4164 | | 0.4164 | 0.4164 | 0.0000 | 6,575.2941 | 6,575.2941 | 0.1260 | 0.1206 | 6,614.3678 |
| Landscaping | 0.8698 | 0.3298 | 28.5842 | 1.5100e-003 | | 0.1575 | 0.1575 | | 0.1575 | 0.1575 | | 51.3774 | 51.3774 | 0.0500 | | 52.6274 |
| **Total** | **11.3853** | **5.4805** | **30.7759** | **0.0344** | | **0.5739** | **0.5739** | | **0.5739** | **0.5739** | **0.0000** | **6,626.6715** | **6,626.6715** | **0.1760** | **0.1206** | **6,666.9952** |

## 6.2 Area by SubCategory

**Mitigated**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SubCategory | lb/day | | | | | | | | | | lb/day | | | | | |
| Architectural Coating | 0.8100 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| Consumer Products | 9.1028 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| Hearth | 0.6027 | 5.1507 | 2.1918 | 0.0329 | | 0.4164 | 0.4164 | | 0.4164 | 0.4164 | 0.0000 | 6,575.294 1 | 6,575.294 1 | 0.1260 | 0.1206 | 6,614.367 8 |
| Landscaping | 0.8698 | 0.3298 | 28.5842 | 1.5100e-003 | | 0.1575 | 0.1575 | | 0.1575 | 0.1575 | | 51.3774 | 51.3774 | 0.0500 | | 52.6274 |
| **Total** | **11.3853** | **5.4805** | **30.7759** | **0.0344** | | **0.5739** | **0.5739** | | **0.5739** | **0.5739** | **0.0000** | **6,626.671 5** | **6,626.671 5** | **0.1760** | **0.1206** | **6,666.995 2** |

## 7.0 Water Detail

### 7.1 Mitigation Measures Water

## 8.0 Waste Detail

### 8.1 Mitigation Measures Waste

## 9.0 Operational Offroad

| Equipment Type | Number | Hours/Day | Days/Year | Horse Power | Load Factor | Fuel Type |
|---|---|---|---|---|---|---|

## 10.0 Stationary Equipment

**Fire Pumps and Emergency Generators**

| Equipment Type | Number | Hours/Day | Hours/Year | Horse Power | Load Factor | Fuel Type |
|---|---|---|---|---|---|---|

**Boilers**

| Equipment Type | Number | Heat Input/Day | Heat Input/Year | Boiler Rating | Fuel Type |
|---|---|---|---|---|---|

**User Defined Equipment**

| Equipment Type | Number |
|---|---|

## 11.0 Vegetation

# W3rd and Pacific - Full Buildout OY

**Los Angeles-South Coast County, Summer**

## 1.0 Project Characteristics

### 1.1 Land Usage

| Land Uses | Size | Metric | Lot Acreage | Floor Surface Area | Population |
|---|---|---|---|---|---|
| Enclosed Parking Structure | 565.00 | Space | 0.40 | 217,493.00 | 0 |
| Apartments High Rise | 203.00 | Dwelling Unit | 0.53 | 293,101.00 | 589 |
| Apartments Mid Rise | 142.00 | Dwelling Unit | 0.26 | 148,262.00 | 412 |
| Regional Shopping Center | 14.48 | 1000sqft | 0.03 | 14,481.00 | 12 |

### 1.2 Other Project Characteristics

| | | | | | |
|---|---|---|---|---|---|
| **Urbanization** | Urban | **Wind Speed (m/s)** | 2.2 | **Precipitation Freq (Days)** | 33 |
| **Climate Zone** | 11 | | | **Operational Year** | 2021 |
| **Utility Company** | Southern California Edison | | | | |
| **CO2 Intensity (lb/MWhr)** | 702.44 | **CH4 Intensity (lb/MWhr)** | 0.029 | **N2O Intensity (lb/MWhr)** | 0.006 |

### 1.3 User Entered Comments & Non-Default Data

Project Characteristics - See SWAPE comment about CO2 intensity factor.

Land Use - Matches Addendum's model. See SWAPE comment about land use sizes.

Construction Phase - Matches Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Off-road Equipment - Use of defaults as per Addendum's model.

Demolition - Matches Addendum's model.

Grading - Matches Addendum's model.

Vehicle Trips - See SWAPE comment about trip rates.

Woodstoves - Matches Addendum's model.

Energy Use -

| Table Name | Column Name | Default Value | New Value |
|---|---|---|---|
| tblConstructionPhase | NumDays | 10.00 | 63.00 |
| tblConstructionPhase | NumDays | 200.00 | 364.00 |
| tblConstructionPhase | NumDays | 20.00 | 42.00 |
| tblConstructionPhase | NumDays | 4.00 | 66.00 |
| tblConstructionPhase | NumDays | 10.00 | 63.00 |
| tblConstructionPhase | NumDays | 2.00 | 5.00 |
| tblFireplaces | NumberGas | 172.55 | 182.70 |
| tblFireplaces | NumberGas | 120.70 | 127.80 |
| tblFireplaces | NumberWood | 10.15 | 0.00 |
| tblFireplaces | NumberWood | 7.10 | 0.00 |
| tblGrading | AcresOfGrading | 2.50 | 0.00 |

| | | | |
|---|---|---|---|
| tblGrading | MaterialExported | 0.00 | 59,260.00 |
| tblLandUse | LandUseSquareFeet | 226,000.00 | 217,493.00 |
| tblLandUse | LandUseSquareFeet | 203,000.00 | 293,101.00 |
| tblLandUse | LandUseSquareFeet | 142,000.00 | 148,262.00 |
| tblLandUse | LandUseSquareFeet | 14,480.00 | 14,481.00 |
| tblLandUse | LotAcreage | 5.08 | 0.40 |
| tblLandUse | LotAcreage | 3.27 | 0.53 |
| tblLandUse | LotAcreage | 3.74 | 0.26 |
| tblLandUse | LotAcreage | 0.33 | 0.03 |
| tblLandUse | Population | 581.00 | 589.00 |
| tblLandUse | Population | 406.00 | 412.00 |
| tblLandUse | Population | 0.00 | 12.00 |
| tblVehicleTrips | ST_TR | 4.98 | 3.54 |
| tblVehicleTrips | ST_TR | 6.39 | 4.80 |
| tblVehicleTrips | ST_TR | 49.97 | 101.73 |
| tblVehicleTrips | SU_TR | 3.65 | 3.49 |
| tblVehicleTrips | SU_TR | 5.86 | 4.27 |
| tblVehicleTrips | SU_TR | 25.24 | 86.93 |
| tblVehicleTrips | WD_TR | 4.20 | 3.49 |
| tblVehicleTrips | WD_TR | 6.65 | 4.27 |
| tblVehicleTrips | WD_TR | 42.70 | 86.93 |
| tblWoodstoves | NumberCatalytic | 10.15 | 0.00 |
| tblWoodstoves | NumberCatalytic | 7.10 | 0.00 |
| tblWoodstoves | NumberNoncatalytic | 10.15 | 0.00 |
| tblWoodstoves | NumberNoncatalytic | 7.10 | 0.00 |
| tblWoodstoves | WoodstoveDayYear | 25.00 | 0.00 |
| tblWoodstoves | WoodstoveDayYear | 25.00 | 0.00 |

| | | | |
|---|---|---|---|
| tblWoodstoves | WoodstoveWoodMass | 999.60 | 0.00 |
| tblWoodstoves | WoodstoveWoodMass | 999.60 | 0.00 |

## 2.0 Emissions Summary

## 2.1 Overall Construction (Maximum Daily Emission)

**Unmitigated Construction**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | lb/day | | | | | | | | | | lb/day | | | | | |
| 2020 | 3.8804 | 47.3858 | 30.3402 | 0.1037 | 7.0677 | 1.1542 | 7.8559 | 3.1027 | 1.0778 | 3.8315 | 0.0000 | 11,065.871 1 | 11,065.871 1 | 1.0985 | 0.0000 | 11,093.334 1 |
| 2021 | 51.7871 | 31.4420 | 42.6356 | 0.1066 | 5.2418 | 1.2471 | 6.4890 | 1.4011 | 1.1875 | 2.5886 | 0.0000 | 10,492.29 88 | 10,492.29 88 | 1.0521 | 0.0000 | 10,518.60 10 |
| **Maximum** | **51.7871** | **47.3858** | **42.6356** | **0.1066** | **7.0677** | **1.2471** | **7.8559** | **3.1027** | **1.1875** | **3.8315** | **0.0000** | **11,065.87 11** | **11,065.87 11** | **1.0985** | **0.0000** | **11,093.33 41** |

**Mitigated Construction**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | lb/day | | | | | | | | | | lb/day | | | | | |
| 2020 | 3.8804 | 47.3858 | 30.3402 | 0.1037 | 7.0677 | 1.1542 | 7.8559 | 3.1027 | 1.0778 | 3.8315 | 0.0000 | 11,065.87 11 | 11,065.871 1 | 1.0985 | 0.0000 | 11,093.33 41 |
| 2021 | 51.7871 | 31.4420 | 42.6356 | 0.1066 | 5.2418 | 1.2471 | 6.4890 | 1.4011 | 1.1875 | 2.5886 | 0.0000 | 10,492.29 88 | 10,492.29 88 | 1.0521 | 0.0000 | 10,518.60 10 |
| **Maximum** | **51.7871** | **47.3858** | **42.6356** | **0.1066** | **7.0677** | **1.2471** | **7.8559** | **3.1027** | **1.1875** | **3.8315** | **0.0000** | **11,065.87 11** | **11,065.87 11** | **1.0985** | **0.0000** | **11,093.33 41** |

| | **ROG** | **NOx** | **CO** | **SO2** | **Fugitive PM10** | **Exhaust PM10** | **PM10 Total** | **Fugitive PM2.5** | **Exhaust PM2.5** | **PM2.5 Total** | **Bio- CO2** | **NBio-CO2** | **Total CO2** | **CH4** | **N20** | **CO2e** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Percent Reduction** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** |

## 2.2 Overall Operational

**Unmitigated Operational**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Area | 11.3853 | 5.4805 | 30.7759 | 0.0344 | | 0.5739 | 0.5739 | | 0.5739 | 0.5739 | 0.0000 | 6,626.6715 | 6,626.6715 | 0.1760 | 0.1206 | 6,666.9952 |
| Energy | 0.0947 | 0.8092 | 0.3470 | 5.1600e-003 | | 0.0654 | 0.0654 | | 0.0654 | 0.0654 | | 1,032.5844 | 1,032.5844 | 0.0198 | 0.0189 | 1,038.7206 |
| Mobile | 5.0955 | 23.2613 | 64.1419 | 0.2168 | 16.9492 | 0.1797 | 17.1289 | 4.5361 | 0.1678 | 4.7038 | | 22,049.5049 | 22,049.5049 | 1.1680 | | 22,078.7058 |
| **Total** | **16.5755** | **29.5510** | **95.2649** | **0.2564** | **16.9492** | **0.8190** | **17.7682** | **4.5361** | **0.8071** | **5.3431** | **0.0000** | **29,708.7608** | **29,708.7608** | **1.3639** | **0.1395** | **29,784.4216** |

**Mitigated Operational**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Area | 11.3853 | 5.4805 | 30.7759 | 0.0344 | | 0.5739 | 0.5739 | | 0.5739 | 0.5739 | 0.0000 | 6,626.6715 | 6,626.6715 | 0.1760 | 0.1206 | 6,666.9952 |
| Energy | 0.0947 | 0.8092 | 0.3470 | 5.1600e-003 | | 0.0654 | 0.0654 | | 0.0654 | 0.0654 | | 1,032.5844 | 1,032.5844 | 0.0198 | 0.0189 | 1,038.7206 |
| Mobile | 5.0955 | 23.2613 | 64.1419 | 0.2168 | 16.9492 | 0.1797 | 17.1289 | 4.5361 | 0.1678 | 4.7038 | | 22,049.5049 | 22,049.5049 | 1.1680 | | 22,078.7058 |
| **Total** | **16.5755** | **29.5510** | **95.2649** | **0.2564** | **16.9492** | **0.8190** | **17.7682** | **4.5361** | **0.8071** | **5.3431** | **0.0000** | **29,708.7608** | **29,708.7608** | **1.3639** | **0.1395** | **29,784.4216** |

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio-CO2 | Total CO2 | CH4 | N20 | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Percent Reduction** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

## 3.0 Construction Detail

**Construction Phase**

| Phase Number | Phase Name | Phase Type | Start Date | End Date | Num Days Week | Num Days | Phase Description |
|---|---|---|---|---|---|---|---|
| 1 | Demolition | Demolition | 1/1/2020 | 2/27/2020 | 5 | 42 | |
| 2 | Site Preparation | Site Preparation | 2/28/2020 | 3/5/2020 | 5 | 5 | |
| 3 | Grading | Grading | 3/6/2020 | 6/5/2020 | 5 | 66 | |
| 4 | Building Construction | Building Construction | 6/8/2020 | 10/28/2021 | 5 | 364 | |
| 5 | Paving | Paving | 9/1/2021 | 11/26/2021 | 5 | 63 | |
| 6 | Architectural Coating | Architectural Coating | 9/1/2021 | 11/26/2021 | 5 | 63 | |

**Acres of Grading (Site Preparation Phase): 0**

**Acres of Grading (Grading Phase): 24.75**

**Acres of Paving: 0.4**

**Residential Indoor: 893,760; Residential Outdoor: 297,920; Non-Residential Indoor: 21,722; Non-Residential Outdoor: 7,241; Striped Parking Area: 13,050 (Architectural Coating – sqft)**

**OffRoad Equipment**

| Phase Name | Offroad Equipment Type | Amount | Usage Hours | Horse Power | Load Factor |
|---|---|---|---|---|---|
| Demolition | Concrete/Industrial Saws | 1 | 8.00 | 81 | 0.73 |
| Demolition | Rubber Tired Dozers | 1 | 8.00 | 247 | 0.40 |
| Demolition | Tractors/Loaders/Backhoes | 3 | 8.00 | 97 | 0.37 |
| Site Preparation | Graders | 1 | 8.00 | 187 | 0.41 |
| Site Preparation | Rubber Tired Dozers | 1 | 7.00 | 247 | 0.40 |
| Site Preparation | Tractors/Loaders/Backhoes | 1 | 8.00 | 97 | 0.37 |
| Grading | Graders | 1 | 6.00 | 187 | 0.41 |
| Grading | Rubber Tired Dozers | 1 | 6.00 | 247 | 0.40 |
| Grading | Tractors/Loaders/Backhoes | 1 | 7.00 | 97 | 0.37 |
| Building Construction | Cranes | 1 | 6.00 | 231 | 0.29 |
| Building Construction | Forklifts | 1 | 6.00 | 89 | 0.20 |
| Building Construction | Generator Sets | 1 | 8.00 | 84 | 0.74 |
| Building Construction | Tractors/Loaders/Backhoes | 1 | 6.00 | 97 | 0.37 |
| Building Construction | Welders | 3 | 8.00 | 46 | 0.45 |
| Paving | Cement and Mortar Mixers | 1 | 6.00 | 9 | 0.56 |
| Paving | Pavers | 1 | 6.00 | 130 | 0.42 |
| Paving | Paving Equipment | 1 | 8.00 | 132 | 0.36 |
| Paving | Rollers | 1 | 7.00 | 80 | 0.38 |
| Paving | Tractors/Loaders/Backhoes | 1 | 8.00 | 97 | 0.37 |
| Architectural Coating | Air Compressors | 1 | 6.00 | 78 | 0.48 |

**Trips and VMT**

| Phase Name | Offroad Equipment Count | Worker Trip Number | Vendor Trip Number | Hauling Trip Number | Worker Trip Length | Vendor Trip Length | Hauling Trip Length | Worker Vehicle Class | Vendor Vehicle Class | Hauling Vehicle Class |
|---|---|---|---|---|---|---|---|---|---|---|
| Demolition | 5 | 13.00 | 0.00 | 24.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Site Preparation | 3 | 8.00 | 0.00 | 0.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Grading | 3 | 8.00 | 0.00 | 7,408.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Building Construction | 7 | 344.00 | 75.00 | 0.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Paving | 5 | 13.00 | 0.00 | 0.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |
| Architectural Coating | 1 | 69.00 | 0.00 | 0.00 | 14.70 | 6.90 | 20.00 | LD_Mix | HDT_Mix | HHDT |

## 3.1 Mitigation Measures Construction

## 3.2 Demolition - 2020

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Fugitive Dust | | | | | 0.1223 | 0.0000 | 0.1223 | 0.0185 | 0.0000 | 0.0185 | | | 0.0000 | | | 0.0000 |
| Off-Road | 2.1262 | 20.9463 | 14.6573 | 0.0241 | | 1.1525 | 1.1525 | | 1.0761 | 1.0761 | | 2,322.3127 | 2,322.3127 | 0.5970 | | 2,337.2363 |
| **Total** | **2.1262** | **20.9463** | **14.6573** | **0.0241** | **0.1223** | **1.1525** | **1.2748** | **0.0185** | **1.0761** | **1.0947** | | **2,322.3127** | **2,322.3127** | **0.5970** | | **2,337.2363** |

## 3.2 Demolition - 2020

### Unmitigated Construction Off-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 4.9900e-003 | 0.1643 | 0.0364 | 4.5000e-004 | 9.9900e-003 | 5.2000e-004 | 0.0105 | 2.7400e-003 | 5.0000e-004 | 3.2400e-003 | | 48.9047 | 48.9047 | 3.3300e-003 | | 48.9879 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0598 | 0.0426 | 0.5692 | 1.5400e-003 | 0.1453 | 1.2100e-003 | 0.1465 | 0.0385 | 1.1200e-003 | 0.0397 | | 152.8947 | 152.8947 | 4.8200e-003 | | 153.0152 |
| **Total** | **0.0648** | **0.2069** | **0.6056** | **1.9900e-003** | **0.1553** | **1.7300e-003** | **0.1570** | **0.0413** | **1.6200e-003** | **0.0429** | | **201.7994** | **201.7994** | **8.1500e-003** | | **202.0031** |

### Mitigated Construction On-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Fugitive Dust | | | | | 0.1223 | 0.0000 | 0.1223 | 0.0185 | 0.0000 | 0.0185 | | | 0.0000 | | | 0.0000 |
| Off-Road | 2.1262 | 20.9463 | 14.6573 | 0.0241 | | 1.1525 | 1.1525 | | 1.0761 | 1.0761 | 0.0000 | 2,322.3127 | 2,322.3127 | 0.5970 | | 2,337.2363 |
| **Total** | **2.1262** | **20.9463** | **14.6573** | **0.0241** | **0.1223** | **1.1525** | **1.2748** | **0.0185** | **1.0761** | **1.0947** | **0.0000** | **2,322.3127** | **2,322.3127** | **0.5970** | | **2,337.2363** |

## 3.2 Demolition - 2020

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 4.9900e-003 | 0.1643 | 0.0364 | 4.5000e-004 | 9.9900e-003 | 5.2000e-004 | 0.0105 | 2.7400e-003 | 5.0000e-004 | 3.2400e-003 | | 48.9047 | 48.9047 | 3.3300e-003 | | 48.9879 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0598 | 0.0426 | 0.5692 | 1.5400e-003 | 0.1453 | 1.2100e-003 | 0.1465 | 0.0385 | 1.1200e-003 | 0.0397 | | 152.8947 | 152.8947 | 4.8200e-003 | | 153.0152 |
| **Total** | **0.0648** | **0.2069** | **0.6056** | **1.9900e-003** | **0.1553** | **1.7300e-003** | **0.1570** | **0.0413** | **1.6200e-003** | **0.0429** | | **201.7994** | **201.7994** | **8.1500e-003** | | **202.0031** |

## 3.3 Site Preparation - 2020

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Fugitive Dust | | | | | 5.2693 | 0.0000 | 5.2693 | 2.8965 | 0.0000 | 2.8965 | | | 0.0000 | | | 0.0000 |
| Off-Road | 1.6299 | 18.3464 | 7.7093 | 0.0172 | | 0.8210 | 0.8210 | | 0.7553 | 0.7553 | | 1,667.4119 | 1,667.4119 | 0.5393 | | 1,680.8937 |
| **Total** | **1.6299** | **18.3464** | **7.7093** | **0.0172** | **5.2693** | **0.8210** | **6.0903** | **2.8965** | **0.7553** | **3.6517** | | **1,667.4119** | **1,667.4119** | **0.5393** | | **1,680.8937** |

## 3.3 Site Preparation - 2020

### Unmitigated Construction Off-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0368 | 0.0262 | 0.3503 | 9.4000e-004 | 0.0894 | 7.5000e-004 | 0.0902 | 0.0237 | 6.9000e-004 | 0.0244 | | 94.0890 | 94.0890 | 2.9700e-003 | | 94.1632 |
| **Total** | **0.0368** | **0.0262** | **0.3503** | **9.4000e-004** | **0.0894** | **7.5000e-004** | **0.0902** | **0.0237** | **6.9000e-004** | **0.0244** | | **94.0890** | **94.0890** | **2.9700e-003** | | **94.1632** |

### Mitigated Construction On-Site

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Fugitive Dust | | | | | 5.2693 | 0.0000 | 5.2693 | 2.8965 | 0.0000 | 2.8965 | | | 0.0000 | | | 0.0000 |
| Off-Road | 1.6299 | 18.3464 | 7.7093 | 0.0172 | | 0.8210 | 0.8210 | | 0.7553 | 0.7553 | 0.0000 | 1,667.4119 | 1,667.4119 | 0.5393 | | 1,680.8937 |
| **Total** | **1.6299** | **18.3464** | **7.7093** | **0.0172** | **5.2693** | **0.8210** | **6.0903** | **2.8965** | **0.7553** | **3.6517** | **0.0000** | **1,667.4119** | **1,667.4119** | **0.5393** | | **1,680.8937** |

## 3.3 Site Preparation - 2020

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0368 | 0.0262 | 0.3503 | 9.4000e-004 | 0.0894 | 7.5000e-004 | 0.0902 | 0.0237 | 6.9000e-004 | 0.0244 | | 94.0890 | 94.0890 | 2.9700e-003 | | 94.1632 |
| **Total** | **0.0368** | **0.0262** | **0.3503** | **9.4000e-004** | **0.0894** | **7.5000e-004** | **0.0902** | **0.0237** | **6.9000e-004** | **0.0244** | | **94.0890** | **94.0890** | **2.9700e-003** | | **94.1632** |

## 3.4 Grading - 2020

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Fugitive Dust | | | | | 5.0158 | 0.0000 | 5.0158 | 2.5410 | 0.0000 | 2.5410 | | | 0.0000 | | | 0.0000 |
| Off-Road | 1.3498 | 15.0854 | 6.4543 | 0.0141 | | 0.6844 | 0.6844 | | 0.6296 | 0.6296 | | 1,365.7183 | 1,365.7183 | 0.4417 | | 1,376.7609 |
| **Total** | **1.3498** | **15.0854** | **6.4543** | **0.0141** | **5.0158** | **0.6844** | **5.7002** | **2.5410** | **0.6296** | **3.1706** | | **1,365.7183** | **1,365.7183** | **0.4417** | | **1,376.7609** |

