APPENDIX C:
HEALTH RISK ASSESSMENT

1. Health Risk Assessment

1.1 CONSTRUCTION HEALTH RISK ASSESSMENT

The proposed project would demolish the existing buildings on-site and construct of a four-story hotel with 124 guest rooms, 113 on-site parking spaces at grade, on-site guest amenities and landscaping. The project site is located in the central portion of the City of Walnut Creek in Contra Costa County. The following provides the background methodology used for the construction health risk assessment for the proposed project.

The latest version of the Bay Area Air Quality Management District (BAAQMD) CEQA Air Quality Guidelines requires projects to evaluate the impacts of construction activities on sensitive receptors (BAAQMD, 2017). Project construction is anticipated to take place starting at the beginning of September 2018 and be completed by the end of April 2020 (approximately 415 workdays). The nearest off-site sensitive receptors to the project site are single and multi-family residents to the east. The BAAQMD has developed *Screening Tables for Air Toxics Evaluation During Construction* (2017) that evaluate construction-related health risks associated with residential, commercial, and industrial projects. According to the screening tables, the residences are closer than the distance of 100 meters (328 feet) that would screen out potential health risks and therefore could be potentially impacted from the proposed construction activities. As a result, a site-specific construction health risk assessment (HRA) has been prepared for the proposed project. This HRA considers the health impact to off-site sensitive receptors (children at the nearby residences) from construction emissions at the project site, including diesel equipment exhaust (diesel particulate matter or DPM) and particulate matter less than 2.5 microns ($PM_{2.5}$).

It should be noted that these health impacts are based on conservative (i.e., health protective) assumptions. The United States Environmental Protection Agency (USEPA, 2005) and the Office of Environmental Health Hazard Assessment (OEHHA, 2015) note that conservative assumptions used in a risk assessment are intended to ensure that the estimated risks do not underestimate the actual risks. Therefore, the estimated risks may not necessarily represent actual risks experienced by populations at or near a site. The use of conservative assumptions tends to produce upper-bound estimates of exposure and thus risk.

For residential-based receptors, the following conservative assumptions were used:

- It was assumed that maximum-exposed off-site residential receptors (both children and adults) stood outdoors and are subject to DPM at their residence for 8 hours per day, and approximately 260 construction days per year. In reality, California residents typically will spend on average 2 hours per day outdoors at their residences (USEPA, 2011). This would result in lower exposures to construction related DPM emissions and lower estimated risk values.

- The calculated risk for infants from third trimester to age 2 is multiplied by a factor of 10 to account for early life exposure and uncertainty in child versus adult exposure impacts (OEHHA, 2015).

1.2 METHODOLOGY AND SIGNIFICANCE THRESHOLDS

For this HRA, the BAAQMD significance thresholds were deemed to be appropriate and the thresholds that were used for this project are shown below:

- Excess cancer risk of more than 10 in a million
- Non-cancer hazard index (chronic or acute) greater than 1.0
- Incremental increase in average annual $PM_{2.5}$ concentration of greater than 0.3 $\mu g/m^3$

The methodology used in this HRA is consistent with the following BAAQMD and the OEHHA guidance documents:

- BAAQMD, 2017. *California Environmental Quality Act Air Quality Guidelines*. May 2017.
- BAAQMD, 2010. *Screening Tables for Air Toxics Evaluation During Construction.* May 2010.
- BAAQMD, 2012. *Recommended Methods for Screening and Modeling Local Risks and Hazards.* Version 3.0. May 2012.
- OEHHA. 2015. *Air Toxics Hot Spots Program Guidance Manual for the Preparation of Health Risk Assessments.* February, 2015.

Potential exposures to DPM and $PM_{2.5}$ from proposed project construction were evaluated for off-site sensitive receptors in close proximity to the site. Pollutant concentrations were estimated using an air dispersion model, and excess lifetime cancer risks and chronic non-cancer hazard indexes were calculated. These risks were then compared to the significance thresholds adopted for this HRA.

1.3 CONSTRUCTION EMISSIONS

Construction emissions were calculated as average daily emissions in pounds per day, using the proposed construction schedule and the latest version of California Emissions Estimation Model, known as CalEEMod Version 2016.3.2 (CAPCOA, 2016). DPM emissions were based on the CalEEMod construction runs, using annual exhaust PM_{10} construction emissions presented in pounds (lbs) per day. The $PM_{2.5}$ emissions were taken from the CalEEMod output for exhaust $PM_{2.5}$ also presented in lbs per day.

The project was assumed to take place over 19 months (415 work days) from beginning of September 2018 to April 2020. The average daily emission rates from construction equipment used during the proposed project were determined by dividing the annual average emissions for each construction year by the number of construction days per year for each calendar year of construction (i.e., 2018, 2019, and 2020). The off-site hauling emission rates were adjusted to evaluate localized emissions from the 1.19-mile haul route within 1,000 feet of the project site. The CalEEMod construction emissions output and emission rate calculations are provided in Appendix A of the HRA.

1.4 DISPERSION MODELING

To assess the impact of emitted compounds on sensitive receptors near the project, air quality modeling using the AERMOD atmospheric dispersion model was performed. The model is a steady state Gaussian plume

model and is an approved model by BAAQMD for estimating ground level impacts from point and fugitive sources in simple and complex terrain. The on-site construction emissions for the project were modeled as poly-area sources. The off-site mobile sources were modeled as adjacent line volume sources. The model requires additional input parameters, including chemical emission data and local meteorology. Inputs for the construction emission rates are those described in Section 1.3. Meteorological data obtained from the BAAQMD for the nearest representative meteorological station (Livermore Municipal Airport) with the five latest available years (2009 to 2013) of record were used to represent local weather conditions and prevailing winds.

The modeling analysis also considered the spatial distribution and elevation of each emitting source in relation to the sensitive receptors. To accommodate the model's Cartesian grid format, direction-dependent calculations were obtained by identifying the Universal Transverse Mercator (UTM) coordinates for each source location. In addition, digital elevation model (DEM) data for the area were obtained and included in the model runs to account for complex terrain. An emission release height of 4.15 meters was used as representative of the stack exhaust height for off-road construction equipment and diesel truck traffic, and an initial vertical dispersion parameter of 1.93 m was used, per California Air Resources Board (CARB) guidance (2000).

To determine contaminant impacts during construction hours, the model's Season-Hour-Day (HRDOW) scalar option was invoked to predict flagpole-level concentrations (1.5 m for ground-floor receptors and 6.1 for second-floor receptors) for construction emissions generated between the hours of 7:00 AM and 4:00 PM with a 1-hour lunch break. In addition, a scalar factor was applied to the risk calculations to account for the number of days residents are exposed to construction emissions per year.

For all modeling runs, a unit emission rate of 1 gram per second was used. The unit emission rates were proportioned over the poly-area sources for on-site construction emissions, and divided between the volume sources for off-site hauling emissions. The maximum modeled concentrations from the output files were then multiplied by the emission rates calculated in Appendix A to obtain the maximum flagpole-level concentrations