## 3.4 Grading - 2020

**Unmitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.9804 | 32.2743 | 7.1517 | 0.0887 | 1.9625 | 0.1030 | 2.0655 | 0.5380 | 0.0986 | 0.6365 | | 9,606.0638 | 9,606.0638 | 0.6539 | | 9,622.4100 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0368 | 0.0262 | 0.3503 | 9.4000e-004 | 0.0894 | 7.5000e-004 | 0.0902 | 0.0237 | 6.9000e-004 | 0.0244 | | 94.0890 | 94.0890 | 2.9700e-003 | | 94.1632 |
| **Total** | **1.0173** | **32.3005** | **7.5020** | **0.0896** | **2.0519** | **0.1038** | **2.1557** | **0.5617** | **0.0992** | **0.6609** | | **9,700.1528** | **9,700.1528** | **0.6568** | | **9,716.5732** |

**Mitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Fugitive Dust | | | | | 5.0158 | 0.0000 | 5.0158 | 2.5410 | 0.0000 | 2.5410 | | | 0.0000 | | | 0.0000 |
| Off-Road | 1.3498 | 15.0854 | 6.4543 | 0.0141 | | 0.6844 | 0.6844 | | 0.6296 | 0.6296 | 0.0000 | 1,365.7183 | 1,365.7183 | 0.4417 | | 1,376.7609 |
| **Total** | **1.3498** | **15.0854** | **6.4543** | **0.0141** | **5.0158** | **0.6844** | **5.7002** | **2.5410** | **0.6296** | **3.1706** | **0.0000** | **1,365.7183** | **1,365.7183** | **0.4417** | | **1,376.7609** |

## 3.4 Grading - 2020

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.9804 | 32.2743 | 7.1517 | 0.0887 | 1.9625 | 0.1030 | 2.0655 | 0.5380 | 0.0986 | 0.6365 | | 9,606.063 8 | 9,606.063 8 | 0.6539 | | 9,622.410 0 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0368 | 0.0262 | 0.3503 | 9.4000e-004 | 0.0894 | 7.5000e-004 | 0.0902 | 0.0237 | 6.9000e-004 | 0.0244 | | 94.0890 | 94.0890 | 2.9700e-003 | | 94.1632 |
| **Total** | **1.0173** | **32.3005** | **7.5020** | **0.0896** | **2.0519** | **0.1038** | **2.1557** | **0.5617** | **0.0992** | **0.6609** | | **9,700.152 8** | **9,700.152 8** | **0.6568** | | **9,716.573 2** |

## 3.5 Building Construction - 2020

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Off-Road | 2.0305 | 14.7882 | 13.1881 | 0.0220 | | 0.7960 | 0.7960 | | 0.7688 | 0.7688 | | 2,001.159 5 | 2,001.159 5 | 0.3715 | | 2,010.446 7 |
| **Total** | **2.0305** | **14.7882** | **13.1881** | **0.0220** | | **0.7960** | **0.7960** | | **0.7688** | **0.7688** | | **2,001.159 5** | **2,001.159 5** | **0.3715** | | **2,010.446 7** |

## 3.5 Building Construction - 2020

**Unmitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.2668 | 7.9779 | 2.0903 | 0.0195 | 0.4802 | 0.0376 | 0.5177 | 0.1382 | 0.0359 | 0.1742 | | 2,077.685 2 | 2,077.685 2 | 0.1268 | | 2,080.854 9 |
| Worker | 1.5831 | 1.1262 | 15.0619 | 0.0406 | 3.8451 | 0.0321 | 3.8773 | 1.0197 | 0.0296 | 1.0494 | | 4,045.828 3 | 4,045.828 3 | 0.1276 | | 4,049.017 2 |
| **Total** | **1.8499** | **9.1042** | **17.1521** | **0.0601** | **4.3253** | **0.0697** | **4.3950** | **1.1580** | **0.0655** | **1.2235** | | **6,123.513 5** | **6,123.513 5** | **0.2544** | | **6,129.872 1** |

**Mitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Off-Road | 2.0305 | 14.7882 | 13.1881 | 0.0220 | | 0.7960 | 0.7960 | | 0.7688 | 0.7688 | 0.0000 | 2,001.159 5 | 2,001.159 5 | 0.3715 | | 2,010.446 7 |
| **Total** | **2.0305** | **14.7882** | **13.1881** | **0.0220** | | **0.7960** | **0.7960** | | **0.7688** | **0.7688** | **0.0000** | **2,001.159 5** | **2,001.159 5** | **0.3715** | | **2,010.446 7** |

## 3.5 Building Construction - 2020

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.2668 | 7.9779 | 2.0903 | 0.0195 | 0.4802 | 0.0376 | 0.5177 | 0.1382 | 0.0359 | 0.1742 | | 2,077.685 2 | 2,077.685 2 | 0.1268 | | 2,080.854 9 |
| Worker | 1.5831 | 1.1262 | 15.0619 | 0.0406 | 3.8451 | 0.0321 | 3.8773 | 1.0197 | 0.0296 | 1.0494 | | 4,045.828 3 | 4,045.828 3 | 0.1276 | | 4,049.017 2 |
| **Total** | **1.8499** | **9.1042** | **17.1521** | **0.0601** | **4.3253** | **0.0697** | **4.3950** | **1.1580** | **0.0655** | **1.2235** | | **6,123.513 5** | **6,123.513 5** | **0.2544** | | **6,129.872 1** |

## 3.5 Building Construction - 2021

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Off-Road | 1.8125 | 13.6361 | 12.8994 | 0.0221 | | 0.6843 | 0.6843 | | 0.6608 | 0.6608 | | 2,001.220 0 | 2,001.220 0 | 0.3573 | | 2,010.151 7 |
| **Total** | **1.8125** | **13.6361** | **12.8994** | **0.0221** | | **0.6843** | **0.6843** | | **0.6608** | **0.6608** | | **2,001.220 0** | **2,001.220 0** | **0.3573** | | **2,010.151 7** |

## 3.5 Building Construction - 2021

**Unmitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.2280 | 7.2817 | 1.9036 | 0.0193 | 0.4802 | 0.0149 | 0.4951 | 0.1383 | 0.0142 | 0.1525 | | 2,061.6047 | 2,061.6047 | 0.1215 | | 2,064.6411 |
| Worker | 1.4746 | 1.0136 | 13.8554 | 0.0393 | 3.8451 | 0.0311 | 3.8762 | 1.0197 | 0.0286 | 1.0484 | | 3,917.3683 | 3,917.3683 | 0.1154 | | 3,920.2539 |
| **Total** | **1.7026** | **8.2953** | **15.7591** | **0.0586** | **4.3253** | **0.0460** | **4.3712** | **1.1580** | **0.0429** | **1.2009** | | **5,978.9730** | **5,978.9730** | **0.2369** | | **5,984.8950** |

**Mitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Off-Road | 1.8125 | 13.6361 | 12.8994 | 0.0221 | | 0.6843 | 0.6843 | | 0.6608 | 0.6608 | 0.0000 | 2,001.2200 | 2,001.2200 | 0.3573 | | 2,010.1517 |
| **Total** | **1.8125** | **13.6361** | **12.8994** | **0.0221** | | **0.6843** | **0.6843** | | **0.6608** | **0.6608** | **0.0000** | **2,001.2200** | **2,001.2200** | **0.3573** | | **2,010.1517** |

## 3.5 Building Construction - 2021

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.2280 | 7.2817 | 1.9036 | 0.0193 | 0.4802 | 0.0149 | 0.4951 | 0.1383 | 0.0142 | 0.1525 | | 2,061.604 7 | 2,061.604 7 | 0.1215 | | 2,064.641 1 |
| Worker | 1.4746 | 1.0136 | 13.8554 | 0.0393 | 3.8451 | 0.0311 | 3.8762 | 1.0197 | 0.0286 | 1.0484 | | 3,917.368 3 | 3,917.368 3 | 0.1154 | | 3,920.253 9 |
| **Total** | **1.7026** | **8.2953** | **15.7591** | **0.0586** | **4.3253** | **0.0460** | **4.3712** | **1.1580** | **0.0429** | **1.2009** | | **5,978.973 0** | **5,978.973 0** | **0.2369** | | **5,984.895 0** |

## 3.6 Paving - 2021

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Off-Road | 0.7739 | 7.7422 | 8.8569 | 0.0135 | | 0.4153 | 0.4153 | | 0.3830 | 0.3830 | | 1,296.866 4 | 1,296.866 4 | 0.4111 | | 1,307.144 2 |
| Paving | 0.0000 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| **Total** | **0.7739** | **7.7422** | **8.8569** | **0.0135** | | **0.4153** | **0.4153** | | **0.3830** | **0.3830** | | **1,296.866 4** | **1,296.866 4** | **0.4111** | | **1,307.144 2** |

### 3.6 Paving - 2021

**Unmitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0557 | 0.0383 | 0.5236 | 1.4900e-003 | 0.1453 | 1.1700e-003 | 0.1465 | 0.0385 | 1.0800e-003 | 0.0396 | | 148.0401 | 148.0401 | 4.3600e-003 | | 148.1491 |
| **Total** | **0.0557** | **0.0383** | **0.5236** | **1.4900e-003** | **0.1453** | **1.1700e-003** | **0.1465** | **0.0385** | **1.0800e-003** | **0.0396** | | **148.0401** | **148.0401** | **4.3600e-003** | | **148.1491** |

**Mitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Off-Road | 0.7739 | 7.7422 | 8.8569 | 0.0135 | | 0.4153 | 0.4153 | | 0.3830 | 0.3830 | 0.0000 | 1,296.8664 | 1,296.8664 | 0.4111 | | 1,307.1442 |
| Paving | 0.0000 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| **Total** | **0.7739** | **7.7422** | **8.8569** | **0.0135** | | **0.4153** | **0.4153** | | **0.3830** | **0.3830** | **0.0000** | **1,296.8664** | **1,296.8664** | **0.4111** | | **1,307.1442** |

## 3.6 Paving - 2021

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.0557 | 0.0383 | 0.5236 | 1.4900e-003 | 0.1453 | 1.1700e-003 | 0.1465 | 0.0385 | 1.0800e-003 | 0.0396 | | 148.0401 | 148.0401 | 4.3600e-003 | | 148.1491 |
| **Total** | **0.0557** | **0.0383** | **0.5236** | **1.4900e-003** | **0.1453** | **1.1700e-003** | **0.1465** | **0.0385** | **1.0800e-003** | **0.0396** | | **148.0401** | **148.0401** | **4.3600e-003** | | **148.1491** |

## 3.7 Architectural Coating - 2021

**Unmitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Archit. Coating | 46.9278 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| Off-Road | 0.2189 | 1.5268 | 1.8176 | 2.9700e-003 | | 0.0941 | 0.0941 | | 0.0941 | 0.0941 | | 281.4481 | 281.4481 | 0.0193 | | 281.9309 |
| **Total** | **47.1467** | **1.5268** | **1.8176** | **2.9700e-003** | | **0.0941** | **0.0941** | | **0.0941** | **0.0941** | | **281.4481** | **281.4481** | **0.0193** | | **281.9309** |

## 3.7 Architectural Coating - 2021

**Unmitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.2958 | 0.2033 | 2.7791 | 7.8900e-003 | 0.7713 | 6.2300e-003 | 0.7775 | 0.2045 | 5.7400e-003 | 0.2103 | | 785.7512 | 785.7512 | 0.0232 | | 786.3300 |
| **Total** | **0.2958** | **0.2033** | **2.7791** | **7.8900e-003** | **0.7713** | **6.2300e-003** | **0.7775** | **0.2045** | **5.7400e-003** | **0.2103** | | **785.7512** | **785.7512** | **0.0232** | | **786.3300** |

**Mitigated Construction On-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Archit. Coating | 46.9278 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| Off-Road | 0.2189 | 1.5268 | 1.8176 | 2.9700e-003 | | 0.0941 | 0.0941 | | 0.0941 | 0.0941 | 0.0000 | 281.4481 | 281.4481 | 0.0193 | | 281.9309 |
| **Total** | **47.1467** | **1.5268** | **1.8176** | **2.9700e-003** | | **0.0941** | **0.0941** | | **0.0941** | **0.0941** | **0.0000** | **281.4481** | **281.4481** | **0.0193** | | **281.9309** |

### 3.7 Architectural Coating - 2021

**Mitigated Construction Off-Site**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Hauling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Vendor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | | 0.0000 |
| Worker | 0.2958 | 0.2033 | 2.7791 | 7.8900e-003 | 0.7713 | 6.2300e-003 | 0.7775 | 0.2045 | 5.7400e-003 | 0.2103 | | 785.7512 | 785.7512 | 0.0232 | | 786.3300 |
| **Total** | **0.2958** | **0.2033** | **2.7791** | **7.8900e-003** | **0.7713** | **6.2300e-003** | **0.7775** | **0.2045** | **5.7400e-003** | **0.2103** | | **785.7512** | **785.7512** | **0.0232** | | **786.3300** |

## 4.0 Operational Detail - Mobile

### 4.1 Mitigation Measures Mobile

| Category | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb/day | | | | | | | | | | lb/day | | | | | |
| Mitigated | 5.0955 | 23.2613 | 64.1419 | 0.2168 | 16.9492 | 0.1797 | 17.1289 | 4.5361 | 0.1678 | 4.7038 | | 22,049.50 49 | 22,049.50 49 | 1.1680 | | 22,078.70 58 |
| Unmitigated | 5.0955 | 23.2613 | 64.1419 | 0.2168 | 16.9492 | 0.1797 | 17.1289 | 4.5361 | 0.1678 | 4.7038 | | 22,049.50 49 | 22,049.50 49 | 1.1680 | | 22,078.70 58 |

## 4.2 Trip Summary Information

| | Average Daily Trip Rate | | | Unmitigated | Mitigated |
|---|---|---|---|---|---|
| Land Use | Weekday | Saturday | Sunday | Annual VMT | Annual VMT |
| Apartments High Rise | 708.47 | 718.62 | 708.47 | 2,425,904 | 2,425,904 |
| Apartments Mid Rise | 606.34 | 681.60 | 606.34 | 2,108,695 | 2,108,695 |
| Enclosed Parking Structure | 0.00 | 0.00 | 0.00 | | |
| Regional Shopping Center | 1,258.75 | 1,473.05 | 1258.75 | 2,788,687 | 2,788,687 |
| Total | 2,573.56 | 2,873.27 | 2,573.56 | 7,323,287 | 7,323,287 |

## 4.3 Trip Type Information

| | Miles | | | Trip % | | | Trip Purpose % | | |
|---|---|---|---|---|---|---|---|---|---|
| Land Use | H-W or C-W | H-S or C-C | H-O or C-NW | H-W or C-W | H-S or C-C | H-O or C-NW | Primary | Diverted | Pass-by |
| Apartments High Rise | 14.70 | 5.90 | 8.70 | 40.20 | 19.20 | 40.60 | 86 | 11 | 3 |
| Apartments Mid Rise | 14.70 | 5.90 | 8.70 | 40.20 | 19.20 | 40.60 | 86 | 11 | 3 |
| Enclosed Parking Structure | 16.60 | 8.40 | 6.90 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Regional Shopping Center | 16.60 | 8.40 | 6.90 | 16.30 | 64.70 | 19.00 | 54 | 35 | 11 |

## 4.4 Fleet Mix

| Land Use | LDA | LDT1 | LDT2 | MDV | LHD1 | LHD2 | MHD | HHD | OBUS | UBUS | MCY | SBUS | MH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apartments High Rise | 0.547192 | 0.045177 | 0.202743 | 0.121510 | 0.016147 | 0.006143 | 0.019743 | 0.029945 | 0.002479 | 0.002270 | 0.005078 | 0.000682 | 0.000891 |
| Apartments Mid Rise | 0.547192 | 0.045177 | 0.202743 | 0.121510 | 0.016147 | 0.006143 | 0.019743 | 0.029945 | 0.002479 | 0.002270 | 0.005078 | 0.000682 | 0.000891 |
| Enclosed Parking Structure | 0.547192 | 0.045177 | 0.202743 | 0.121510 | 0.016147 | 0.006143 | 0.019743 | 0.029945 | 0.002479 | 0.002270 | 0.005078 | 0.000682 | 0.000891 |
| Regional Shopping Center | 0.547192 | 0.045177 | 0.202743 | 0.121510 | 0.016147 | 0.006143 | 0.019743 | 0.029945 | 0.002479 | 0.002270 | 0.005078 | 0.000682 | 0.000891 |

## 5.0 Energy Detail

Historical Energy Use: N

### 5.1 Mitigation Measures Energy

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| NaturalGas Mitigated | 0.0947 | 0.8092 | 0.3470 | 5.1600e-003 | | 0.0654 | 0.0654 | | 0.0654 | 0.0654 | | 1,032.5844 | 1,032.5844 | 0.0198 | 0.0189 | 1,038.7206 |
| NaturalGas Unmitigated | 0.0947 | 0.8092 | 0.3470 | 5.1600e-003 | | 0.0654 | 0.0654 | | 0.0654 | 0.0654 | | 1,032.5844 | 1,032.5844 | 0.0198 | 0.0189 | 1,038.7206 |

## 5.2 Energy by Land Use - NaturalGas

**Unmitigated**

| | NaturalGas Use | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Use | kBTU/yr | lb/day | | | | | | | | | | lb/day | | | | | |
| Apartments High Rise | 5126.13 | 0.0553 | 0.4724 | 0.2010 | 3.0200e-003 | | 0.0382 | 0.0382 | | 0.0382 | 0.0382 | | 603.0746 | 603.0746 | 0.0116 | 0.0111 | 606.6583 |
| Apartments Mid Rise | 3585.77 | 0.0387 | 0.3305 | 0.1406 | 2.1100e-003 | | 0.0267 | 0.0267 | | 0.0267 | 0.0267 | | 421.8551 | 421.8551 | 8.0900e-003 | 7.7300e-003 | 424.3620 |
| Enclosed Parking Structure | 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Regional Shopping Center | 65.0653 | 7.0000e-004 | 6.3800e-003 | 5.3600e-003 | 4.0000e-005 | | 4.8000e-004 | 4.8000e-004 | | 4.8000e-004 | 4.8000e-004 | | 7.6547 | 7.6547 | 1.5000e-004 | 1.4000e-004 | 7.7002 |
| **Total** | | **0.0947** | **0.8092** | **0.3470** | **5.1700e-003** | | **0.0654** | **0.0654** | | **0.0654** | **0.0654** | | **1,032.5844** | **1,032.5844** | **0.0198** | **0.0189** | **1,038.7205** |

## 5.2 Energy by Land Use - NaturalGas

**Mitigated**

| | NaturalGas Use | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Use | kBTU/yr | lb/day | | | | | | | | | | lb/day | | | | | |
| Apartments High Rise | 5.12613 | 0.0553 | 0.4724 | 0.2010 | 3.0200e-003 | | 0.0382 | 0.0382 | | 0.0382 | 0.0382 | | 603.0746 | 603.0746 | 0.0116 | 0.0111 | 606.6583 |
| Apartments Mid Rise | 3.58577 | 0.0387 | 0.3305 | 0.1406 | 2.1100e-003 | | 0.0267 | 0.0267 | | 0.0267 | 0.0267 | | 421.8551 | 421.8551 | 8.0900e-003 | 7.7300e-003 | 424.3620 |
| Enclosed Parking Structure | 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Regional Shopping Center | 0.0650653 | 7.0000e-004 | 6.3800e-003 | 5.3600e-003 | 4.0000e-005 | | 4.8000e-004 | 4.8000e-004 | | 4.8000e-004 | 4.8000e-004 | | 7.6547 | 7.6547 | 1.5000e-004 | 1.4000e-004 | 7.7002 |
| **Total** | | **0.0947** | **0.8092** | **0.3470** | **5.1700e-003** | | **0.0654** | **0.0654** | | **0.0654** | **0.0654** | | **1,032.5844** | **1,032.5844** | **0.0198** | **0.0189** | **1,038.7205** |

# 6.0 Area Detail

## 6.1 Mitigation Measures Area

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | lb/day | | | | | | | | | | lb/day | | | | | |
| Mitigated | 11.3853 | 5.4805 | 30.7759 | 0.0344 | | 0.5739 | 0.5739 | | 0.5739 | 0.5739 | 0.0000 | 6,626.6715 | 6,626.6715 | 0.1760 | 0.1206 | 6,666.9952 |
| Unmitigated | 11.3853 | 5.4805 | 30.7759 | 0.0344 | | 0.5739 | 0.5739 | | 0.5739 | 0.5739 | 0.0000 | 6,626.6715 | 6,626.6715 | 0.1760 | 0.1206 | 6,666.9952 |

## 6.2 Area by SubCategory

**Unmitigated**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SubCategory | lb/day | | | | | | | | | | lb/day | | | | | |
| Architectural Coating | 0.8100 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| Consumer Products | 9.1028 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| Hearth | 0.6027 | 5.1507 | 2.1918 | 0.0329 | | 0.4164 | 0.4164 | | 0.4164 | 0.4164 | 0.0000 | 6,575.2941 | 6,575.2941 | 0.1260 | 0.1206 | 6,614.3678 |
| Landscaping | 0.8698 | 0.3298 | 28.5842 | 1.5100e-003 | | 0.1575 | 0.1575 | | 0.1575 | 0.1575 | | 51.3774 | 51.3774 | 0.0500 | | 52.6274 |
| **Total** | **11.3853** | **5.4805** | **30.7759** | **0.0344** | | **0.5739** | **0.5739** | | **0.5739** | **0.5739** | **0.0000** | **6,626.6715** | **6,626.6715** | **0.1760** | **0.1206** | **6,666.9952** |

### 6.2 Area by SubCategory

**Mitigated**

| | ROG | NOx | CO | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SubCategory | lb/day | | | | | | | | | | lb/day | | | | | |
| Architectural Coating | 0.8100 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| Consumer Products | 9.1028 | | | | | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | | | 0.0000 |
| Hearth | 0.6027 | 5.1507 | 2.1918 | 0.0329 | | 0.4164 | 0.4164 | | 0.4164 | 0.4164 | 0.0000 | 6,575.294 1 | 6,575.294 1 | 0.1260 | 0.1206 | 6,614.367 8 |
| Landscaping | 0.8698 | 0.3298 | 28.5842 | 1.5100e-003 | | 0.1575 | 0.1575 | | 0.1575 | 0.1575 | | 51.3774 | 51.3774 | 0.0500 | | 52.6274 |
| **Total** | **11.3853** | **5.4805** | **30.7759** | **0.0344** | | **0.5739** | **0.5739** | | **0.5739** | **0.5739** | **0.0000** | **6,626.671 5** | **6,626.671 5** | **0.1760** | **0.1206** | **6,666.995 2** |

## 7.0 Water Detail

### 7.1 Mitigation Measures Water

## 8.0 Waste Detail

### 8.1 Mitigation Measures Waste

## 9.0 Operational Offroad

| Equipment Type | Number | Hours/Day | Days/Year | Horse Power | Load Factor | Fuel Type |
|---|---|---|---|---|---|---|

## 10.0 Stationary Equipment

**Fire Pumps and Emergency Generators**

| Equipment Type | Number | Hours/Day | Hours/Year | Horse Power | Load Factor | Fuel Type |
|---|---|---|---|---|---|---|

**Boilers**

| Equipment Type | Number | Heat Input/Day | Heat Input/Year | Boiler Rating | Fuel Type |
|---|---|---|---|---|---|

**User Defined Equipment**

| Equipment Type | Number |
|---|---|

## 11.0 Vegetation

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# Matthew F. Hagemann, P.G., C.Hg., QSD, QSP

**Geologic and Hydrogeologic Characterization**
**Industrial Stormwater Compliance**
**Investigation and Remediation Strategies**
**Litigation Support and Testifying Expert**
**CEQA Review**

**Education:**

M.S. Degree, Geology, California State University Los Angeles, Los Angeles, CA, 1984.

B.A. Degree, Geology, Humboldt State University, Arcata, CA, 1982.

**Professional Certifications:**

California Professional Geologist

California Certified Hydrogeologist

Qualified SWPPP Developer and Practitioner

**Professional Experience:**

Matt has 25 years of experience in environmental policy, assessment and remediation. He spent nine years with the U.S. EPA in the RCRA and Superfund programs and served as EPA's Senior Science Policy Advisor in the Western Regional Office where he identified emerging threats to groundwater from perchlorate and MTBE. While with EPA, Matt also served as a Senior Hydrogeologist in the oversight of the assessment of seven major military facilities undergoing base closure. He led numerous enforcement actions under provisions of the Resource Conservation and Recovery Act (RCRA) while also working with permit holders to improve hydrogeologic characterization and water quality monitoring.

Matt has worked closely with U.S. EPA legal counsel and the technical staff of several states in the application and enforcement of RCRA, Safe Drinking Water Act and Clean Water Act regulations. Matt has trained the technical staff in the States of California, Hawaii, Nevada, Arizona and the Territory of Guam in the conduct of investigations, groundwater fundamentals, and sampling techniques.

Positions Matt has held include:

- Founding Partner, Soil/Water/Air Protection Enterprise (SWAPE) (2003 – present);
- Geology Instructor, Golden West College, 2010 – 2014;
- Senior Environmental Analyst, Komex H2O Science, Inc. (2000 -- 2003);

- Executive Director, Orange Coast Watch (2001 – 2004);
- Senior Science Policy Advisor and Hydrogeologist, U.S. Environmental Protection Agency (1989–1998);
- Hydrogeologist, National Park Service, Water Resources Division (1998 – 2000);
- Adjunct Faculty Member, San Francisco State University, Department of Geosciences (1993 – 1998);
- Instructor, College of Marin, Department of Science (1990 – 1995);
- Geologist, U.S. Forest Service (1986 – 1998); and
- Geologist, Dames & Moore (1984 – 1986).

**Senior Regulatory and Litigation Support Analyst:**

With SWAPE, Matt's responsibilities have included:

- Lead analyst and testifying expert in the review of over 100 environmental impact reports since 2003 under CEQA that identify significant issues with regard to hazardous waste, water resources, water quality, air quality, Valley Fever, greenhouse gas emissions, and geologic hazards. Make recommendations for additional mitigation measures to lead agencies at the local and county level to include additional characterization of health risks and implementation of protective measures to reduce worker exposure to hazards from toxins and Valley Fever.
- Stormwater analysis, sampling and best management practice evaluation at industrial facilities.
- Manager of a project to provide technical assistance to a community adjacent to a former Naval shipyard under a grant from the U.S. EPA.
- Technical assistance and litigation support for vapor intrusion concerns.
- Lead analyst and testifying expert in the review of environmental issues in license applications for large solar power plants before the California Energy Commission.
- Manager of a project to evaluate numerous formerly used military sites in the western U.S.
- Manager of a comprehensive evaluation of potential sources of perchlorate contamination in Southern California drinking water wells.
- Manager and designated expert for litigation support under provisions of Proposition 65 in the review of releases of gasoline to sources drinking water at major refineries and hundreds of gas stations throughout California.
- Expert witness on two cases involving MTBE litigation.
- Expert witness and litigation support on the impact of air toxins and hazards at a school.
- Expert witness in litigation at a former plywood plant.

With Komex H2O Science Inc., Matt's duties included the following:

- Senior author of a report on the extent of perchlorate contamination that was used in testimony by the former U.S. EPA Administrator and General Counsel.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of MTBE use, research, and regulation.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of perchlorate use, research, and regulation.
- Senior researcher in a study that estimates nationwide costs for MTBE remediation and drinking water treatment, results of which were published in newspapers nationwide and in testimony against provisions of an energy bill that would limit liability for oil companies.
- Research to support litigation to restore drinking water supplies that have been contaminated by MTBE in California and New York.

- Expert witness testimony in a case of oil production-related contamination in Mississippi.
- Lead author for a multi-volume remedial investigation report for an operating school in Los Angeles that met strict regulatory requirements and rigorous deadlines.

- Development of strategic approaches for cleanup of contaminated sites in consultation with clients and regulators.

**Executive Director:**

As Executive Director with Orange Coast Watch, Matt led efforts to restore water quality at Orange County beaches from multiple sources of contamination including urban runoff and the discharge of wastewater. In reporting to a Board of Directors that included representatives from leading Orange County universities and businesses, Matt prepared issue papers in the areas of treatment and disinfection of wastewater and control of the discharge of grease to sewer systems. Matt actively participated in the development of countywide water quality permits for the control of urban runoff and permits for the discharge of wastewater. Matt worked with other nonprofits to protect and restore water quality, including Surfrider, Natural Resources Defense Council and Orange County CoastKeeper as well as with business institutions including the Orange County Business Council.

**Hydrogeology:**

As a Senior Hydrogeologist with the U.S. Environmental Protection Agency, Matt led investigations to characterize and cleanup closing military bases, including Mare Island Naval Shipyard, Hunters Point Naval Shipyard, Treasure Island Naval Station, Alameda Naval Station, Moffett Field, Mather Army Airfield, and Sacramento Army Depot. Specific activities were as follows:

- Led efforts to model groundwater flow and contaminant transport, ensured adequacy of monitoring networks, and assessed cleanup alternatives for contaminated sediment, soil, and groundwater.
- Initiated a regional program for evaluation of groundwater sampling practices and laboratory analysis at military bases.
- Identified emerging issues, wrote technical guidance, and assisted in policy and regulation development through work on four national U.S. EPA workgroups, including the Superfund Groundwater Technical Forum and the Federal Facilities Forum.

At the request of the State of Hawaii, Matt developed a methodology to determine the vulnerability of groundwater to contamination on the islands of Maui and Oahu. He used analytical models and a GIS to show zones of vulnerability, and the results were adopted and published by the State of Hawaii and County of Maui.

As a hydrogeologist with the EPA Groundwater Protection Section, Matt worked with provisions of the Safe Drinking Water Act and NEPA to prevent drinking water contamination. Specific activities included the following:

- Received an EPA Bronze Medal for his contribution to the development of national guidance for the protection of drinking water.
- Managed the Sole Source Aquifer Program and protected the drinking water of two communities through designation under the Safe Drinking Water Act. He prepared geologic reports, conducted public hearings, and responded to public comments from residents who were very concerned about the impact of designation.

- Reviewed a number of Environmental Impact Statements for planned major developments, including large hazardous and solid waste disposal facilities, mine reclamation, and water transfer.

Matt served as a hydrogeologist with the RCRA Hazardous Waste program. Duties were as follows:

- Supervised the hydrogeologic investigation of hazardous waste sites to determine compliance with Subtitle C requirements.
- Reviewed and wrote "part B" permits for the disposal of hazardous waste.
- Conducted RCRA Corrective Action investigations of waste sites and led inspections that formed the basis for significant enforcement actions that were developed in close coordination with U.S. EPA legal counsel.
- Wrote contract specifications and supervised contractor's investigations of waste sites.

With the National Park Service, Matt directed service-wide investigations of contaminant sources to prevent degradation of water quality, including the following tasks:

- Applied pertinent laws and regulations including CERCLA, RCRA, NEPA, NRDA, and the Clean Water Act to control military, mining, and landfill contaminants.
- Conducted watershed-scale investigations of contaminants at parks, including Yellowstone and Olympic National Park.
- Identified high-levels of perchlorate in soil adjacent to a national park in New Mexico and advised park superintendent on appropriate response actions under CERCLA.
- Served as a Park Service representative on the Interagency Perchlorate Steering Committee, a national workgroup.
- Developed a program to conduct environmental compliance audits of all National Parks while serving on a national workgroup.
- Co-authored two papers on the potential for water contamination from the operation of personal watercraft and snowmobiles, these papers serving as the basis for the development of nation-wide policy on the use of these vehicles in National Parks.
- Contributed to the Federal Multi-Agency Source Water Agreement under the Clean Water Action Plan.

**Policy:**

Served senior management as the Senior Science Policy Advisor with the U.S. Environmental Protection Agency, Region 9. Activities included the following:

- Advised the Regional Administrator and senior management on emerging issues such as the potential for the gasoline additive MTBE and ammonium perchlorate to contaminate drinking water supplies.
- Shaped EPA's national response to these threats by serving on workgroups and by contributing to guidance, including the Office of Research and Development publication, Oxygenates in Water: Critical Information and Research Needs.
- Improved the technical training of EPA's scientific and engineering staff.
- Earned an EPA Bronze Medal for representing the region's 300 scientists and engineers in negotiations with the Administrator and senior management to better integrate scientific principles into the policy-making process.
- Established national protocol for the peer review of scientific documents.

**Geology:**

With the U.S. Forest Service, Matt led investigations to determine hillslope stability of areas proposed for timber harvest in the central Oregon Coast Range. Specific activities were as follows:

- Mapped geology in the field, and used aerial photographic interpretation and mathematical models to determine slope stability.
- Coordinated his research with community members who were concerned with natural resource protection.
- Characterized the geology of an aquifer that serves as the sole source of drinking water for the city of Medford, Oregon.

As a consultant with Dames and Moore, Matt led geologic investigations of two contaminated sites (later listed on the Superfund NPL) in the Portland, Oregon, area and a large hazardous waste site in eastern Oregon. Duties included the following:

- Supervised year-long effort for soil and groundwater sampling.
- Conducted aquifer tests.
- Investigated active faults beneath sites proposed for hazardous waste disposal.

**Teaching:**

From 1990 to 1998, Matt taught at least one course per semester at the community college and university levels:

- At San Francisco State University, held an adjunct faculty position and taught courses in environmental geology, oceanography (lab and lecture), hydrogeology, and groundwater contamination.
- Served as a committee member for graduate and undergraduate students.
- Taught courses in environmental geology and oceanography at the College of Marin.

Matt taught physical geology (lecture and lab and introductory geology at Golden West College in Huntington Beach, California from 2010 to 2014.

**Invited Testimony, Reports, Papers and Presentations:**

**Hagemann, M.F**., 2008. Disclosure of Hazardous Waste Issues under CEQA. Presentation to the Public Environmental Law Conference, Eugene, Oregon.

**Hagemann, M.F**., 2008. Disclosure of Hazardous Waste Issues under CEQA. Invited presentation to U.S. EPA Region 9, San Francisco, California.

**Hagemann, M.F.,** 2005. Use of Electronic Databases in Environmental Regulation, Policy Making and Public Participation. Brownfields 2005, Denver, Coloradao.

**Hagemann, M.F.,** 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Nevada and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Las Vegas, NV (served on conference organizing committee).

**Hagemann, M.F.**, 2004. Invited testimony to a California Senate committee hearing on air toxins at schools in Southern California, Los Angeles.

Brown, A., Farrow, J., Gray, A. and **Hagemann, M.**, 2004. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to the Ground Water and Environmental Law Conference, National Groundwater Association.

**Hagemann, M.F.,** 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Arizona and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Phoenix, AZ (served on conference organizing committee).

**Hagemann, M.F.,** 2003. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in the Southwestern U.S. Invited presentation to a special committee meeting of the National Academy of Sciences, Irvine, CA.

**Hagemann, M.F**., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a tribal EPA meeting, Pechanga, CA.

**Hagemann, M.F**., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a meeting of tribal repesentatives, Parker, AZ.

**Hagemann, M.F**., 2003. Impact of Perchlorate on the Colorado River and Associated Drinking Water Supplies. Invited presentation to the Inter-Tribal Meeting, Torres Martinez Tribe.

**Hagemann, M.F**., 2003. The Emergence of Perchlorate as a Widespread Drinking Water Contaminant. Invited presentation to the U.S. EPA Region 9.

**Hagemann, M.F**., 2003. A Deductive Approach to the Assessment of Perchlorate Contamination. Invited presentation to the California Assembly Natural Resources Committee.

**Hagemann, M.F**., 2003. Perchlorate: A Cold War Legacy in Drinking Water. Presentation to a meeting of the National Groundwater Association.

**Hagemann, M.F**., 2002. From Tank to Tap: A Chronology of MTBE in Groundwater. Presentation to a meeting of the National Groundwater Association.

**Hagemann, M.F**., 2002. A Chronology of MTBE in Groundwater and an Estimate of Costs to Address Impacts to Groundwater. Presentation to the annual meeting of the Society of Environmental Journalists.

**Hagemann, M.F**., 2002. An Estimate of the Cost to Address MTBE Contamination in Groundwater (and Who Will Pay). Presentation to a meeting of the National Groundwater Association.

**Hagemann, M.F**., 2002. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to a meeting of the U.S. EPA and State Underground Storage Tank Program managers.

**Hagemann, M.F**., 2001. From Tank to Tap: A Chronology of MTBE in Groundwater. Unpublished report.

**Hagemann, M.F**., 2001. Estimated Cleanup Cost for MTBE in Groundwater Used as Drinking Water. Unpublished report.

**Hagemann, M.F**., 2001. Estimated Costs to Address MTBE Releases from Leaking Underground Storage Tanks. Unpublished report.

**Hagemann, M.F**., and VanMouwerik, M., 1999. Potential Water Quality Concerns Related to Snowmobile Usage. Water Resources Division, National Park Service, Technical Report.

VanMouwerik, M. and **Hagemann, M.F**. 1999, Water Quality Concerns Related to Personal Watercraft Usage. Water Resources Division, National Park Service, Technical Report.

**Hagemann, M.F**., 1999, Is Dilution the Solution to Pollution in National Parks? The George Wright Society Biannual Meeting, Asheville, North Carolina.

**Hagemann, M.F**., 1997, The Potential for MTBE to Contaminate Groundwater. U.S. EPA Superfund Groundwater Technical Forum Annual Meeting, Las Vegas, Nevada.

**Hagemann, M.F**., and Gill, M., 1996, Impediments to Intrinsic Remediation, Moffett Field Naval Air Station, Conference on Intrinsic Remediation of Chlorinated Hydrocarbons, Salt Lake City.

**Hagemann, M.F**., Fukunaga, G.L., 1996, The Vulnerability of Groundwater to Anthropogenic Contaminants on the Island of Maui, Hawaii. Hawaii Water Works Association Annual Meeting, Maui, October 1996.

**Hagemann, M. F**., Fukanaga, G. L., 1996, Ranking Groundwater Vulnerability in Central Oahu, Hawaii. Proceedings, Geographic Information Systems in Environmental Resources Management, Air and Waste Management Association Publication VIP-61.

**Hagemann, M.F**., 1994. Groundwater Characterization and Cleanup at Closing Military Bases in California. Proceedings, California Groundwater Resources Association Meeting.

**Hagemann, M.**F. and Sabol, M.A., 1993. Role of the U.S. EPA in the High Plains States Groundwater Recharge Demonstration Program. Proceedings, Sixth Biennial Symposium on the Artificial Recharge of Groundwater.

**Hagemann, M.F**., 1993. U.S. EPA Policy on the Technical Impracticability of the Cleanup of DNAPL-contaminated Groundwater. California Groundwater Resources Association Meeting.

**Hagemann, M.F**., 1992. Dense Nonaqueous Phase Liquid Contamination of Groundwater: An Ounce of Prevention... Proceedings, Association of Engineering Geologists Annual Meeting, v. 35.

**Other Experience:**

Selected as subject matter expert for the California Professional Geologist licensing examination, 2009-2011.

SWAPE Technical Consultation, Data Analysis and Litigation Support for the Environment

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Email: prosenfeld@swape.com

# *Paul Rosenfeld, Ph.D.*

**Chemical Fate and Transport & Air Dispersion Modeling**

*Principal Environmental Chemist*

**Risk Assessment & Remediation Specialist**

## Education

Ph.D. Soil Chemistry, University of Washington, 1999. Dissertation on VOC filtration.

M.S. Environmental Science, U.C. Berkeley, 1995. Thesis on organic waste economics.

B.A. Environmental Studies, U.C. Santa Barbara, 1991. Thesis on wastewater treatment.

## Professional Experience

Dr. Rosenfeld is the Co-Founder and Principal Environmental Chemist at Soil Water Air Protection Enterprise (SWAPE). His focus is the fate and transport of environmental contaminants, risk assessment, and ecological restoration. His project experience ranges from monitoring and modeling of pollution sources as they relate to human and ecological health. Dr. Rosenfeld has investigated and designed remediation programs and risk assessments for contaminated sites containing, petroleum, MtBE and fuel oxygenates, chlorinated solvents, pesticides, radioactive waste, PCBs, PAHs, dioxins, furans, volatile organics, semi-volatile organics, perchlorate, heavy metals, asbestos, PFOA, unusual polymers, and odor. Significant projects performed by Dr. Rosenfeld include the following:

## Litigation Support

**Client: Missouri Department of Natural Resources (Jefferson City, Missouri)**
Serving as an expert in evaluating air pollution and odor emissions from a Republic Landfill in St. Louis, Missouri. Conducted. Project manager overseeing daily, weekly and comprehensive sampling of odor and chemicals.

**Client: Louisiana Department of Transportation and Development (Baton Rouge, Louisiana)**
Serving as an expert witness, conducting groundwater modeling of an ethylene dichloride DNAPL and soluble plume resulting from spill caused by Conoco Phillips.

**Client: Missouri Department of Natural Resources (St. Louis, Missouri)**
Serving as a consulting expert and potential testifying expert regarding a landfill fire directly adjacent to another landfill containing radioactive waste. Implemented an air monitoring program testing for over 100 different compounds using approximately 12 different analytical methods.

**Client: Baron & Budd, P.C. (Dallas, Texas) and Weitz & Luxeinberg (New York, New York)**
Served as a consulting expert in MTBE Federal Multi District Litigation (MDL) in New York. Consolidated ground water data, created maps for test cases, constructed damage model, evaluated taste and odor threshold levels. Resulted in a settlement of over $440 million.

**Client: The Buzbee Law Firm (Houston, Texas)**
Served as a as an expert in ongoing litigation involving over 50,000+ plaintiffs who are seeking compensation for chemical exposure and reduction in property value resulting from chemicals released from the BP facility.

**Client: The Law Offices of Daniel Miller LLC (Baltimore, Maryland)**
Evaluated the contamination on nearby properties of gasoline constituents released from an Underground Storage Tank at a Royal Farms gas station.

**Client: Environmental Litigation Group (Birmingham, Alabama)**
Serving as an expert on property damage, medical monitoring and toxic tort claims that have been filed on behalf of over 13,000 plaintiffs who were exposed to PCBs and dioxins/furans resulting from emissions from Monsanto and Cerro Copper's operations in Sauget, Illinois. Developed AERMOD models to demonstrate plaintiff's exposure.

**Client: Baron & Budd P.C. (Dallas Texas) and Korein Tillery (St. Louis, Missouri)**
Served as a consulting expert for a Class Action defective product claim filed in Madison County, Illinois against Syngenta and five other manufacturers for atrazine. Evaluated health issues associated with atrazine and deterimied treatment cost for filtration of public drinking water supplies. Resulted in $105 million dollar settlement.

**Client: The Buzbee Law Firm (Houston, Texas)**
Served as a consulting expert in catalyst release and refinery emissions cases against the BP Refinery in Texas City. A jury verdict for 10 employees exposed to catalyst via BP's irresponsible behavior.

**Client: Baron & Budd, P.C. (Dallas, Texas)**
Served as a consulting expert to calculate the Maximum Allowable Dose Level (MADL) and No Significant Risk Level (NSRL), based on Cal EPA and OEHHA guidelines, for Polychlorinated Biphenyls (PCBs) in fish oil dietary supplements.

**Client: Girardi Keese (Los Angeles, California)**
Served as an expert testifying on hydrocarbon exposure of a woman who worked on a fuel barge operated by Chevron. Demonstrated that the plaintiff was exposed to excessive amounts of benzene.

**Client: Mason & Cawood (Annapolis, Maryland) and Girardi & Keese (Los Angeles, California)**
Serving as an expert consultant on the Battlefield Golf Club fly ash disposal site in Chesapeake, VA, where arsenic, other metals and radionuclides are leaching into groundwater, and ash is blowing off-site onto the surrounding communities.

**Client: California Earth Mineral Corporation (Culver City, California)**
Evaluating the montmorillonite clay deposit located near El Centro, California. Working as a Defense Expert representing an individual who owns a 2,500 acre parcel that will potentially be seized by the United States Navy via eminent domain.

**Client: Matthews & Associates (Houston, Texas)**
Serving as an expert witness, preparing air model demonstrating residential exposure via emissions from fracking in natural gas wells in Duncan, Texas.

**Client: Baron & Budd P.C. (Dallas, Texas) and Korein Tillery (St. Louis, Missouri)**
Served as a consulting expert for analysis of private wells relating to litigation regarding compensation of private well owners for MTBE testing. Coordinated data acquisition and GIS analysis evaluating private well proximity to leaking underground storage tanks.

**Client: Lurie & Park LLP (Los Angeles, California)**
Served as an expert witness evaluating a vapor intrusion toxic tort case that resulted in a settlement. The Superfund site is a 4 ½ mile groundwater plume of chlorinated solvents in Whittier, California.

**Client: Mason & Cawood (Annapolis, Maryland)**
Evaluated data from the Hess Gasoline Station in northern Baltimore, Maryland that had a release resulting in flooding of plaintiff's homes with gasoline-contaminated water, foul odor, and biofilm growth.

**Client: The Buzbee Law Firm (Houston, Texas)**
Evaluated air quality resulting from grain processing emissions in Muscatine, Iowa.

**Client: Anderson Kill & Olick, P.C. (Ventura, California)**
Evaluated historical exposure and lateral and vertical extent of contamination resulting from a ~150 million gallon Exxon Mobil tank farm located near Watts, California.

**Client: Packard Law Firm (Petaluma, California)**

Served as an expert witness, evaluated lead in Proposition 65 Case where various products were found to have elevated lead levels.

**Client: The Buzbee Law Firm (Houston, Texas)**
Evaluated data resulting from an oil spill in Port Arthur, Texas.

**Client: Nexsen Pruet, LLC (Charleston, South Carolina)**
Serving as expert in chlorine exposure in a railroad tank car accident where approximately 120,000 pounds of chlorine were released.

**Client: Girardi & Keese (Los Angeles, California)**
Serving as an expert investigating hydrocarbon exposure and property damage for ~600 individuals and ~280 properties in Carson, California where homes were constructed above a large tank farm formerly owned by Shell.

**Client: Brent Coon Law Firm (Cleveland, Ohio)**
Served as an expert, calculating an environmental exposure to benzene, PAHs, and VOCs from a Chevron Refinery in Hooven, Ohio. Conducted AERMOD modeling to determine cumulative dose.

**Client: Lundy Davis (Lake Charles, Louisiana)**
Served as consulting expert on an oil field case representing the lease holder of a contaminated oil field. Conducted field work evaluating oil field contamination in Sulphur, Louisiana. Property is owned by Conoco Phillips, but leased by Yellow Rock, a small oil firm.

**Client: Cox Cox Filo (Lake Charles, Louisiana)**
Served as testifying expert on a multimillion gallon oil spill in Lake Charles which occurred on June 19, 2006, resulting in hydrocarbon vapor exposure to hundreds of workers and residents. Prepared air model and calculated exposure concentration. Demonstrated that petroleum odor alone can result in significant health harms.

**Client: Cotchett Pitre & McCarthy (San Francisco, California)**
Served as testifying expert representing homeowners who unknowingly purchased homes built on an old oil field in Santa Maria, California. Properties have high concentrations of petroleum hydrocarbons in subsurface soils resulting in diminished property value.

**Client: Law Offices Of Anthony Liberatore P.C. (Los Angeles, California)**
Served as testifying expert representing individuals who rented homes on the Inglewood Oil Field in California. Plaintiffs were exposed to hydrocarbon contaminated water and air, and experienced health harms associated with the petroleum exposure.

**Client: Orange County District Attorney (Orange County, California)**
Coordinated a review of 143 ARCO gas stations in Orange County to assist the District Attorney's prosecution of CCR Title 23 and California Health and Safety Code violators.

**Client: Environmental Litigation Group (Birmingham, Alabama)**
Served as a testifying expert in a health effects case against ABC Coke/Drummond Company for polluting a community with PAHs, benzene, particulate matter, heavy metals, and coke oven emissions. Created air dispersion models and conducted attic dust sampling, exposure modeling, and risk assessment for plaintiffs.

**Client: Masry & Vitatoe (Westlake Village, California), Engstrom Lipscomb Lack (Los Angeles, Califronia) and Baron & Budd P.C. (Dallas, Texas)**
Served as a consulting expert in Proposition 65 lawsuit filed against major oil companies for benzene and toluene releases from gas stations and refineries resulting in contaminated groundwater. Settlement included over $110 million dollars in injunctive relief.

**Client: Tommy Franks Law Firm (Austin, Texas)**
Served as expert evaluating groundwater contamination which resulted from the hazardous waste injection program and negligent actions of Morton Thiokol and Rohm Hass. Evaluated drinking water contamination and community exposure.

**Client: Baron & Budd P.C. (Dallas, Texas) and Sher Leff (San Francisco, California)**
Served as consulting expert for several California cities that filed defective product cases against Dow Chemical and Shell for 1,2,3-trichloropropane groundwater contamination. Generated maps showing capture zones of impacted wells for various municipalities.

**Client: Weitz & Luxenberg (New York, New York)**
Served as expert on Property Damage and Nuisance claims resulting from emissions from the Countywide Landfill in Ohio. The landfill had an exothermic reaction or fire resulting from aluminum dross dumping, and the EPA fined the landfill $10,000,000 dollars.

**Client: Baron & Budd P.C. (Dallas, Texas)**
Served as a consulting expert for a groundwater contamination case in Pensacola, Florida where fluorinated compounds contaminated wells operated by Escambia County.

**Client: Environmental Litigation Group (Birmingham, Alabama)**
Served as an expert on groundwater case where Exxon Mobil and Helena Chemical released ethylene dichloride into groundwater resulting in a large plume. Prepared report on the appropriate treatment technology and cost, and flaws with the proposed on-site remediation.

**Client: Environmental Litigation Group (Birmingham, Alabama)**
Served as an expert on air emissions released when a Bartlo Packaging Incorporated facility in West Helena, Arkansas exploded resulting in community exposure to pesticides and smoke from combustion of pesticides.

**Client: Omara & Padilla (San Diego, California)**
Served as a testifying expert on nuisance case against Nutro Dogfood Company that constructed a large dog food processing facility in the middle of a residential community in Victorville, California with no odor control devices. The facility has undergone significant modifications, including installation of a regenerative thermal oxidizer.

**Client: Environmental Litigation Group (Birmingham, Alabama)**
Serving as an expert on property damage and medical monitoring claims that have been filed against International Paper resulting from chemical emissions from facilities located in Bastrop, Louisiana; Prattville, Alabama; and Georgetown, South Carolina.

**Client: Estep and Shafer L.C. (Kingwood, West Virginia)**
Served as expert calculating acid emissions doses to residents resulting from coal-fired power plant emissions in West V
irginia using various air models.

**Client: Watts Law Firm (Austin, Texas), Woodfill & Pressler (Houston, Texas) and Woska & Associates (Oklahoma City, Oklahoma)**
Served as testifying expert on community and worker exposure to CCA, creosote, PAHs, and dioxins/furans from a BNSF and Koppers Facility in Somerville, Texas. Conducted field sampling, risk assessment, dose assessment and air modeling to quantify exposure to workers and community members.

**Client: Environmental Litigation Group (Birmingham, Alabama)**
Served as expert regarding community exposure to CCA, creosote, PAHs, and dioxins/furans from a Louisiana Pacific wood treatment facility in Florala, Alabama. Conducted blood sampling and environmental sampling to determine environmental exposure to dioxins/furans and PAHs.

**Client: Sanders Law Firm (Colorado Springs, Colorado) and Vamvoras & Schwartzberg (Lake Charles, Louisiana)**
Served as an expert calculating chemical exposure to over 500 workers from large ethylene dichloride spill in Lake Charles, Louisiana at the Conoco Phillips Refinery.

**Client: Baron & Budd P.C. (Dallas, Texas)**
Served as consulting expert in a defective product lawsuit against Dow Agroscience focusing on Clopyralid, a recalcitrant herbicide that damaged numerous compost facilities across the United States.

**Client: Sullivan Papain Block McGrath & Cannavo (New York, New York) and The Cochran Firm (Dothan, Mississippi)**
Served as an expert regarding community exposure to metals, PAHs PCBs, and dioxins/furans from the burning of Ford paint sludge and municipal solid waste in Ringwood, New Jersey.

**Client: Rose, Klein & Marias LLP (Los Angeles, California)**
Served as an expert in 55 Proposition 65 cases against individual facilities in the Port of Los Angeles and Port of Long Beach. Prepared air dispersion and risk models to demonstrate that each facility emits diesel particulate matter that results in risks exceeding 1/100,000, hence violating the Proposition 65 Statute.

**Client: Rose, Klein & Marias LLP (Los Angeles, California) and Environmental Law Foundation (San Francisco, California)**
Served as an expert in a Proposition 65 case against potato chip manufacturers. Conducted an analysis of several brands of potato chips for acrylamide concentrations and found that all samples exceeded Proposition 65 No Significant Risk Levels.

**Client: Gonzales & Robinson (Westlake Village, California)**
Served as a testifying expert in a toxic tort case against Chevron (Ortho) for allowing a community to be contaminated with lead arsenate pesticide. Created air dispersion and soil vadose zone transport models, and evaluated bioaccumulation of lead arsenate in food.

**Client: Environment Now (Santa Monica, California)**
Served as expert for Environment Now to convince the State of California to file a nuisance claim against automobile manufactures to recover MediCal damages from expenditures on asthma-related health care costs.

**Client: Trutanich Michell (Long Beach, California)**
Served as expert representing San Pedro Boat Works in the Port of Los Angeles. Prepared air dispersion, particulate air dispersion, and storm water discharge models to demonstrate that Kaiser Bulk Loading is responsible for copper concentrate accumulating in the bay sediment.

**Client: Azurix of North America (Fort Myers, Florida)**
Provided expert opinions, reports and research pertaining to a proposed County Ordinance requiring biosolids applicators to measure VOC and odor concentrations at application sites' boundaries.

**Client: MCP Polyurethane (Pittsburg, Kansas)**
Provided expert opinions and reports regarding metal-laden landfill runoff that damaged a running track by causing the reversion of the polyurethane due to its catalytic properties.

## Risk Assessment And Air Modeling

**Client: Hager, Dewick & Zuengler, S.C. (Green Bay, Wisconsin)**
Conducted odor audit of rendering facility in Green Bay, Wisconsin.

**Client: ABT-Haskell (San Bernardino, California)**
Prepared air dispersion model for a proposed state-of-the-art enclosed compost facility. Prepared a traffic analysis and developed odor detection limits to predict 1, 8, and 24-hour off-site concentrations of sulfur, ammonia, and amine.

**Client: Jefferson PRP Group (Los Angeles, California)**
Evaluated exposure pathways for chlorinated solvents and hexavalent chromium for human health risk assessment of Los Angeles Academy (formerly Jefferson New Middle School) operated by Los Angeles Unified School District.

**Client: Covanta (Susanville, California)**

Prepared human health risk assessment for Covanta Energy focusing on agricultural worker exposure to caustic fertilizer.

**Client: CIWMB (Sacramento, California)**
Used dispersion models to estimate traveling distance and VOC concentrations downwind from a composting facility for the California Integrated Waste Management Board.

**Client: Carboquimeca (Bogotá, Columbia)**
Evaluated exposure pathways for human health risk assessment for a confidential client focusing on significant concentrations of arsenic and chlorinated solvents present in groundwater used for drinking water.

**Client: Navy Base Realignment and Closure Team (Treasure Island, California)**
Used Johnson-Ettinger model to estimate indoor air PCB concentrations and compared estimated values with empirical data collected in homes.

**Client: San Diego State University (San Diego, California)**
Measured $CO_2$ flux from soils amended with different quantities of biosolids compost at Camp Pendleton to determine $CO_2$ credit values for coastal sage under fertilized and non-fertilized conditions.

**Client: Navy Base Realignment and Closure Team (MCAS Tustin, California)**
Evaluated cumulative risk of a multiple pathway scenario for a child resident and a construction worker. Evaluated exposure to air and soil via particulate and vapor inhalation, incidental soil ingestion, and dermal contact with soil.

**Client: MCAS Miramar (San Diego, California)**
Evaluated exposure pathways of metals in soil by comparing site data to background data. Risk assessment incorporated multiple pathway scenarios assuming child resident and construction worker particulate and vapor inhalation, soil ingestion, and dermal soil contact.

**Client: Naval Weapons Station (Seal Beach, California)**
Used a multiple pathway model to generate dust emission factors from automobiles driving on dirt roads. Calculated bioaccumulation of metals, PCBs, dioxin congeners and pesticides to estimate human and ecological risk.

**Client: King County, Douglas County (Washington State)**
Measured $PM_{10}$ and $PM_{2.5}$ emissions from windblown soil treated with biosolids and a polyacrylamide polymer in Douglas County, Washington. Used Pilat Mark V impactor for measurement and compared data to EPA particulate regulations.

**Client: King County (Seattle, Washington)**
Created emission inventory for several compost and wastewater facilities comparing VOC, particulate, and fungi concentrations to NIOSH values estimating risk to workers and individuals at neighboring facilities.

## Air Pollution Investigation and Remediation

**Client: Republic Landfill (Santa Clarita, California)**
Managed a field investigation of odor around a landfill during 30+ events. Used hedonic tone, butanol scale, dilution-to-threshold values, and odor character to evaluate odor sources and character and intensity.

**Client: California Biomass (Victorville, California)**
Managed a field investigation of odor around landfill during 9+ events. Used hedonic tone, butanol scale, dilution-to-threshold values, and odor character to evaluate odor sources, character and intensity.

**Client: ABT-Haskell (Redlands, California)**
Assisted in permitting a compost facility that will be completely enclosed with a complex scrubbing system using acid scrubbers, base scrubbers, biofilters, heat exchangers and chlorine to reduce VOC emissions by 99 percent.

**Client: Synagro (Corona, California)**

Designed and monitored 30-foot by 20-foot by 6-foot biofilter for VOC control at an industrial composting facility in Corona, California to reduce VOC emissions by 99 percent.

**Client: Jeff Gage (Tacoma, Washington)**
Conducted emission inventory at industrial compost facility using GC/MS analyses for VOCs. Evaluated effectiveness of VOC and odor control systems and estimated human health risk.

**Client: Daishowa America (Port Angeles Mill, Washington)**
Analyzed industrial paper sludge and ash for VOCs, heavy metals and nutrients to develop a land application program. Metals were compared to federal guidelines to determine maximum allowable land application rates.

**Client: Jeff Gage (Puyallup, Washington)**
Measured effectiveness of biofilters at composting facility and conducted EPA dispersion models to estimate traveling distance of odor and human health risk from exposure to volatile organics.

## Surface Water, Groundwater, and Wastewater Investigation/Remediation

**Client: Confidential (Downey, California)**
Managed groundwater investigation to determine horizontal extent of 1,000 foot TCE plume associated with a metal finishing shop.

**Client: Confidential (West Hollywood, California)**
Designing soil vapor extraction system that is currently being installed for confidential client. Managing groundwater investigation to determine horizontal extent of TCE plume associated with dry cleaning.

**Client: Synagro Technologies (Sacramento, California)**
Managed groundwater investigation to determine if biosolids application impacted salinity and nutrient concentrations in groundwater.

**Client: Navy Base Realignment and Closure Team (Treasure Island, California)**
Assisted in the design and remediation of PCB, chlorinated solvent, hydrocarbon and lead contaminated groundwater and soil on Treasure Island. Negotiated screening levels with DTSC and Water Board. Assisted in the preparation of FSP/QAPP, RI/FS, and RAP documents and assisted in CEQA document preparation.

**Client: Navy Base Realignment and Closure Team (MCAS Tustin, California)**
Assisted in the design of groundwater monitoring systems for chlorinated solvents at Tustin MCAS. Contributed to the preparation of FS for groundwater treatment.

**Client: Mission Cleaning Facility (Salinas, California)**
Prepared a RAP and cost estimate for using an oxygen releasing compound (ORC) and molasses to oxidize diesel fuel in soil and groundwater at Mission Cleaning in Salinas.

**Client: King County (Washington)**
Established and monitored experimental plots at a US EPA Superfund Site in wetland and upland mine tailings contaminated with zinc and lead in Smelterville, Idaho. Used organic matter and pH adjustment for wetland remediation and erosion control.

**Client: City of Redmond (Richmond, Washington)**
Collected storm water from compost-amended and fertilized turf to measure nutrients in urban runoff. Evaluated effectiveness of organic matter-lined detention ponds on reduction of peak flow during storm events. Drafted compost amended landscape installation guidelines to promote storm water detention and nutrient runoff reduction.

**Client: City of Seattle (Seattle, Washington)**
Measured VOC emissions from Renton wastewater treatment plant in Washington. Ran GC/MS, dispersion models, and sensory panels to characterize, quantify, control and estimate risk from VOCs.

**Client: Plumas County (Quincy, California)**
Installed wetland to treat contaminated water containing 1% copper in an EPA Superfund site. Revegetated 10 acres of acidic and metal laden sand dunes resulting from hydraulic mining. Installed and monitored piezometers in wetland estimating metal loading.

**Client: Adams Egg Farm (St. Kitts, West Indies)**
Designed, constructed, and maintained 3 anaerobic digesters at Springfield Egg Farm, St. Kitts. Digesters treated chicken excrement before effluent discharged into sea. Chicken waste was converted into methane cooking gas.

**Client: BLM (Kremmling, Colorado)**
Collected water samples for monitoring program along upper stretch of the Colorado River. Rafted along river and protected water quality by digging and repairing latrines.

## Soil Science and Restoration Projects

**Client: Hefner, Stark & Marois, LLP (Sacramento, California)**
Facilitated in assisting Hefner, Stark & Marois, LLP in working with the Regional Water Quality board to determine how to utilize Calcium Participate as a by-product of processing sugar beets.

**Client: Kinder Morgan (San Diego County, California)**
Designed and monitored the restoration of a 110-acre project on Camp Pendleton along a 26-mile pipeline. Managed crew of 20, planting coastal sage, riparian, wetland, native grassland, and marsh ecosystems. Negotiated with the CDFW concerning species planting list and success standards.

**Client: NAVY BRAC (Orote Landfill, Guam)**
Designed and monitored pilot landfill cap mimicking limestone forest. Measured different species' root-penetration into landfill cap. Plants were used to evapotranspirate water, reducing water leaching through soil profile.

**Client: LA Sanitation District Puente Hills Landfill (Whittier, California)**
Monitored success of upland and wetland mitigation at Puente Hills Landfill operated by Sanitation Districts of Los Angeles. Negotiated with the Army Corps of Engineers and CDFG to obtain an early sign-off.

**Client: City of Escondido (Escondido, California)**
Designed, managed, installed, and monitored a 20-acre coastal sage scrub restoration project at Kit Carson Park, Escondido, California.

**Client: Home Depot (Encinitas, California)**
Designed, managed, installed and monitored a 15-acre coastal sage scrub and wetland restoration project at Home Depot in Encinitas, California.

**Client: Alvarado Water Filtration Plant (San Diego, California)**
Planned, installed and monitored 2-acre riparian and coastal sage scrub mitigation in San Diego California.

**Client: Monsanto and James River Corporation (Clatskanie, Oregon)**
Served as a soil scientist on a 50,000-acre hybrid poplar farm. Worked on genetically engineering study of Poplar trees to see if glyphosate resistant poplar clones were economically viable.

**Client: World Wildlife Fund (St. Kitts, West Indies)**
Managed 2-year biodiversity study, quantifying and qualifying the various flora and fauna in St. Kitts' expanding volcanic rainforest. Collaborated with skilled botanists, ornithologists and herpetologists.

## Publications

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**Rosenfeld, P.E.,** J. J. J. Clark, A. R. Hensley, M. Suffet. (2007) "The Use of an Odor Wheel Classification for Evaluation of Human Health Risk Criteria for Compost Facilities" –Water Science & Technology 55(5): 345-357.

**Rosenfeld, P. E.,** M. Suffet. (2007) **"**The Anatomy Of Odour Wheels For Odours Of Drinking Water, Wastewater, Compost And The Urban Environment **"** Water Science & Technology 55(5): 335-344.

Sullivan, P. J. Clark, J.J.J., Agardy, F. J., **Rosenfeld, P.E.,** (2007) "Toxic Legacy, Synthetic Toxins in the Food, Water, and Air in American Cities," Elsevier Publishing, Boston Massachusetts.

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**P. Rosenfeld.** 1991. How to Build a Small Rural Anaerobic Digester & Uses Of Biogas In The First And Third World. Bachelors Thesis. University of California.

England Environmental Agency, 2002. Landfill Gas Control Technologies. Publishing Organization Environment Agency, Rio House, Waterside Drive, Aztec West, Almondsbury BRISTOL, BS32 4UD.

## Presentations

Sok, H.L.; Waller, C.C.; Feng, L.; Gonzalez, J.; Sutherland, A.J.; Wisdom-Stack, T.; Sahai, R.K.; Hesse, R.C.; **Rosenfeld, P.E.** "Atrazine: A Persistent Pesticide in Urban Drinking Water." Urban Environmental Pollution, Boston, MA, June 20-23, 2010.

Feng, L.; Gonzalez, J.; Sok, H.L.; Sutherland, A.J.; Waller, C.C.; Wisdom-Stack, T.; Sahai, R.K.; La, M.; Hesse, R.C.; **Rosenfeld, P.E.** "Bringing Environmental Justice to East St. Louis, Illinois." Urban Environmental Pollution, Boston, MA, June 20-23, 2010.

**Rosenfeld, P.E**. (2009) "Perfluoroctanoic Acid (PFOA) and Perfluoroactane Sulfonate (PFOS) Contamination in Drinking Water From the Use of Aqueous Film Forming Foams (AFFF) at Airports in the United States" Presentation at the 2009 Ground Water Summit and 2009 Ground Water Protection Council Spring Meeting, April 19-23, 2009. Tuscon, AZ.

**Rosenfeld, P.E.** (2009) "Cost to Filter Atrazine Contamination from Drinking Water in the United States" Contamination in Drinking Water From the Use of Aqueous Film Forming Foams (AFFF) at Airports in the United States" Presentation at the 2009 Ground Water Summit and 2009 Ground Water Protection Council Spring Meeting, April 19-23, 2009. Tuscon, AZ.

**Rosenfeld, P. E.** (2007) "Moss Point Community Exposure To Contaminants From A Releasing Facility" Platform Presentation at the 23rd Annual International Conferences on Soils Sediment and Water, October 15-18, 2007. University of Massachusetts, Amherst MA.

**Rosenfeld, P. E.** (2007) "The Repeated Trespass of Tritium-Contaminated Water Into A Surrounding Community Form Repeated Waste Spills From A Nuclear Power Plant" Platform Presentation at the 23rd Annual International Conferences on Soils Sediment and Water, October 15-18, 2007. University of Massachusetts, Amherst MA.

**Rosenfeld, P. E.** (2007) "Somerville Community Exposure To Contaminants From Wood Treatment Facility Emissions" Poster Presentation at the 23rd Annual International Conferences on Soils Sediment and Water, October 15-18, 2007. University of Massachusetts, Amherst MA.

**Rosenfeld P. E.** "Production, Chemical Properties, Toxicology, & Treatment Case Studies of 1,2,3-Trichloropropane (TCP)" – Platform Presentation at the Association for Environmental Health and Sciences (AEHS) Annual Meeting, San Diego, CA, 3/2007.

**Rosenfeld P. E.** "Blood and Attic Sampling for Dioxin/Furan, PAH, and Metal Exposure in Florala, Alabama" – Platform Presentation at the AEHS Annual Meeting, San Diego, CA, 3/2007.

Hensley A.R., Scott, A., **Rosenfeld P.E.,** Clark, J.J.J. (2006) "Dioxin Containing Attic Dust And Human Blood Samples Collected Near A Former Wood Treatment Facility." APHA 134 Annual Meeting & Exposition, Boston Massachusetts. November 4 to 8th, 2006.

**Paul Rosenfeld Ph.D**. “Fate, Transport and Persistence of PFOA and Related Chemicals.” Mealey’s C8/PFOA Science, Risk & Litigation Conference” October 24, 25. The Rittenhouse Hotel, Philadelphia.

**Paul Rosenfeld Ph.D**. “Brominated Flame Retardants in Groundwater: Pathways to Human Ingestion, Toxicology and Remediation PEMA Emerging Contaminant Conference. September 19. Hilton Hotel, Irvine California.

**Paul Rosenfeld Ph.D**. “Fate, Transport, Toxicity, And Persistence of 1,2,3-TCP.” PEMA Emerging Contaminant Conference. September 19. Hilton Hotel in Irvine, California.

**Paul Rosenfeld Ph.D**. “Fate, Transport and Persistence of PDBEs.” Mealey’s Groundwater Conference. September 26, 27. Ritz Carlton Hotel, Marina Del Ray, California.

**Paul Rosenfeld Ph.D**. “Fate, Transport and Persistence of PFOA and Related Chemicals.” International Society of Environmental Forensics: Focus On Emerging Contaminants. June 7,8. Sheraton Oceanfront Hotel, Virginia Beach, Virginia.

**Paul Rosenfeld Ph.D**. “Rate Transport, Persistence and Toxicology of PFOA and Related Perfluorochemicals”. 2005 National Groundwater Association Ground Water And Environmental Law Conference. July 21-22, 2005. Wyndham Baltimore Inner Harbor, Baltimore Maryland.

**Paul Rosenfeld Ph.D**. “Brominated Flame Retardants in Groundwater: Pathways to Human Ingestion, Toxicology and Remediation.” 2005 National Groundwater Association Ground Water And Environmental Law Conference. July 21-22, 2005. Wyndham Baltimore Inner Harbor, Baltimore Maryland.

**Paul Rosenfeld, Ph.D.** and James Clark Ph.D. and Rob Hesse R.G. Tert-butyl Alcohol Liability and Toxicology, A National Problem and Unquantified Liability. National Groundwater Association. Environmental Law Conference. May 5-6, 2004. Congress Plaza Hotel, Chicago Illinois.

**Paul Rosenfeld, Ph.D.,** 2004. Perchlorate Toxicology. Presentation to a meeting of the American Groundwater Trust. March 7th, 2004. Pheonix Arizona.

Hagemann, M.F., **Paul Rosenfeld, Ph.D.** and Rob Hesse, 2004. Perchlorate Contamination of the Colorado River. Invited presentation to a meeting of tribal representatives, Parker, AZ.

**Paul Rosenfeld, Ph.D.** A National Damage Assessment Model For PCE and Dry Cleaners. Drycleaner Symposium. California Ground Water Association. Radison Hotel, Sacramento, California. April 7, 2004.

**Paul Rosenfeld, Ph.D.** and James Clark Ph.D. Understanding Historical Use, Chemical Properties, Toxicity and Regulatory Guidance of 1,4 Dioxane. National Groundwater Association. Southwest Focus Conference. Water Supply and Emerging Contaminants. February 20-21, 2003. Hyatt Regency Phoenix Arizona.

**Paul Rosenfeld, Ph.D.** Underground Storage Tank Litigation and Remediation. California CUPA Forum. Marriott Hotel. Anaheim California. February 6-7, 2003.

**Paul Rosenfeld, Ph.D**. Underground Storage Tank Litigation and Remediation. EPA Underground Storage Tank Roundtable. Sacramento California. October 23, 2002.

**Rosenfeld, P.E**. and Suffet, M. 2002. Understanding Odor from Compost, Wastewater and Industrial Processes. Sixth Annual Symposium On Off Flavors in the Aquatic Environment. International Water Association. Barcelona Spain. October 7- 10.

**Rosenfeld, P.E**. and Suffet, M. 2002. Using High Carbon Wood Ash to Control Compost Odor. Sixth Annual Symposium On Off Flavors in the Aquatic Environment. International Water Association. Barcelona Spain. October 7- 10.

**Rosenfeld, P.E.** and Grey, M. A. 2002. Biocycle Composting For Coastal Sage Restoration. Northwest Biosolids Management Association. Vancouver Washington. September 22-24.

**Rosenfeld, P.E**. and Grey, M. A. 2002. Soil Science Society Annual Conference. Indianapolis, Maryland. November 11-14.

**Rosenfeld. P.E.** 2000. Two stage biofilter for biosolids composting odor control. Water Environment Federation. Anaheim California. September 16, 2000.

**Rosenfeld. P. E. 2000**. Wood ash and biofilter control of compost odor. Biofest. October 16, 2000.Ocean Shores, California.

**Rosenfeld, P. E. 2000**. Bioremediation Using Organic Soil Amendments. California Resource Recovery Association. Sacramento California.

**Rosenfeld, P.E**., C.L. Henry, R. Harrison. 1998. Oat and Grass Seed Germination and Nitrogen and Sulfur Emissions Following Biosolids Incorporation With High-Carbon Wood-Ash. Water Environment Federation 12th Annual Residuals and Biosolids Management Conference Proceedings. Bellevue Washington.

**Rosenfeld, P.E.**, and C.L. Henry. 1999. An evaluation of ash incorporation with biosolids for odor reduction. Soil Science Society of America. Salt Lake City Utah.

**Rosenfeld, P.E.**, C.L. Henry, R. Harrison. 1998. Comparison of Microbial Activity and Odor Emissions from Three Different Biosolids Applied to Forest Soil. Brown and Caldwell, Seattle Washington.

**Rosenfeld, P.E.**, C.L. Henry. 1998. Characterization, Quantification, and Control of Odor Emissions from Biosolids Application To Forest Soil. Biofest Lake Chelan, Washington.

**Rosenfeld, P.E.**, C.L. Henry, R. B. Harrison, and R. Dills. 1997. Comparison of Odor Emissions From Three Different Biosolids Applied to Forest Soil. Soil Science Society of America, Anaheim California.

## Professional History

Soil Water Air Protection Enterprise (SWAPE); 2003 to present; Founding And Managing Partner
UCLA School of Public Health; 2007 to 2010; Lecturer (Asst Res)
UCLA School of Public Health; 2003 to 2006; Adjunct Professor
UCLA Environmental Science and Engineering Program; 2002-2004; Doctoral Intern Coordinator
UCLA Institute of the Environment, 2001-2002; Research Associate
Komex $H_2O$ Science, 2001 to 2003; Senior Remediation Scientist
National Groundwater Association, 2002-2004; Lecturer
San Diego State University, 1999-2001; Adjunct Professor
Anteon Corp., San Diego, 2000-2001; Remediation Project Manager
Ogden (now Amec), San Diego, 2000-2000; Remediation Project Manager
Bechtel, San Diego, California, 1999 – 2000; Risk Assessor
King County, Seattle, 1996 – 1999; Scientist
James River Corp., Washington, 1995-96; Scientist
Big Creek Lumber, Davenport, California, 1995; Scientist
Plumas Corp., California and USFS, Tahoe 1993-1995; Scientist
Peace Corps and World Wildlife Fund, St. Kitts, West Indies, 1991-1993; Scientist
Bureau of Land Management, Kremmling Colorado 1990; Scientist

## Teaching Experience

**UCLA Department of Environmental Health (Summer 2003 through 2010)** Taught Environmental Health Science 100 to students, including undergrad, medical doctors, public health professionals and nurses. Course focuses on the health effects of environmental contaminants.

**National Ground Water Association,** Successful Remediation Technologies. Custom Course In Sante Fe, New Mexico. May 21, 2002. Focused on fate and transport of fuel contaminants associated with underground storage tanks.

**National Ground Water Association;** Successful Remediation Technologies Course in Chicago Illinois. April 1, 2002. Focused on fate and transport of contaminants associated with Superfund and RCRA sites.

**California Integrated Waste Management Board**, April and May, 2001. Alternative Landfill Caps Seminar in San Diego, Ventura, and San Francisco. Focused on both prescriptive and innovative landfill cover design.

**UCLA Department of Environmental Engineering,** February 5 2002 Seminar on Successful Remediation Technologies focusing on Groundwater Remediation.

**University Of Washington, Soil Science Program,** Teaching Assistant for several courses including: Soil Chemistry, Organic Soil Amendments, and Soil Stability.

**U.C. Berkeley, Environmental Science Program** Teaching Assistant for Environmental Science 10.

## Academic Grants Awarded

**California Integrated Waste Management Board**. $41,000 grant awarded to UCLA Institute of the Environment. Goal: To investigate effect of high carbon wood ash on volatile organic emissions from compost. 2001.

**Synagro Technologies, Corona California**: $10,000 grant awarded to San Diego State University. Goal: investigate effect of biosolids for restoration and remediation of degraded coastal sage soils. 2000.

**King County, Department of Research and Technology, Washington State**. $100,000 grant awarded to University of Washington: Goal: To investigate odor emissions from biosolids application and the effect of polymers and ash on VOC emissions. 1998.

**Northwest Biosolids Management Association, Washington State**. $20,000 grant awarded to investigate effect of polymers and ash on VOC emissions from biosolids. 1997.

**James River Corporation, Oregon**: $10,000 grant was awarded to investigate the success of genetically engineered Poplar trees with resistance to round-up. 1996.

**United State Forest Service, Tahoe National Forest**: $15,000 grant was awarded to investigating fire ecology of the Tahoe National Forest. 1995.

**Kellogg Foundation, Washington D.C**. $500 grant was awarded to construct a large anaerobic digester on St. Kitts in West Indies. 1993.

## Cases that Dr. Rosenfeld Provided Deposition or Trial Testimony

In the Court of Common Pleas of Tuscarawas County Ohio
John Michael Abicht, et al., *Plaintiffs*, vs. Republic Services, Inc., et al., *Defendants*
Case Number: 2008 CT 10 0741 (Cons. w/ 2009 CV 10 0987)

In the Court of Common Pleas for the Second Judicial Circuit, State of South Carolina, County of Aiken
David Anderson, et al., *Plaintiffs*, vs. Norfolk Southern Corporation, et al., *Defendants*.
Case Number: 2007-CP-02-1584

In the Circuit Court of Jefferson County Alabama
Jaeanette Moss Anthony, et al., *Plaintiffs*, vs. Drummond Company Inc., et al., *Defendants*
Civil action No. CV 2008-2076

In the Ninth Judicial District Court, Parish of Rapides, State of Louisiana
Roger Price, et al., *Plaintiffs*, vs. Roy O. Martin, L.P., et al., *Defendants*.
Civil Suit Number 224,041 Division G

In the United States District Court, Western District Lafayette Division
Ackle et al., *Plaintiffs*, vs. Citgo Petroleum Corporation, et al., *Defendants*.
Case Number 2:07CV1052

In the United States District Court for the Southern District of Ohio
Carolyn Baker, et al., *Plaintiffs*, vs. Chevron Oil Company, et al., *Defendants*.
Case Number 1:05 CV 227

In the Fourth Judicial District Court, Parish of Calcasieu, State of Louisiana
Craig Steven Arabie, et al., *Plaintiffs*, vs. Citgo Petroleum Corporation, et al., *Defendants*.
Case Number 07-2738 G

In the Fourteenth Judicial District Court, Parish of Calcasieu, State of Louisiana
Leon B. Brydels, *Plaintiffs*, vs. Conoco, Inc., et al., *Defendants*.
Case Number 2004-6941 Division A

In the District Court of Tarrant County, Texas, 153rd Judicial District
Linda Faust, *Plaintiff*, vs. Burlington Northern Santa Fe Rail Way Company, Witco Chemical Corporation A/K/A Witco Corporation, Solvents and Chemicals, Inc. and Koppers Industries, Inc., *Defendants*.
Case Number 153-212928-05

In the Superior Court of the State of California in and for the County of San Bernardino
Leroy Allen, et al., *Plaintiffs*, vs. Nutro Products, Inc., a California Corporation and DOES 1 to 100, inclusive, *Defendants*.
John Loney, Plaintiff, vs. James H. Didion, Sr.; Nutro Products, Inc.; DOES 1 through 20, inclusive, *Defendants*.
Case Number VCVVS044671

In the United States District Court for the Middle District of Alabama, Northern Division
James K. Benefield, et al., *Plaintiffs*, vs. International Paper Company, *Defendant*.
Civil Action Number 2:09-cv-232-WHA-TFM

In the Superior Court of the State of California in and for the County of Los Angeles
Leslie Hensley and Rick Hensley, *Plaintiffs*, vs. Peter T. Hoss, as trustee on behalf of the Cone Fee Trust; Plains Exploration & Production Company, a Delaware corporation; Rayne Water Conditioning, Inc., a California corporation; and DOES 1 through 100, *Defendants.*
Case Number SC094173

In the Superior Court of the State of California in and for the County of Santa Barbara, Santa Maria Branch
Clifford and Shirley Adelhelm, et al., all individually, *Plaintiffs*, vs. Unocal Corporation, a Delaware Corporation; Union Oil Company of California, a California corporation; Chevron Corporation, a California corporation; ConocoPhillips, a Texas corporation; Kerr-McGee Corporation, an Oklahoma corporation; and DOES 1 though 100, *Defendants.*
Case Number 1229251 (Consolidated with case number 1231299)

In the United States District Court for Eastern District of Arkansas, Eastern District of Arkansas
Harry Stephens Farms, Inc, and Harry Stephens, individual and as managing partner of Stephens Partnership, *Plaintiffs*, vs. Helena Chemical Company, and Exxon Mobil Corp., successor to Mobil Chemical Co., *Defendants.*
Case Number 2:06-CV-00166 JMM (Consolidated with case number 4:07CV00278 JMM)

In the United States District Court for the Western District of Arkansas, Texarkana Division
Rhonda Brasel, et al., *Plaintiffs*, vs. Weyerhaeuser Company and DOES 1 through 100, *Defendants.*
Civil Action Number 07-4037

In The Superior Court of the State of California County of Santa Cruz
Constance Acevedo, et al. *Plaintiffs* Vs. California Spray Company, et al. *Defendants*
Case No CV 146344

In the District Court of Texas 21st Judicial District of Burleson County
Dennis Davis, *Plaintiff*, vs. Burlington Northern Santa Fe Rail Way Company, *Defendant.*
Case Number 25,151

In the United States District Court of Southern District of Texas Galveston Division
Kyle Cannon, Eugene Donovan, Genaro Ramirez, Carol Sassler, and Harvey Walton, each Individually and on behalf of those similarly situated, *Plaintiffs,* vs. BP Products North America, Inc., *Defendant.*
Case 3:10-cv-00622

In the Circuit Court of Baltimore County Maryland
Philip E. Cvach, II et al., *Plaintiffs* vs. Two Farms, Inc. d/b/a Royal Farms, Defendants
Case Number: 03-C-12-012487 OT

substantial evidence that the Project will have significant impacts not analyzed in the 2011 PEIR, a tiered EIR must be prepared for the Project. Approval of the Project based on an addendum violates the California Environmental Quality Act ("CEQA"), Pub. Res. Code section 21000, et seq.

This letter in support of SAFER's appeal was prepared with the assistance of environmental consulting firm SWAPE. SWAPE's expert comment and the resumes of SWAPE's consultants are attached hereto as Exhibit A, and is incorporated herein by reference in its entirety. This comment has also been prepared with the assistance of Certified Industrial Hygienist, Francis "Bud" Offermann, PE, CIH. Mr. Offermann's comment and resume are attached as Exhibit B hereto and is incorporated herein by reference in its entirety.

## PROJECT DESCRIPTION

The Project proposes to develop a mixed-use residential and commercial development in the Downtown Plan area. The proposed project would replace two existing surface parking lots with two buildings— an 8-story building at the north end of the property (North Building) and a 23-story high rise building at the south portion of the site (South Building) on a 1.2-acre site. Both buildings would include ground floor retail, with residential units on the upper stories.

The proposed project would include a total of 345 residential units that would range from studios to 3-bedroom units, 14,437 sf of retail commercial space, 563 vehicle parking spaces, and 128 bicycle parking spaces. The project's residential component would consist of 429,456 square feet (sf) of residential uses, including amenities, 14,337 sf of commercial retail uses, 217,493 sf of parking. The proposed project would also include 42,307 sf of open space, namely 13,944 sf of residential common outdoor open space, 11,688 sf of residential indoor common open space, 11,340 sf of residential private open space, and 5,335 sf of public open space. The proposed project's gross building area would be approximately 661,430 sf, including all below-grade levels.

## DISCUSSION

SAFER hereby requests that the City prepare an environmental impact report ("EIR") to analyze the significant environmental impacts of the Project and to propose all feasible mitigation measures and alternatives to reduce those impacts. The City many not rely on an addendum to the 2011 PEIR for several reasons, including, but not limited to, the following:

### I. CEQA REQUIRES THE CITY TO PREPARE A TIERED EIR FOR THE PROJECT INSTEAD OF AN ADDENDUM.

CEQA permits agencies to 'tier' EIRs, in which general matters and environmental effects are considered in an EIR "prepared for a policy, plan, program or ordinance followed by narrower or site-specific [EIRs] which incorporate by reference the discussion in any prior [EIR] and which concentrate on the environmental effects which (a) are capable of being mitigated, or (b) were not analyzed as significant effects on the environment in the prior [EIR]." (Pub. Res.

Code § 21068.5.) The initial general policy-oriented EIR is called a programmatic EIR ("PEIR") and offers the advantage of allowing "the lead agency to consider broad policy alternatives and program wide mitigation measures at an early time when the agency has greater flexibility to deal with basic problems or cumulative impacts." (EIR 14 CCR §15168.) "[T]iering is appropriate when it helps a public agency to focus upon the issues ripe for decision at each level of environmental review and in order to exclude duplicative analysis of environmental effects examined in previous [EIRs]." (Pub Resources Code § 21093.) CEQA regulations strongly promote tiering of EIRs, stating that "[EIRs] shall be tiered whenever feasible, as determined by the lead agency." (Cal Pub Resources Code § 21093.)

Once a program EIR has been prepared, "[s]ubsequent activities in the program must be examined in light of the program EIR to determine whether an additional environmental document must be prepared." (14 CCR § 15168(c).) The first consideration is whether the activity proposed is covered by the PEIR. (*Id.*) If a later project is outside the scope of the program, then it is treated as a separate project and the PEIR may not be relied upon in further review. (*Sierra Club v. County of Sonoma* (1992) 6 Cal.App.4th 1307.) The second consideration is whether the "later activity would have effects that were not examined in the program EIR." (CCR §§ 15168(c)(1).) A PEIR may only serve "to the extent that it contemplates and adequately analyzes the potential environmental impacts of the project." (*Sierra Nevada Conservation v. County of El Dorado* ( "*El Dorado*") (2012) 202 Cal.App.4th 1156). If the PEIR does not evaluate the environmental impacts of the project, a tiered EIR must be completed before the project is approved. (*Id.*) For these inquiries, the "fair argument test" applies. (*Sierra Club*, 6 Cal.App.4th 1307, 1318; *See also Sierra Club v. County of San Diego* (2014) 231 Cal.App.4th 1152, 1164 (**"**when a prior EIR has been prepared and certified for a program or plan, the question for a court reviewing an agency's decision not to use a tiered EIR for a later project 'is one of law, i.e., the sufficiency of the evidence to support a fair argument.'"))

Under the fair argument test, a new EIR must be prepared "whenever it can be fairly argued on the basis of substantial evidence that the project may have significant environmental impact. (*Id.* at 1316 (quotations omitted).) When applying the fair argument test, "deference to the agency's determination is not appropriate and its decision not to require an EIR can be upheld only when there is no credible evidence to the contrary." (*Sierra Club*, 6 Cal. App. 4th at 1312.) "[I]f there is substantial evidence in the record that the later project may arguably have a significant adverse effect on the environment which was not examined in the prior program EIR, doubts must be resolved in favor of environmental review and the agency must prepare a new tiered EIR, notwithstanding the existence of contrary evidence." (*Sierra Club*, 6 Cal.App.4th at 1319.)

In *Friends of College of San Mateo Gardens* the California Supreme Court explained the differing analyses that apply when a project EIR was originally approved and changes are being made to the project, and when a tiered program EIR was originally prepared and a subsequent project is proposed consistent with the program or plan:

> For project EIRs, of course, a subsequent or supplemental impact report is required in the event there are substantial changes to the project or its circumstances, or in the event of

> material new and previously unavailable information. (*Friends of Mammoth*, citing § 21166.) In contrast, when a tiered EIR has been prepared, review of a subsequent project proposal is more searching. **If the subsequent project is consistent with the program or plan for which the EIR was certified, then 'CEQA requires a lead agency to prepare an initial study to determine if the later project may cause significant environmental effects not examined in the first tier EIR.'** (*Ibid*. citing Pub. Resources Code, § 21094, subds. (a), (c).) 'If the subsequent project is not consistent with the program or plan, it is treated as a new project and must be fully analyzed in a project—or another tiered EIR if it may have a significant effect on the environment.' (*Friends of Mammoth*, at pp. 528–529, 98 Cal.Rptr.2d 334.)

(*Friends of Coll. of San Mateo Gardens v. San Mateo County Cmty. Coll. Dist.* ("*San Mateo Gardens*") (2016) 1 Cal.5th 937, 960.)

Here, the City prepared a program EIR in 2011 for the Downtown Plan Project.[1] As a result, CEQA requires the City to prepare an initial study to determine if the Project *may* cause significant environmental effects not examined in the PEIR. (Pub. Res. Code § 21094.) As discussed below, there is substantial evidence supporting a fair argument that the Project may result in significant environmental impacts that were not previously analyzed in the PEIR. Accordingly, an EIR must be prepared for the Project.

## II. THE CITY CANNOT ISSUE AN ADDENDUM FOR THE PROJECT BECAUSE THE PROJECT WAS NOT ADDRESSED IN THE PROGRAM EIR.

The City is wrong in concluding that the Project can be analyzed under CEQA Guidelines Section 15164 and 15162 because those sections are only applicable when a project has recently undergone CEQA review. As the California Supreme Court explained in *San Mateo Gardens*, subsequent CEQA review provisions "can apply only if the project has been subject to initial review; they can have no application if the agency has proposed a new project that has not previously been subject to review." (*Friends of Coll. of San Mateo Gardens v. San Mateo County Cmty. Coll. Dist.* ("*San Mateo Gardens*") (2016) 1 Cal.5th 937, 950.) Agencies can prepare addendums for project modifications or revisions and avoid further environmental review, but only if the project has a previously certified EIR or negative declaration. (*See Save our Heritage v. City of San Diego* (2018) 28 Cal.App.5th 656, 667.)

If the proposed Project had already been addressed in the 2011 PEIR, the standard for determining whether further review is required would be governed by 14 CCR §15162 and Pub. Res. C. §21166, and an addendum could potentially be allowed under § 15164. These sections

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[1] The 2011 PEIR states that it was "prepared in accordance with the provisions of the California Environmental Quality Act (CEQA) and Section 15168 of the CEQA Guidelines, which provides for the preparation of a PEIR '[i]n connection with issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program.'" (2011 PEIR, p. 1-1.)

are inapplicable here, however, because the proposed Project has never undergone CEQA review. Neither an EIR nor a negative declaration was prepared for the Project, and the Project was never mentioned or discussed in the PEIR. As a result, the City cannot rely on the subsequent review provisions of CEQA Guidelines sections 15162 or 15164.

## III. THERE IS SUBSTANTIAL EVIDENCE THAT THE PROJECT WILL HAVE SIGNIFICANT ENVIRONMENTAL IMPACTS.

### A. There is Substantial Evidence that the Project will have a Significant Impact on Indoor Air Quality.

Certified Industrial Hygienist, Francis "Bud" Offermann, PE, CIH concludes that it is likely that the Project will expose future residents to significant impacts related to indoor air quality, and in particular, emissions for the cancer-causing chemical formaldehyde. Mr. Offermann is one of the world's leading experts on indoor air quality and has published extensively on the topic.

Mr. Offermann explains that many composite wood products typically used in modern home construction contain formaldehyde-based glues that off-gas formaldehyde over a very long time period. He states, "The primary source of formaldehyde indoors is composite wood products manufactured with urea-formaldehyde resins, such as plywood, medium density fiberboard, and particle board. These materials are commonly used in residential building construction for flooring, cabinetry, baseboards, window shades, interior doors, and window and door trims." Offermann Comment, pp. 2-3.

Formaldehyde is a known human carcinogen. Mr. Offermann states that there is a fair argument that future residents of the Project will be exposed to a cancer risk from formaldehyde of approximately 125 per million, assuming all materials are compliant with the California Air Resources Board's formaldehyde airborne toxics control measure. *Id*., pp. 3-4. This is almost 12 times the SCAQMD's CEQA significance threshold for airborne cancer risk of 10 per million. *Id*. at 4.

In addition, employees of the commercial spaces are expected to experience similarly significant indoor air exposures to formaldehyde from building materials and furnishings commonly found in offices and hotels. Mr. Offermann calculates that full time employees in the commercial spaces may be exposed to formaldehyde in an amount that would represent a cancer risk of 18.4 per million. *Id*. at 4-5. This also exceeds the 10 per million SCAQMD threshold. *Id*.

Mr. Offermann concludes that this significant environmental impact should be analyzed in an EIR and mitigation measures should be imposed to reduce the risk of formaldehyde exposure. *Id*. at 5.

Mr. Offermann identifies several feasible mitigation measures that are available to reduce these significant health risks, including the installation of air filters and a requirement that the applicant use only composite wood materials (e.g. hardwood plywood, medium density fiberboard, particleboard) for all interior finish systems that are made with CARB approved no-added formaldehyde (NAF) resins or ultra-low emitting formaldehyde (ULEF) resins in the buildings' interiors. Offermann, pp. 11-13.

When a project exceeds a duly adopted CEQA significance threshold, as here, this alone establishes a fair argument that the project will have a significant adverse environmental impact and an EIR is required. Indeed, in many instances, such air quality thresholds are the only criteria reviewed and treated as dispositive in evaluating the significance of a project's air quality impacts. *See, e.g. Schenck v. County of Sonoma* (2011) 198 Cal.App.4th 949, 960 (County applies BAAQMD's "published CEQA quantitative criteria" and "threshold level of cumulative significance"); *see also*, *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 110-111 ("A 'threshold of significance' for a given environmental effect is simply that level at which the lead agency finds the effects of the project to be significant"). The California Supreme Court made clear the substantial importance that an air district significance threshold plays in providing substantial evidence of a significant adverse impact. *Communities for a Better Environment v. South Coast Air Quality Management Dist.* (2010) 48 Cal.4th 310, 327 ("As the [South Coast Air Quality Management] District's established significance threshold for NOx is 55 pounds per day, these estimates [of NOx emissions of 201 to 456 pounds per day] constitute substantial evidence supporting a fair argument for a significant adverse impact"). Since expert evidence demonstrates that the Project will exceed the SCAQMD's CEQA significance threshold, there is a fair argument that the Project will have significant adverse impacts and an EIR is required.

The City has a duty to investigate issues relating to a project's potential environmental impacts, especially those issues raised by an expert's comments. *See Cty. Sanitation Dist. No. 2 v. Cty. of Kern*, (2005) 127 Cal.App.4th 1544, 1597–98 ("under CEQA, the lead agency bears a burden to investigate potential environmental impacts"). In addition to assessing the Project's potential health impacts to future residents, Mr. Offermann identifies the investigatory path that the City should be following in developing an EIR to more precisely evaluate the Project's future formaldehyde emissions and establishing mitigation measures that reduce the cancer risk below the SCAQMD level. Offermann, pp. 5-9. Such an analysis would be similar in form to the air quality modeling and traffic modeling typically conducted as part of a CEQA review.

The failure to address the project's formaldehyde emissions is contrary to the California Supreme Court's decision in *California Building Industry Ass'n v. Bay Area Air Quality Mgmt. Dist.* (2015) 62 Cal.4th 369, 386 ("*CBIA*"). At issue in *CBIA* was whether the Air District could enact CEQA guidelines that advised lead agencies that they must analyze the impacts of adjacent environmental conditions on a project. The Supreme Court held that CEQA does not generally require lead agencies to consider the environment's effects on a project. *CBIA*, 62 Cal.4th at 800-801. However, to the extent a project may exacerbate existing adverse environmental conditions at or near a project site, those would still have to be considered pursuant to CEQA. *Id*. at 801 ("CEQA calls upon an agency to evaluate existing conditions in order to assess whether a project could exacerbate hazards that are already present"). In so holding, the Court expressly held that CEQA's statutory language required lead agencies to disclose and analyze "impacts on ***a***

***project's users or residents*** that arise ***from the project's effects*** on the environment." *Id*. at 800 (emphasis added).)

The carcinogenic formaldehyde emissions identified by Mr. Offermann are not an existing environmental condition. Those emissions to the air will be from the Project. Residents will be users of the Project. Currently, there is presumably little if any formaldehyde emissions at the site. Once the Project is built, emissions will begin at levels that pose significant health risks. Rather than excusing the City from addressing the impacts of carcinogens emitted into the indoor air from the project, the Supreme Court in *CBIA* expressly finds that this type of effect by the project on the environment and a "project's users and residents" must be addressed in the CEQA process.

The Supreme Court's reasoning is well-grounded in CEQA's statutory language. CEQA expressly includes a project's effects on human beings as an effect on the environment that must be addressed in an environmental review. "Section 21083(b)(3)'s express language, for example, requires a finding of a 'significant effect on the environment' (§ 21083(b)) whenever the 'environmental effects of a project will cause substantial adverse effects *on human beings,* either directly or indirectly.'" *CBIA*, 62 Cal.4th at 800 (emphasis in original). Likewise, "the Legislature has made clear—in declarations accompanying CEQA's enactment—that public health and safety are of great importance in the statutory scheme." *Id*., citing e.g., §§ 21000, subds. (b), (c), (d), (g), 21001, subds. (b), (d). It goes without saying that the hundreds of future residents of the Project are human beings and the health and safety of those residents is as important to CEQA's safeguards as nearby residents currently living adjacent to the project site.

Mr. Offermann also notes that the high cancer risk that may be posed by the Project's indoor air emissions likely will be exacerbated by the additional cancer risk that exists from the project's location close to roads with moderate to high traffic such as Ocean Boulevard, Broadway, 3rd Street, and 7th Street, and the Long Beach Airport and the high levels of PM2.5 already present in the ambient air at this location. Offermann Comments, pp. 10-11. No analysis has been conducted of the significant cumulative health impacts that will result to residents and employees of the new Project.

Because Mr. Offermann's expert review is substantial evidence of a fair argument of a significant environmental impact to future users of the project, an EIR must be prepared to disclose and mitigate those impacts.

### B. The Addendum Relies on Unsubstantiated and Inaccurate Input Parameters to Estimate Project Emissions and Thus Failed to Adequately Analyze the Project's Air Quality Impacts.

The Addendum's air quality analysis relies on emissions calculated from the California Emissions Estimator Model Version CalEEMod.2016.3.2 ("CalEEMod"). This model relies on recommended default values or on site specific information related to a number of factors. The model is used to generate a project's construction and operational emissions. SWAPE reviewed the Project's CalEEMod output files and found that the values input into the model were either unsubstantiated or inconsistent with information provided in the Addendum. This resulted in an underestimation of the Project's emissions. As a result, the Project may have a significant air quality impacts and an EIR is required to properly analyze these potential impacts.

**1. The Addendum's air model used incorrect land use sizes and vehicle trips.**

According to the Addendum, the Project would include 217,473 square feet of parking. Addendum, p. 37, table 2. In addition, the Project includes 14,481 square feet of retail commercial space. *Id*. However, the CalEEMod output files demonstrate that the Addendum only modeled an area of 215,559 square feet for parking and 14,437 square feet for retail commercial space. SWAPE, p. 2 (citing Addendum Appendix B pp. 41, 71). In addition, the Addendum states that the residential space will include 11,688 square feet of indoor residential common areas, comprised of residential amenities such as gym and storage areas. Addendum, p. 37, table 2. However, the CalEEMod output files disclose that none of this land use space was included in the model. SWAPE, p. 3.

The use of incorrect land use areas has impacts throughout the Project's environmental analysis. As SWAPE explains:

> The land use type and size features are used throughout CalEEMod to determine default variable and emission factors that go into the model's calculations. For example, the square footage of a land use is used for certain calculations such as determining the wall space to be painted (i.e., VOC emissions from architectural coatings) and volume that is heated or cooled (i.e., energy impacts). Furthermore, CalEEMod assigns each land use type with its own set of energy usage emission factors. Thus, by underestimating the size of the proposed parking, retail, and residential land uses within the air model, the model underestimates the emissions associated with construction and operation of the proposed Project.

SWAPE, p. 3.

Similarly, the Addendum's air model used an incorrect number of traffic trips. According to the Addendum's Traffic Study, the Project will generate 2,574 daily trips. However, the CalEEMod output files demonstrate that the model only considered 2,567 weekday trips, and 1,890 Sunday trips. SWAPE, p. 4.

These inaccuracies must be corrected in an updated air quality analysis. Use of these incorrect input parameters resulted in an underestimation of air quality impacts.

**2. The Addendum's air model used an incorrect list of construction equipment.**

The Project's CalEEMod output files also demonstrate that the air model used an incorrect list of construction equipment. The air quality analysis, included as Exhibit B to the

Addendum, includes a list of construction equipment needed for the Project. That list includes the need for one Concrete/Industrial Saw, one Rubber Tired Dozer, and one Tractor/Loader/Backhoe during the grading phase of Project construction. Addendum, Appendix B, p. 34. SWAPE's review of the CalEEMod output files, however demonstrate that a Grader was included as part of the construction equipment, and no Concrete/Industrial Saws were included in the grading phase of construction. SWAPE, p. 6 (citing Addendum, Appendix B, p. 48).

**3. The Addendum's air model is based on an unsubstantiated reduction in carbon intensity factor.**

The CalEEMOd output data also demonstrates that the default value for CO2 intensity factor was changed, without any justification being given. SWAPE, p. 7. Specifically, the default CO2 intensity factor of 702.44 pounds per megawatt-hour (lbs/MWhr) was changed to 516.04 lbs/MWhr in the air model. Addendum, Appendix B, pp. 43, 73. SWAPE explains that "this intensity factor is used to estimate the $CO_2$ emissions generated from electricity usage during Project operation. By reducing the carbon intensity factor, the air model underestimates the Project's operational greenhouse gas (GHG) emissions." SWAPE, p. 8. Without justification, reduction in the CO2 intensity factor was improper and resulted in an underestimation of the Project's impacts. *Id*.

**C. There is Substantial Evidence that the Project may have a Significant Impact on Human Health.**

The Addendum determined that the Project would result in a less-than-significant health risk impact from diesel particulate matter emissions. Addendum, p. 67. This conclusion is not supported by substantial evidence because a quantitative health risk assessment ("HRA") was never prepared for the Project.

SWAPE conducted a screening-level HRA in order to demonstrate the potential risk posed by Project construction and operation to nearby sensitive receptors. SWAPE, pp. 9-13. SWAPE's HRA corrected the errors in the CalEEMod model described above. Based on the HRA, SWAPE concludes that the Project's construction and operational diesel particulate matter emissions may result in a significant health risk impacts that was not analyzed or mitigated in the Addendum. *Id*. at 9.

According to the HRA, the Project will result in an excess cancer risk to adults, children, and infants of 31, 280, and 240 per million when using the age sensitivity factors recommended by the Office of Health Hazards Assessment ("OEHHA"). SWAPE, p. 13. The excess cancer risk over the course of a residential life time (30 years) at the closest receptor, 25 meters away, is 560 per million. *Id*. Even without using the age sensitivity factors recommended by OEHHA, the excess cancer risk to adults, children, and infants is 31, 93, and 24 in one million, while the excess cancer risk over the course of a residential life time is 150 in one million. *Id*. Each of these risks exceed the South Coast Air Quality Management District's threshold of significance of 10 in one million. *Id*. Accordingly, each of these risks is a significant impact that must be analyzed in an EIR.

### D. There is Substantial Evidence that the Project will have a Significant Greenhouse Gas Impact.

The Addendum improperly concludes that the Project will not have a significant greenhouse gas ("GHG") impact because the Project will be consistent with Ab 32, SB 375, and the City of Long Beach Sustainable City Action Plan. In addition the Addendum quantifies emissions and compares them to SCAQMD's per service population threshold for 2020 to support its conclusion. As explained in SWAPE's comment letter, none of these justifications are sufficient. SWAPE, pp. 14-21.

The Addendum also inadequately compares the Project's annual GHG emissions to the applicable SCAQMD threshold of significance. SWAPE, p. 19. According to the Addendum's GHG analysis the Project would result in a net increase of 4,389 metric tons of $CO_2$ equivalents per year (MT $CO_2$e/year). Addendum Appendix E, p. 60, Table 11. The analysis then goes on to state that:

> [T[here is no scientific or regulatory consensus regarding what particular quantity of GHG emissions is significant. Further, no agency with regulatory authority and expertise, such as CARB or SCAQMD, as adopted numeric GHG thresholds for land use development projects for purposes of CEQA…[D]ividing the total Project 2020 scenario mitigated GHG emissions by the estimated service population yields an efficiency metric of 4.3 $CO_2$e per service population per year as compared to 4.8 for the year 2020 threshold. This comparison is provided for informational purposes.

Addendum Appendix E, p. 34.

There are two problems with this analysis. First, the analysis is deficient because it relies on SCAQMD's 2020 service population efficiency threshold of 4.8 MT $CO_2$e/year. SWAPE, p. 20. This is improper because, as the CalEEMod output files demonstrate, the Project's development and construction would continue beyond 2020, not becoming operational until 2021. Addendum Appendix B, pp. 42, 72. As a result, the GHG analysis should have used SCAQMD's 2030 efficiency standard of 3.0 MT $CO_2$e/year to evaluate the Project's 2021 and beyond emissions. SWAPE, p. 20. When the per-service population emissions estimated in the Addendum are compared to the relevant SCAQMD threshold of significance, "the Project's 2021 service population efficiency value of 4.33 MT $CO_2$e/SP/year exceeds the 2035 service population efficiency threshold of 3.0 MT $CO_2$e/SP/year." *Id*. This is constitutes substantial evidence that the Project will have a significant GHG impact that must be analyzed and mitigated in an EIR.

The second issue with the Addendum's quantitative GHG analysis is that, as discussed above, the Addendum's CalEEMod model relies on inaccurate input parameters, which resulted in an underestimation of the Project's GHG emissions. SWAPE, pp. 19-20. Using the updated CalEEMod model with corrected inputs, SWAPE determined that the Project would emit 4,677.46 MT $CO_2e$/year rather than the Addendum's inaccurate estimation of 4,389 MT $CO_2e$/year. SWAPE, p. 20. The Project's annual GHG emissions of 4,677.46 MT $CO_2e$/year exceed SCAQMD's Tier 3 Option 1's 3,000 MT $CO_2e$/year mixed-use/non-industrial project screening threshold. *Id*. Moreover, when divided by the maximum service population of 1,013, this results in a per service population efficiency value of 4.62 MT $CO_2e$/SP/year, which is an even greater exceedance of the applicable 3.0 MT $CO_2e$/SP/year than is disclosed in the Addendum. *Id*. at 21.

SWAPE's comments constitute substantial evidence that the Proejct may have a significant GHG impact. This impact must be analyzed and mitigated in an EIR. SWAPE's comment contains a number of feasible mitigation measures that should be considered to reduce the Project's GHG impact. SWAPE, pp. 26-32.

**E. There is Substantial Evidence that the Project may have a Significant Impact on Biological Resources as a Result of Window Collisions.**

The Project as planned would contribute to an ongoing national catastrophe in bird collision deaths caused by poorly planned incorporation of windows into building designs. Constructing 8- and 23-story buildings, as the Project proposes to do, will not only take aerial habitat from birds, but it will also interfere with the movement of birds in the region and it will result in large numbers of annual window collision fatalities.

Window collisions are often characterized as either the second or third largest source or anthropogenic-caused bird mortality. The numbers behind these characterizations are often attributed to Klem's (1990)[2] and Dunn's (1993)[3] estimates of about 100 million to 1 billion bird fatalities in the USA, or more recently Loss et al.'s (2014)[4] estimate of 365-988 million bird fatalities in the USA or Calvert et al.'s (2013)[5] and Machtans et al.'s (2013)[6] estimates of 22.4 million and 25 million bird fatalities in Canada, respectively.

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[2] Klem, D., Jr. 1990. Collisions between birds and windows: mortality and prevention. Journal of Field Ornithology 61:120-128.

[3] Dunn, E. H. 1993. Bird mortality from striking residential windows in winter. Journal of Field Ornithology 64:302-309.

[4] Loss, S. R., T. Will, S. S. Loss, and P. P. Marra. 2014. Bird–building collisions in the United States: Estimates of annual mortality and species vulnerability. The Condor: Ornithological Applications 116:8-23. DOI: 10.1650/CONDOR-13-090.1

[5] Calvert, A. M., C. A. Bishop, R. D. Elliot, E. A. Krebs, T. M. Kydd, C. S. Machtans, and G. J. Robertson. 2013. A synthesis of human-related avian mortality in Canada. Avian Conservation and Ecology 8(2): 11. http://dx.doi.org/10.5751/ACE-00581-080211

[6] Machtans, C. S., C. H. R. Wedeles, and E. M. Bayne. 2013. A first estimate for Canada of the number of birds killed by colliding with building windows. Avian Conservation and Ecology 8(2):6. http://dx.doi.org/10.5751/ACE-00568-080206

Gelb and Delacretaz (2009)[7] recorded 5,400 bird fatalities under buildings in New York City, based on a decade of monitoring only during migration periods, and some of the high-rises were associated with hundreds of fatalities each. Klem et al. (2009)[8] monitored 73 building façades in New York City during 114 days of two migratory periods, tallying 549 collision victims, nearly 5 birds per day. Borden et al. (2010)[9] surveyed a 1.8 km route 3 times per week during 12-month period and found 271 bird fatalities of 50 species. Parkins et al. (2015)[10] found 35 bird fatalities of 16 species within only 45 days of monitoring under 4 building façades. In San Francisco, Kahle et al. (2016)[11] found 355 collision victims within 1,762 days under a 5-story building. Ocampo-Peñuela et al. (2016)[12] searched the perimeters of 6 buildings on a university campus, finding 86 fatalities after 63 days of surveys. One of these buildings produced 61 of the 86 fatalities, and another building with collision-deterrent glass caused only 2 of the fatalities.

Here, there is ample evidence to support a fair argument that the Project will result in many collision fatalities of birds, and that this may result in a significant impact. Yet neither the 2011 PEIR nor the Addendum make any attempt to analyze this potentially significant impact. An EIR is required to fully analyze and mitigate this impact.

## IV. THE CITY MUST PREPARE AN EIR BECAUSE THE 2011 PROGRAM EIR ADMITS SIGNIFICANT AND UNAVAILABLE ENVIRONMENTAL IMPACTS.

An EIR must be prepared for the Project because the 2011 PEIR determined that the Downtown Plan would cause significant and unavoidable impacts on aesthetics, air quality, cultural resources, greenhouse gases, noise, population and housing, public services, transportation and traffic, and utilities and service systems. (Addendum, p. 8.)

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[7] Gelb, Y. and N. Delacretaz. 2009. Windows and vegetation: Primary factors in Manhattan bird collisions. Northeastern Naturalist 16:455-470.

[8] Klem, D., Jr. 2009. Preventing bird-window collisions. The Wilson Journal of Ornithology 121:314-321.

[9] Borden, W. C., O. M. Lockhart, A. W. Jones, and M. S. Lyons. 2010. Seasonal, taxonomic, and local habitat components of bird-window collisions on an urban university campus in Cleveland, OH. Ohio Journal of Science 110(3):44-52.

[10] Parkins, K. L., S. B. Elbin, and E. Barnes. 2015. Light, Glass, and Bird–building Collisions in an Urban Park. Northeastern Naturalist 22:84-94.

[11] Kahle, L. Q., M. E. Flannery, and J. P. Dumbacher. 2016. Bird-window collisions at a west-coast urban park museum: analyses of bird biology and window attributes from Golden Gate Park, San Francisco. PLoS ONE 11(1):e144600 DOI 10.1371/journal.pone.0144600.

[12] Ocampo-Peñuela, N., R. S. Winton, C. J. Wu, E. Zambello, T. W. Wittig and N. L. Cagle . 2016. Patterns of bird-window collisions inform mitigation on a university campus. PeerJ4:e1652;DOI10.7717/peerj.1652

In the case of *Communities for a Better Environment v. Cal. Resources Agency* (2002) 103 Cal.App.4th 98, 122-125, the court of appeal held that when a "first tier" EIR admits a significant, unavoidable environmental impact, then the agency must prepare second tier EIRs for later projects to ensure that those unmitigated impacts are "mitigated or avoided." (*Id*. citing CEQA Guidelines §15152(f)) The court reasoned that the unmitigated impacts was not "adequately addressed" in the first tier EIR since it was not "mitigated or avoided." (*Id*.) Thus, significant effects disclosed in first tier EIRs will trigger second tier EIRs unless such effects have been "adequately addressed," in a way that ensures the effects will be "mitigated or avoided." (*Id*.) Such a second tier EIR is required, even if the impact still cannot be fully mitigated and a statement of overriding considerations will be required. The court explained, "The requirement of a statement of overriding considerations is central to CEQA's role as a public accountability statute; it requires public officials, in approving environmental detrimental projects, to justify their decisions based on counterbalancing social, economic or other benefits, and to point to substantial evidence in support." (*Id*. at 124-125)

Since the 2011 PEIR admitted numerous significant, unmitigated impacts, a second tier EIR is not required to determine if mitigation measure can now be imposed to reduce or eliminate those impacts. If the impacts still remain significant and unavoidable, a statement of overriding considerations will be required.

## **CONCLUSION**

For the above reasons, the City must prepare an EIR to analyze and mitigate the impacts of the Project that were not previously analyzed in the 2011 PEIR. The County may not on an addendum.

Sincerely,

Rebecca L. Davis

# EXHIBIT B

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Date: November 8, 2019

To: Rebecca Davis
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From: Francis J. Offermann PE CIH

Subject: Indoor Air Quality: 3rd and Pacifica – Long Beach
(IEE File Reference: P-4309)

Pages: 15

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## Indoor Air Quality Impacts

Indoor air quality (IAQ) directly impacts the comfort and health of building occupants, and the achievement of acceptable IAQ in newly constructed and renovated buildings is a well-recognized design objective. For example, IAQ is addressed by major high-performance building rating systems and building codes (California Building Standards Commission, 2014; USGBC, 2014). Indoor air quality in homes is particularly important because occupants, on average, spend approximately ninety percent of their time indoors with the majority of this time spent at home (EPA, 2011). Some segments of the population that are most susceptible to the effects of poor IAQ, such as the very young and the elderly, occupy their homes almost continuously. Additionally, an increasing number of adults are working from home at least some of the time during the workweek. Indoor air quality also is a serious concern for workers in hotels, offices and other business establishments.

The concentrations of many air pollutants often are elevated in homes and other buildings relative to outdoor air because many of the materials and products used indoors contain and release a variety of pollutants to air (Hodgson et al., 2002; Offermann and Hodgson, 2011). With respect to indoor air contaminants for which inhalation is the primary route of exposure, the critical design and construction parameters are the provision of adequate ventilation and the reduction of indoor sources of the contaminants.

Indoor Formaldehyde Concentrations Impact. In the California New Home Study (CNHS) of 108 new homes in California (Offermann, 2009), 25 air contaminants were measured, and formaldehyde was identified as the indoor air contaminant with the highest cancer risk as determined by the California Proposition 65 Safe Harbor Levels (OEHHA, 2017a), No Significant Risk Levels (NSRL) for carcinogens. The NSRL is the daily intake level calculated to result in one excess case of cancer in an exposed population of 100,000 (i.e., ten in one million cancer risk) and for formaldehyde is 40 µg/day. The NSRL concentration of formaldehyde that represents a daily dose of 40 µg is 2 µg/m$^3$, assuming a continuous 24-hour exposure, a total daily inhaled air volume of 20 m$^3$, and 100% absorption by the respiratory system. All of the CNHS homes exceeded this NSRL concentration of 2 µg/m$^3$. The median indoor formaldehyde concentration was 36 µg/m$^3$, and ranged from 4.8 to 136 µg/m$^3$, which corresponds to a median exceedance of the 2 µg/m$^3$ NSRL concentration of 18 and a range of 2.3 to 68.

Therefore, the cancer risk of a resident living in a California home with the median indoor formaldehyde concentration of 36 µg/m$^3$, is 180 per million as a result of formaldehyde alone. The CEQA significance threshold for airborne cancer risk is 10 per million, as established by the South Coast Air Quality Management District (SCAQMD, 2015).

Besides being a human carcinogen, formaldehyde is also a potent eye and respiratory irritant. In the CNHS, many homes exceeded the non-cancer reference exposure levels (RELs) prescribed by California Office of Environmental Health Hazard Assessment (OEHHA, 2017b). The percentage of homes exceeding the RELs ranged from 98% for the Chronic REL of 9 µg/m$^3$ to 28% for the Acute REL of 55 µg/m$^3$.

The primary source of formaldehyde indoors is composite wood products manufactured with urea-formaldehyde resins, such as plywood, medium density fiberboard, and particleboard. These materials are commonly used in building construction for flooring, cabinetry, baseboards, window shades, interior doors, and window and door trims.

In January 2009, the California Air Resources Board (CARB) adopted an airborne toxics control measure (ATCM) to reduce formaldehyde emissions from composite wood products, including hardwood plywood, particleboard, medium density fiberboard, and also furniture and other finished products made with these wood products (California Air Resources Board 2009). While this formaldehyde ATCM has resulted in reduced emissions from composite wood products sold in California, they do not preclude that homes built with composite wood products meeting the CARB ATCM will have indoor formaldehyde concentrations that are below cancer and non-cancer exposure guidelines.

A follow up study to the California New Home Study (CNHS) was conducted in 2016-2018 (Chan et. al., 2018), and found that the median indoor formaldehyde in new homes built after the 2009 CARB formaldehyde ATCM had lower indoor formaldehyde concentrations, with a median indoor concentrations of 25 $\mu g/m^3$ as compared to a median of 36 $\mu g/m^3$ found in the 2007 CNHS.

Thus, while new homes built after the 2009 CARB formaldehyde ATCM have a 30% lower median indoor formaldehyde concentration and cancer risk, the median lifetime cancer risk is still 125 per million for homes built with CARB compliant composite wood products, which is more than 12 times the OEHHA 10 in a million cancer risk threshold (OEHHA, 2017a).

With respect to this project, the buildings at the 3rd and Pacifica project in Long Beach, CA include residential and commercial spaces.

The residential occupants will potentially have continuous exposure (e.g. 24 hours per day, 52 weeks per year). These exposures are anticipated to result in significant cancer risks resulting from exposures to formaldehyde released by the building materials and furnishing commonly found in residential construction.

Because these residences will be constructed with CARB Phase 2 Formaldehyde ATCM materials, and be ventilated with the minimum code required amount of outdoor air, the indoor residential formaldehyde concentrations are likely similar to those concentrations observed in residences built with CARB Phase 2 Formaldehyde ATCM materials, which is a median of 25 μg/m$^3$.

Assuming that the residential occupants inhale 20 m$^3$ of air per day, the average 70-year lifetime formaldehyde daily dose is 500 μg/day for continuous exposure in the residences. This exposure represents a cancer risk of 125 per million, which is more than 12 times the South Coast Air Quality Management District CEQA cancer risk of 10 per million (SCAQMD, 2007). For occupants that do not have continuous exposure, the cancer risk will be proportionally less but still substantially over the SCAQMD CEQA cancer risk of 10 per million (e.g. for 12/hour/day occupancy, more than 6 times the SCAQMD CEQA cancer risk of 10 per million).

The employees of the commercial spaces are expected to experience significant indoor exposures (e.g., 40 hours per week, 50 weeks per year). These exposures for employees are anticipated to result in significant cancer risks resulting from exposures to formaldehyde released by the building materials and furnishing commonly found in offices, warehouses, residences and hotels.

Because these commercial spaces will be constructed with CARB Phase 2 Formaldehyde ATCM materials, and be ventilated with the minimum code required amount of outdoor air, the indoor warehouse formaldehyde concentrations are likely similar to those concentrations observed in residences built with CARB Phase 2 Formaldehyde ATCM materials, which is a median of 25 μg/m$^3$.

Assuming that the commercial space employees work 8 hours per day and inhale 20 m$^3$ of air per day, the formaldehyde dose per work-day at the offices is 167 μg/day.

Assuming that the commercial space employees work 5 days per week and 50 weeks per year for 45 years (start at age 20 and retire at age 65) the average 70-year lifetime formaldehyde daily dose is 73.6 µg/day.

This is 1.84 times the NSRL (OEHHA, 2017a) of 40 µg/day and represents a cancer risk of 18.4 per million, which exceeds the CEQA cancer risk of 10 per million. This impact should be analyzed in an environmental impact report ("EIR"), and the agency should impose all feasible mitigation measures to reduce this impact. Several feasible mitigation measures are discussed below and these and other measures should be analyzed in an EIR.

While measurements of the indoor concentrations of formaldehyde in residences built with CARB Phase 2 Formaldehyde ATCM materials (Chan et. al., 2018), indicate that indoor formaldehyde concentrations in buildings built with similar materials (e.g. hotels, residences, offices, warehouses, schools) will pose cancer risks in excess of the CEQA cancer risk of 10 per million, a determination of the cancer risk that is specific to this project and the materials used to construct these buildings can and should be conducted prior to completion of the environmental review.

The following describes a method that should be used prior to construction in the environmental review under CEQA, for determining whether the indoor concentrations resulting from the formaldehyde emissions of the specific building materials/furnishings selected for the building exceed cancer and non-cancer guidelines. Such a design analyses can be used to identify those materials/furnishings prior to the completion of the City's CEQA review and project approval, that have formaldehyde emission rates that contribute to indoor concentrations that exceed cancer and non-cancer guidelines, so that alternative lower emitting materials/furnishings may be selected and/or higher minimum outdoor air ventilation rates can be increased to achieve acceptable indoor concentrations and incorporated as mitigation measures for this project.

Pre-Construction Building Material/Furnishing Formaldehyde Emissions Assessment.

This formaldehyde emissions assessment should be used in the environmental review under CEQA to <u>assess</u> the indoor formaldehyde concentrations from the proposed loading of building materials/furnishings, the area-specific formaldehyde emission rate data for building materials/furnishings, and the design minimum outdoor air ventilation rates. This assessment allows the applicant (and the City) to determine before the conclusion of the environmental review process and the building materials/furnishings are specified, purchased, and installed if the total chemical emissions will exceed cancer and non-cancer guidelines, and if so, allow for changes in the selection of specific material/furnishings and/or the design minimum outdoor air ventilations rates such that cancer and non-cancer guidelines are not exceeded.

1.) Define Indoor Air Quality Zones. Divide the building into separate indoor air quality zones, (IAQ Zones). IAQ Zones are defined as areas of well-mixed air. Thus, each ventilation system with recirculating air is considered a single zone, and each room or group of rooms where air is not recirculated (e.g. 100% outdoor air) is considered a separate zone. For IAQ Zones with the same construction material/furnishings and design minimum outdoor air ventilation rates. (e.g. hotel rooms, apartments, condominiums, etc.) the formaldehyde emission rates need only be assessed for a single IAQ Zone of that type.

2.) Calculate Material/Furnishing Loading. For each IAQ Zone, determine the building material and furnishing loadings (e.g., $m^2$ of material/$m^2$ floor area, units of furnishings/$m^2$ floor area) from an inventory of all potential indoor formaldehyde sources, including flooring, ceiling tiles, furnishings, finishes, insulation, sealants, adhesives, and any products constructed with composite wood products containing urea-formaldehyde resins (e.g., plywood, medium density fiberboard, particleboard).

3.) Calculate the Formaldehyde Emission Rate. For each building material, calculate the formaldehyde emission rate (μg/h) from the product of the area-specific formaldehyde emission rate (μg/$m^2$-h) and the area ($m^2$) of material in the IAQ Zone, and from each furnishing (e.g. chairs, desks, etc.) from the unit-specific formaldehyde emission rate (μg/unit-h) and the number of units in the IAQ Zone.

NOTE: As a result of the high-performance building rating systems and building codes (California Building Standards Commission, 2014; USGBC, 2014), most manufacturers of building materials furnishings sold in the United States conduct chemical emission rate tests using the California Department of Health "Standard Method for the Testing and

Evaluation of Volatile Organic Chemical Emissions for Indoor Sources Using Environmental Chambers", (CDPH, 2017), or other equivalent chemical emission rate testing methods. Most manufacturers of building furnishings sold in the United States conduct chemical emission rate tests using ANSI/BIFMA M7.1 Standard Test Method for Determining VOC Emissions (BIFMA, 2018), or other equivalent chemical emission rate testing methods.

CDPH, BIFMA, and other chemical emission rate testing programs, typically certify that a material or furnishing does not create indoor chemical concentrations in excess of the maximum concentrations permitted by their certification. For instance, the CDPH emission rate testing requires that the measured emission rates when input into an office, school, or residential model do not exceed one-half of the OEHHA Chronic Exposure Guidelines (OEHHA, 2017b) for the 35 specific VOCs, including formaldehyde, listed in Table 4-1 of the CDPH test method (CDPH, 2017). These certifications themselves do not provide the actual area-specific formaldehyde emission rate (i.e., $\mu g/m^2$-h) of the product, but rather provide data that the formaldehyde emission rates do not exceed the maximum rate allowed for the certification. Thus for example, the data for a certification of a specific type of flooring may be used to calculate that the area-specific emission rate of formaldehyde is less than 31 $\mu g/m^2$-h, but not the actual measured specific emission rate, which may be 3, 18, or 30 $\mu g/m^2$-h. These area-specific emission rates determined from the product certifications of CDPH, BIFA, and other certification programs can be used as an initial estimate of the formaldehyde emission rate.

If the actual area-specific emission rates of a building material or furnishing is needed (i.e. the initial emission rates estimates from the product certifications are higher than desired), then that data can be acquired by requesting from the manufacturer the complete chemical emission rate test report. For instance if the complete CDPH emission test report is requested for a CDHP certified product, that report will provide the actual area-specific emission rates for not only the 35 specific VOCs, including formaldehyde, listed in Table 4-1 of the CDPH test method (CDPH, 2017), but also all of the cancer and reproductive/developmental chemicals listed in the California Proposition 65 Safe Harbor Levels (OEHHA, 2017a), all of the toxic air contaminants (TACs) in the California Air

Resources Board Toxic Air Contamination List (CARB, 2011), and the 10 chemicals with the greatest emission rates.

Alternatively, a sample of the building material or furnishing can be submitted to a chemical emission rate testing laboratory, such as Berkeley Analytical Laboratory (https://berkeleyanalytical.com), to measure the formaldehyde emission rate.

4.) Calculate the Total Formaldehyde Emission Rate. For each IAQ Zone, calculate the total formaldehyde emission rate (i.e. µg/h) from the individual formaldehyde emission rates from each of the building material/furnishings as determined in Step 3.

5.) Calculate the Indoor Formaldehyde Concentration. For each IAQ Zone, calculate the indoor formaldehyde concentration (µg/$m^3$) from Equation 1 by dividing the total formaldehyde emission rates (i.e. µg/h) as determined in Step 4, by the design minimum outdoor air ventilation rate ($m^3$/h) for the IAQ Zone.

$$C_{in} = \frac{E_{total}}{Q_{oa}} \quad \text{(Equation 1)}$$

where:

$C_{in}$ = indoor formaldehyde concentration (µg/$m^3$)

$E_{total}$ = total formaldehyde emission rate (µg/h) into the IAQ Zone.

$Q_{oa}$ = design minimum outdoor air ventilation rate to the IAQ Zone ($m^3$/h)

The above Equation 1 is based upon mass balance theory, and is referenced in Section 3.10.2 "Calculation of Estimated Building Concentrations" of the California Department of Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources Using Environmental Chambers", (CDPH, 2017).

6.) Calculate the Indoor Exposure Cancer and Non-Cancer Health Risks. For each IAQ Zone, calculate the cancer and non-cancer health risks from the indoor formaldehyde concentrations determined in Step 5 and as described in the OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines; Guidance Manual for Preparation of Health Risk Assessments (OEHHA, 2015).

7.) Mitigate Indoor Formaldehyde Exposures of exceeding the CEQA Cancer and/or Non-Cancer Health Risks. In each IAQ Zone, provide mitigation for any formaldehyde exposure risk as determined in Step 6, that exceeds the CEQA cancer risk of 10 per million or the CEQA non-cancer Hazard Quotient of 1.0.

Provide the source and/or ventilation mitigation required in all IAQ Zones to reduce the health risks of the chemical exposures below the CEQA cancer and non-cancer health risks.

Source mitigation for formaldehyde may include:

1.) reducing the amount materials and/or furnishings that emit formaldehyde
2.) substituting a different material with a lower area-specific emission rate of formaldehyde

Ventilation mitigation for formaldehyde emitted from building materials and/or furnishings may include:

1.) increasing the design minimum outdoor air ventilation rate to the IAQ Zone.

NOTE: Mitigating the formaldehyde emissions through use of less material/furnishings, or use of lower emitting materials/furnishings, is the preferred mitigation option, as mitigation with increased outdoor air ventilation increases initial and operating costs associated with the heating/cooling systems.

Outdoor Air Ventilation Impact. Another important finding of the CNHS, was that the outdoor air ventilation rates in the homes were very low. Outdoor air ventilation is a very important factor influencing the indoor concentrations of air contaminants, as it is the primary removal mechanism of all indoor air generated air contaminants. Lower outdoor air exchange rates cause indoor generated air contaminants to accumulate to higher indoor air concentrations. Many homeowners rarely open their windows or doors for ventilation as a result of their concerns for security/safety, noise, dust, and odor concerns (Price, 2007). In the CNHS field study, 32% of the homes did not use their windows during the 24-hour Test Day, and 15% of the homes did not use their windows during the entire preceding week.

Most of the homes with no window usage were homes in the winter field session. Thus, a substantial percentage of homeowners never open their windows, especially in the winter season. The median 24-hour measurement was 0.26 ach, with a range of 0.09 ach to 5.3 ach. A total of 67% of the homes had outdoor air exchange rates below the minimum California Building Code (2001) requirement of 0.35 ach. Thus, the relatively tight envelope construction, combined with the fact that many people never open their windows for ventilation, results in homes with low outdoor air exchange rates and higher indoor air contaminant concentrations.

The 3rd and Pacifica project in Long Beach, CA includes residential and commercial spaces, and is located close to roads with moderate to high traffic (e.g. Ocean Boulevard, Broadway, 3rd Street, 7th Street etc.) and the Long Beach Airport. As a result of these outdoor sources of noise, this area has been determined by the City of Long Beach Downtown Plan (AEOCM, 2010) to be a sound impacted area, with noise levels reported in Tables 4.9-2 and 4.8-3 ranging from 57 to 69 dBA Leq, and an Ldn of 70 at Cesar Chavez Park. In addition, the modeled future with project peak-hour noise levels in Tables 4.9-7 and 4.9-8 range from 56 to 71 dBA CNEL.

As a result of the high outdoor noise levels, the current project will require the need for mechanical supply of outdoor air ventilation air to allow for a habitable interior environment with closed windows and doors. Such a ventilation system would allow windows and doors to be kept closed at the occupant's discretion to control exterior noise within residential interiors.

$PM_{2.5}$ Outdoor Concentrations Impact. An additional impact of the nearby motor vehicle traffic associated with this project, are the outdoor concentrations of $PM_{2.5}$. The SCAQMD has determined that the South Coast Air Basin, where this project is located, is a non-attainment area for $PM_{2.5}$.

An air quality analyses should to be conducted to determine the concentrations of $PM_{2.5}$ in the outdoor and indoor air that people inhale each day. This air quality analyses needs to consider the cumulative impacts of the project related emissions, existing and projected future emissions from local $PM_{2.5}$ sources (e.g. stationary sources, motor vehicles, and airport traffic) upon the outdoor air concentrations at the project site. If the outdoor concentrations are determined to exceed the California and National annual average $PM_{2.5}$ exceedance concentration of 12 $\mu g/m^3$, or the National 24-hour average exceedance concentration of 35 $\mu g/m^3$, then the buildings need to have a mechanical supply of outdoor air that has air filtration with sufficient $PM_{2.5}$ removal efficiency, such that the indoor concentrations of outdoor $PM_{2.5}$ particles is less than the California and National $PM_{2.5}$ annual and 24-hour standards.

It is my experience that based on the projected combination of high traffic and airport noise levels, the annual average concentration of $PM_{2.5}$ will exceed the California and National $PM_{2.5}$ annual and 24-hour standards and warrant installation of high efficiency air filters (i.e. MERV 13 or higher) in all mechanically supplied outdoor air ventilation systems.

## Indoor Air Quality Impact Mitigation Measures

The following are recommended mitigation measures to minimize the impacts upon indoor quality:

- indoor formaldehyde concentrations
- outdoor air ventilation
- $PM_{2.5}$ outdoor air concentrations

Indoor Formaldehyde Concentrations Mitigation. Use only composite wood materials (e.g. hardwood plywood, medium density fiberboard, particleboard) for all interior finish systems that are made with CARB approved no-added formaldehyde (NAF) resins or ultra-low emitting formaldehyde (ULEF) resins (CARB, 2009). Other projects such as the AC by Marriott Hotel – West San Jose Project (Asset Gas SC Inc.) and 2525 North Main Street, Santa Ana (AC 2525 Main LLC, 2019) have entered into settlement agreements stipulating the use of composite wood materials only containing NAF or ULEF resins.

Alternatively, conduct the previously described Pre-Construction Building Material/Furnishing Chemical Emissions Assessment, to determine that the combination of formaldehyde emissions from building materials and furnishings do not create indoor formaldehyde concentrations that exceed the CEQA cancer and non-cancer health risks.

It is important to note that we are not asking that the builder to "speculate" on what and how much composite materials be used, but rather at the design stage to select composite wood materials based on the formaldehyde emission rates that manufacturers routinely conduct using the California Department of Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources Using Environmental Chambers", (CDPH, 2017), and use the procedure described earlier (i.e. Pre-Construction Building Material/Furnishing Formaldehyde Emissions Assessment) to insure that the materials selected achieve acceptable cancer risks from material off gassing of formaldehyde.

Outdoor Air Ventilation Mitigation. Provide each habitable room with a continuous mechanical supply of outdoor air that meets or exceeds the California 2016 Building Energy Efficiency Standards (California Energy Commission, 2015) requirements of the greater of 15 cfm/occupant or 0.15 cfm/ft$^2$ of floor area. Following installation of the system conduct testing and balancing to insure that required amount of outdoor air is entering each habitable room and provide a written report documenting the outdoor airflow rates. Do not use exhaust only mechanical outdoor air systems, use only balanced outdoor air supply and exhaust systems or outdoor air supply only systems. Provide a manual for the occupants or maintenance personnel, that describes the purpose of the mechanical outdoor air system and the operation and maintenance requirements of the system.

$PM_{2.5}$ Outdoor Air Concentration Mitigation. Install air filtration with sufficient $PM_{2.5}$ removal efficiency (e.g. MERV 13 or higher) to filter the outdoor air entering the mechanical outdoor air supply systems, such that the indoor concentrations of outdoor $PM_{2.5}$ particles are less than the California and National $PM_{2.5}$ annual and 24-hour standards. Install the air filters in the system such that they are accessible for replacement by the occupants or maintenance personnel. Include in the mechanical outdoor air ventilation system manual instructions on how to replace the air filters and the estimated frequency of replacement.

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# EXHIBIT A

# Indoor Air Quality in New California Homes with Mechanical Ventilation

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**SUMMARY**
The Healthy Efficient New Gas Homes (HENGH) study measured indoor air quality and mechanical ventilation use in 70 new California homes. This paper summarizes preliminary results collected from 42 homes. In addition to measurements of formaldehyde, nitrogen dioxide ($NO_2$), and $PM_{2.5}$ that are discussed here, HENGH also monitored other indoor environmental parameters (e.g., $CO_2$) and indoor activities (e.g., cooking, fan use) using sensors and occupant logs. Each home was monitored for one week. Diagnostic tests were performed to characterize building envelope and duct leakage, and mechanical system airflow. Comparisons of indoor formaldehyde, $NO_2$, and $PM_{2.5}$ with a prior California New Home Study (CNHS) (Offermann, 2009) suggest that contaminant levels are lower than measured from about 10 years ago. The role of mechanical ventilation on indoor contaminant levels will be evaluated.

**KEYWORDS**
Formaldehyde; nitrogen dioxide; particles; home performance; field study

## 1 INTRODUCTION
The HENGH field study (2016–2018) aimed to measure indoor air quality in 70 new California homes that have mechanical ventilation. Eligible houses were built in 2011 or later; had an operable whole-dwelling mechanical ventilation system; used natural gas for space heating, water heating, and/or cooking; and had no smoking in the home. Study participants were asked to rely on mechanical ventilation and avoid window use during the one-week monitoring period. All homes had a venting kitchen range hood or over the range microwave and bathroom exhaust fans. This paper presents summary results of formaldehyde, $NO_2$, and $PM_{2.5}$ measurements in 42 homes. The full dataset is expected to be available in summer 2018.

## 2 METHODS
Integrated one-week concentrations of formaldehyde and $NO_x$ were measured using SKC UMEx-100 and Ogawa passive samplers. Formaldehyde samplers were deployed in the main living space, master bedroom, and outdoors. $PM_{2.5}$ were measured using a pair of photometers (ES-642/BT-645, MetOne Instruments) indoor in the main living space and outdoors. $PM_{2.5}$ filter samples were collected using a co-located pDR-1500 (ThermoFisher) in a subset of the homes and time-resolved photometer data were adjusted using the gravimetric measurements. Results are compared with a prior field study CNHS (2007–2008) (Offermann, 2009) that monitored for contaminant concentrations over a 24-hour period in 108 homes built between 2002 and 2004, including a subset of 26 homes with whole-dwelling mechanical ventilation.

## 3 RESULTS
Figure 1 compares the indoor concentrations of formaldehyde, $NO_2$, and $PM_{2.5}$ measured by the two studies. Results of HENGH are one-week averaged concentrations, whereas CHNS are 24-hour averages. HENGH measured lower indoor concentrations of formaldehyde and $PM_{2.5}$, compared to CNHS. For $NO_2$, the indoor concentrations measured by the two studies

are similar. Summary statistics of indoor and outdoor contaminant concentrations (mean and median concentrations; N=number of homes with available data) are presented in Table 1.

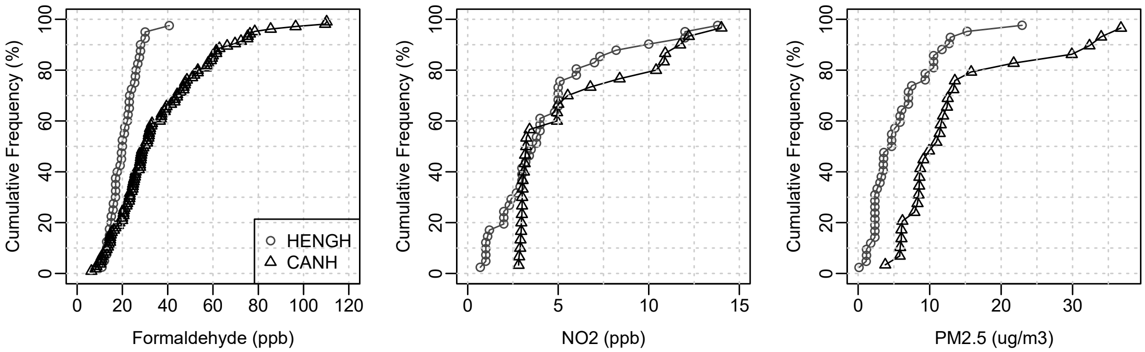


Figure 1. Comparisons of indoor contaminant concentrations measured by two studies.

Table 1. Summary statistics of indoor and outdoor contaminant concentrations.

| | HENGH - Indoor | | | CNHS - Indoor | | | HENGH - Outdoor | | | CNHS - Outdoor | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Median | Mean | N | Median | Mean | N | Median | Mean | N | Median | Mean |
| Formaldehyde (ppb) | 39 | 20.0 | 20.6 | 104 | 29.5 | 36.3 | 38 | 2.0 | 2.0 | 43 | 1.8 | 2.8 |
| $NO_2$ (ppb) | 40 | 3.7 | 4.4 | 29 | 3.2 | 5.4 | 40 | 3.0 | 3.1 | 11 | 3.1 | 3.5 |
| $PM_{2.5}$ (ug/m$^3$) | 41 | 4.7 | 5.8 | 28 | 10.4 | 13.3 | 42 | 5.9 | 7.7 | 11 | 8.7 | 7.9 |

## 4 DISCUSSION

The lower formaldehyde concentrations measured by HENGH in comparison to CNHS may be attributable to California's regulation to limit formaldehyde emissions from composite wood products that came into effect between the two studies. Gas cooking is a significant source of indoor $NO_2$ (Mullen et al., 2016). Even though $NO_2$ concentrations measured by HENGH are similar to levels found in CNHS, the two studies differed in that HENGH homes all use gas for cooking, whereas almost all homes (98%) from the prior study used electric ranges. More analysis is needed to determine the effectiveness of source control, such as range hood use during cooking, on indoor concentrations of cooking emissions such as $NO_2$ and $PM_{2.5}$. Lower $PM_{2.5}$ indoors measured by HENGH compared to CNHS may be explained from a combination of lower outdoor $PM_{2.5}$ levels, reduced particle penetration due to tighter building envelopes (Stephens and Siegel, 2012) combined with exhaust ventilation, and use of medium efficiency air filter (MERV 11 or better) in some HENGH homes. Further analysis of the data will evaluate the role of mechanical ventilation, including local exhaust and whole-dwelling ventilation system, on measured indoor contaminant levels.

## 5 CONCLUSIONS

New California homes now have lower indoor formaldehyde levels than previously measured, likely as a result of California's formaldehyde emission standards. Indoor concentrations of $NO_2$ and $PM_{2.5}$ measured are also low compared to a prior study of new homes in California.


## ACKNOWLEDGEMENT

LBNL work on the project was supported by the California Energy Commission. Field data collection was performed by the Gas Technology Institute. Support for field teams was provided by Pacific Gas & Electric and the Southern California Gas Company.


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Offermann FJ. 2009. California Air Resource Board and California Energy Commission Report CEC-500-2009-085.
Stephens B, Siegel JA. 2012 *Indoor Air* 22(6):501–513.

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## Education

M.S. Mechanical Engineering (1985)
Stanford University, Stanford, CA.

Graduate Studies in Air Pollution Monitoring and Control (1980)
University of California, Berkeley, CA.

B.S. in Mechanical Engineering (1976)
Rensselaer Polytechnic Institute, Troy, N.Y.

## Professional Experience

President: Indoor Environmental Engineering, San Francisco, CA. December, 1981 - present.

Direct team of environmental scientists, chemists, and mechanical engineers in conducting State and Federal research regarding indoor air quality instrumentation development, building air quality field studies, ventilation and air cleaning performance measurements, and chemical emission rate testing.

Provide design side input to architects regarding selection of building materials and ventilation system components to ensure a high quality indoor environment.

Direct Indoor Air Quality Consulting Team for the winning design proposal for the new State of Washington Ecology Department building.

Develop a full-scale ventilation test facility for measuring the performance of air diffusers; ASHRAE 129, Air Change Effectiveness, and ASHRAE 113, Air Diffusion Performance Index.

Develop a chemical emission rate testing laboratory for measuring the chemical emissions from building materials, furnishings, and equipment.

Principle Investigator of the California New Homes Study (2005-2007). Measured ventilation and indoor air quality in 108 new single family detached homes in northern and southern California.

Develop and teach IAQ professional development workshops to building owners, managers, hygienists, and engineers.

Air Pollution Engineer: Earth Metrics Inc., Burlingame, CA, October, 1985 to March, 1987.

Responsible for development of an air pollution laboratory including installation a forced choice olfactometer, tracer gas electron capture chromatograph, and associated calibration facilities. Field team leader for studies of fugitive odor emissions from sewage treatment plants, entrainment of fume hood exhausts into computer chip fabrication rooms, and indoor air quality investigations.

Staff Scientist: Building Ventilation and Indoor Air Quality Program, Energy and Environment Division, Lawrence Berkeley Laboratory, Berkeley, CA. January, 1980 to August, 1984.

Deputy project leader for the Control Techniques group; responsible for laboratory and field studies aimed at evaluating the performance of indoor air pollutant control strategies (i.e. ventilation, filtration, precipitation, absorption, adsorption, and source control).

Coordinated field and laboratory studies of air-to-air heat exchangers including evaluation of thermal performance, ventilation efficiency, cross-stream contaminant transfer, and the effects of freezing/defrosting.

Developed an *in situ* test protocol for evaluating the performance of air cleaning systems and introduced the concept of effective cleaning rate (ECR) also known as the Clean Air Delivery Rate (CADR).

Coordinated laboratory studies of portable and ducted air cleaning systems and their effect on indoor concentrations of respirable particles and radon progeny.

Co-designed an automated instrument system for measuring residential ventilation rates and radon concentrations.

Designed hardware and software for a multi-channel automated data acquisition system used to evaluate the performance of air-to-air heat transfer equipment.

Assistant Chief Engineer: Alta Bates Hospital, Berkeley, CA, October, 1979 to January, 1980.

Responsible for energy management projects involving installation of power factor correction capacitors on large inductive electrical devices and installation of steam meters on physical plant steam lines. Member of Local 39, International Union of Operating Engineers.

Manufacturing Engineer: American Precision Industries, Buffalo, NY, October, 1977 to October, 1979.

Responsible for reorganizing the manufacturing procedures regarding production of shell and tube heat exchangers. Designed customized automatic assembly, welding, and testing equipment. Designed a large paint spray booth. Prepared economic studies justifying new equipment purchases. Safety Director.

Project Engineer: Arcata Graphics, Buffalo, N.Y. June, 1976 to October, 1977.

Responsible for the design and installation of a bulk ink storage and distribution system and high speed automatic counting and marking equipment. Also coordinated material handling studies which led to the purchase and installation of new equipment.

## PROFESSIONAL ORGANIZATION MEMBERSHIP

American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

- Chairman of SPC-145P, Standards Project Committee - Test Method for Assessing the Performance of Gas Phase Air Cleaning Equipment (1991-1992)
- Member SPC-129P, Standards Project Committee - Test Method for Ventilation Effectiveness (1986-97)
  - Member of Drafting Committee
- Member Environmental Health Committee (1992-1994, 1997-2001, 2007-2010)
  - Chairman of EHC Research Subcommittee
  - Member of Man Made Mineral Fiber Position Paper Subcommittee
  - Member of the IAQ Position Paper Committee
  - Member of the Legionella Position Paper Committee
  - Member of the Limiting Indoor Mold and Dampness in Buildings Position Paper Committee
- Member SSPC-62, Standing Standards Project Committee - Ventilation for Acceptable Indoor Air Quality (1992 to 2000)
  - Chairman of Source Control and Air Cleaning Subcommittee
- Chairman of TC-4.10, Indoor Environmental Modeling (1988-92)
  - Member of Research Subcommittee
- Chairman of TC-2.3, Gaseous Air Contaminants and Control Equipment (1989-92)
  - Member of Research Subcommittee

American Society for Testing and Materials (ASTM)

- D-22 Sampling and Analysis of Atmospheres
  - Member of Indoor Air Quality Subcommittee
- E-06 Performance of Building Constructions

American Board of Industrial Hygiene (ABIH)

American Conference of Governmental Industrial Hygienists (ACGIH)

- Bioaerosols Committee (2007-2013)

American Industrial Hygiene Association (AIHA)

Cal-OSHA Indoor Air Quality Advisory Committee

International Society of Indoor Air Quality and Climate (ISIAQ)

- Co-Chairman of Task Force on HVAC Hygiene

U. S. Green Building Council (USGBC)
- Member of the IEQ Technical Advisory Group (2007-2009)
- Member of the IAQ Performance Testing Work Group (2010-2012)

Western Construction Consultants (WESTCON)

## PROFESSIONAL CREDENTIALS

Licensed Professional Engineer - Mechanical Engineering

Certified Industrial Hygienist - American Board of Industrial Hygienists

## SCIENTIFIC MEETINGS AND SYMPOSIA

Biological Contamination, Diagnosis, and Mitigation, Indoor Air'90, Toronto, Canada, August, 1990.

Models for Predicting Air Quality, Indoor Air'90, Toronto, Canada, August, 1990.

Microbes in Building Materials and Systems, Indoor Air '93, Helsinki, Finland, July, 1993.

Microorganisms in Indoor Air Assessment and Evaluation of Health Effects and Probable Causes, Walnut Creek, CA, February 27, 1997.

Controlling Microbial Moisture Problems in Buildings, Walnut Creek, CA, February 27, 1997.

Scientific Advisory Committee, Roomvent 98, 6$^{th}$ International Conference on Air Distribution in Rooms, KTH, Stockholm, Sweden, June 14-17, 1998.

Moisture and Mould, Indoor Air '99, Edinburgh, Scotland, August, 1999.

Ventilation Modeling and Simulation, Indoor Air '99, Edinburgh, Scotland, August, 1999.

Microbial Growth in Materials, Healthy Buildings 2000, Espoo, Finland, August, 2000.

Co-Chair, Bioaerosols X- Exposures in Residences, Indoor Air 2002, Monterey, CA, July 2002.

Healthy Indoor Environments, Anaheim, CA, April 2003.

Chair, Environmental Tobacco Smoke in Multi-Family Homes, Indoor Air 2008, Copenhagen, Denmark, July 2008.

Co-Chair, ISIAQ Task Force Workshop; HVAC Hygiene, Indoor Air 2002, Monterey, CA, July 2002.

Chair, ETS in Multi-Family Housing: Exposures, Controls, and Legalities Forum, Healthy Buildings 2009, Syracuse, CA, September 14, 2009.

Chair, Energy Conservation and IAQ in Residences Workshop, Indoor Air 2011, Austin, TX, June 6, 2011.

Chair, Electronic Cigarettes: Chemical Emissions and Exposures Colloquium, Indoor Air 2016, Ghent, Belgium, July 4, 2016.

## SPECIAL CONSULTATION

Provide consultation to the American Home Appliance Manufacturers on the development of a standard for testing portable air cleaners, AHAM Standard AC-1.

Served as an expert witness and special consultant for the U.S. Federal Trade Commission regarding the performance claims found in advertisements of portable air cleaners and residential furnace filters.

Conducted a forensic investigation for a San Mateo, CA pro se defendant, regarding an alleged homicide where the victim was kidnapped in a steamer trunk. Determined the air exchange rate in the steamer trunk and how long the person could survive.

Conducted *in situ* measurement of human exposure to toluene fumes released during nailpolish application for a plaintiffs attorney pursuing a California Proposition 65 product labeling case. June, 1993.

Conducted a forensic *in situ* investigation for the Butte County, CA Sheriff's Department of the emissions of a portable heater used in the bedroom of two twin one year old girls who suffered simultaneous crib death.

Consult with OSHA on the 1995 proposed new regulation regarding indoor air quality and environmental tobacco smoke.

Consult with EPA on the proposed Building Alliance program and with OSHA on the proposed new OSHA IAQ regulation.

Johnson Controls Audit/Certification Expert Review; Milwaukee, WI. May 28-29, 1997.

Winner of the nationally published 1999 Request for Proposals by the State of Washington to conduct a comprehensive indoor air quality investigation of the Washington State Department of Ecology building in Lacey, WA.

Selected by the State of California Attorney General's Office in August, 2000 to conduct a comprehensive indoor air quality investigation of the Tulare County Court House.

Lawrence Berkeley Laboratory IAQ Experts Workshop: "Cause and Prevention of Sick Building Problems in Offices: The Experience of Indoor Environmental Quality Investigators", Berkeley, California, May 26-27, 2004.

Provide consultation and chemical emission rate testing to the State of California Attorney General's Office in 2013-2015 regarding the chemical emissions from e-cigarettes.

**PEER-REVIEWED PUBLICATIONS :**


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“Identifying and Mitigating Mold Contamination in Buildings”, Western Construction Consultants Association, Oakland, CA, March 15, 2000; AIG Construction Defect Seminar, Walnut Creek, CA, May 2, 2001; City of Oakland Public Works Agency, Oakland, CA, July 24, 2001; Executive Council of Homeowners, Alamo, CA, August 3, 2001.

“Using the EPA BASE Study for IAQ Investigation / Communication”, Joint Professional Symposium 2000, American Industrial Hygiene Association, Orange County & Southern California Sections, Long Beach, October 19, 2000.

“Ventilation,” Indoor Air Quality: Risk Reduction in the 21$^{st}$ Century Symposium, sponsored by the California Environmental Protection Agency/Air Resources Board, Sacramento, CA, May 3-4, 2000.

“Workshop 18: Criteria for Cleaning of Air Handling Systems”, Healthy Buildings 2000, Espoo, Finland, August 2000.

“Closing Session Summary: ‘Building Investigations’ and ‘Building Design & Construction’, Healthy Buildings 2000, Espoo, Finland, August 2000.

“Managing Building Air Quality and Energy Efficiency, Meeting the Standard of Care”, BOMA, MidAtlantic Environmental Hygiene Resource Center, Seattle, WA, May 23$^{rd}$, 2000; San Antonio, TX, September 26-27, 2000.

“Diagnostics & Mitigation in Sick Buildings: When Good Buildings Go Bad,” University of California Berkeley, September 18, 2001.

“Mold Contamination: Recognition and What To Do and Not Do”, Redwood Empire Remodelers Association; Santa Rosa, CA, April 16, 2002.

“Investigative Tools of the IAQ Trade”, Healthy Indoor Environments 2002; Austin, TX; April 22, 2002.

“Finding Hidden Mold: Case Studies in IAQ Investigations”, AIHA Northern California Professionals Symposium; Oakland, CA, May 8, 2002.

“Assessing and Mitigating Fungal Contamination in Buildings”, Cal/OSHA Training; Oakland, CA, February 14, 2003 and West Covina, CA, February 20-21, 2003.

“Use of External Containments During Fungal Mitigation”, Invited Speaker, ACGIH Mold Remediation Symposium, Orlando, FL, November 3-5, 2003.

Building Operator Certification (BOC), 106-IAQ Training Workshops, Northwest Energy Efficiency Council; Stockton, CA, December 3, 2003; San Francisco, CA, December 9, 2003; Irvine, CA, January 13, 2004; San Diego, January 14, 2004; Irwindale, CA, January 27, 2004; Downey, CA, January 28, 2004; Santa Monica, CA, March 16, 2004; Ontario, CA, March 17, 2004; Ontario, CA, November 9, 2004, San Diego, CA, November 10, 2004; San Francisco, CA, November 17, 2004; San Jose, CA, November 18, 2004; Sacramento, CA, March 15, 2005.

“Mold Remediation: The National QUEST for Uniformity Symposium”, Invited Speaker, Orlando, Florida, November 3-5, 2003.

“Mold and Moisture Control”, Indoor Air Quality workshop for The Collaborative for High Performance Schools (CHPS), San Francisco, December 11, 2003.

“Advanced Perspectives In Mold Prevention & Control Symposium”, Invited Speaker, Las Vegas, Nevada, November 7-9, 2004.

“Building Sciences: Understanding and Controlling Moisture in Buildings”, American Industrial Hygiene Association, San Francisco, CA, February 14-16, 2005.

“Indoor Air Quality Diagnostics and Healthy Building Design”, University of California Berkeley, Berkeley, CA, March 2, 2005.

“Improving IAQ = Reduced Tenant Complaints”, Northern California Facilities Exposition, Santa Clara, CA, September 27, 2007.

“Defining Safe Building Air”, Criteria for Safe Air and Water in Buildings, ASHRAE Winter Meeting, Chicago, IL, January 27, 2008.

“Update on USGBC LEED and Air Filtration”, Invited Speaker, NAFA 2008 Convention, San Francisco, CA, September 19, 2008.

“Ventilation and Indoor air Quality in New California Homes”, National Center of Healthy Housing, October 20, 2008.

“Indoor Air Quality in New Homes”, California Energy and Air Quality Conference, October 29, 2008.

“Mechanical Outdoor air Ventilation Systems and IAQ in New Homes”, ACI Home Performance Conference, Kansas City, MO, April 29, 2009.

“Ventilation and IAQ in New Homes with and without Mechanical Outdoor Air Systems”, Healthy Buildings 2009, Syracuse, CA, September 14, 2009.

"Ten Ways to Improve Your Air Quality", Northern California Facilities Exposition, Santa Clara, CA, September 30, 2009.

"New Developments in Ventilation and Indoor Air Quality in Residential Buildings", Westcon meeting, Alameda, CA, March 17, 2010.

"Intermittent Residential Mechanical Outdoor Air Ventilation Systems and IAQ", ASHRAE SSPC 62.2 Meeting, Austin, TX, April 19, 2010.

"Measured IAQ in Homes", ACI Home Performance Conference, Austin, TX, April 21, 2010.

"Respiration: IEQ and Ventilation", AIHce 2010, How IH Can LEED in Green buildings, Denver, CO, May 23, 2010.

"IAQ Considerations for Net Zero Energy Buildings (NZEB)", Northern California Facilities Exposition, Santa Clara, CA, September 22, 2010.

"Energy Conservation and Health in Buildings", Berkeley High SchoolGreen Career Week, Berkeley, CA, April 12, 2011.

"What Pollutants are Really There ?", ACI Home Performance Conference, San Francisco, CA, March 30, 2011.

"Energy Conservation and Health in Residences Workshop", Indoor Air 2011, Austin, TX, June 6, 2011.

"Assessing IAQ and Improving Health in Residences", US EPA Weatherization Plus Health, September 7, 2011.

"Ventilation: What a Long Strange Trip It's Been", Westcon, May 21, 2014.

"Chemical Emissions from E-Cigarettes: Direct and Indirect Passive Exposures", Indoor Air 2014, Hong Kong, July, 2014.

"Infectious Disease Aerosol Exposures With and Without Surge Control Ventilation System Modifications", Indoor Air 2014, Hong Kong, July, 2014.

"Chemical Emissions from E-Cigarettes", IMF Health and Welfare Fair, Washington, DC, February 18, 2015.

"Chemical Emissions and Health Hazards Associated with E-Cigarettes", Roswell Park Cancer Institute, Buffalo, NY, August 15, 2014.

"Formaldehyde Indoor Concentrations, Material Emission Rates, and the CARB ATCM", Harris Martin's Lumber Liquidators Flooring Litigation Conference, WQ Minneapolis Hotel, May 27, 2015.

“Chemical Emissions from E-Cigarettes: Direct and Indirect Passive Exposure”, FDA Public Workshop: Electronic Cigarettes and the Public Health, Hyattsville, MD June 2, 2015.

“Creating Healthy Homes, Schools, and Workplaces”, Chautauqua Institution, Athenaeum Hotel, August 24, 2015.

“Diagnosing IAQ Problems and Designing Healthy Buildings”, University of California Berkeley, Berkeley, CA, October 6, 2015.

“Diagnosing Ventilation and IAQ Problems in Commercial Buildings”, BEST Center Annual Institute, Lawrence Berkeley National Laboratory, January 6, 2016.

“A Review of Studies of Ventilation and Indoor Air Quality in New Homes and Impacts of Environmental Factors on Formaldehyde Emission Rates From Composite Wood Products”, AIHce2016, May, 21-26, 2016.

“Admissibility of Scientific Testimony”, Science in the Court, Proposition 65 Clearinghouse Annual Conference, Oakland, CA, September 15, 2016.

“Indoor Air Quality and Ventilation”, ASHRAE Redwood Empire, Napa, CA, December 1, 2016.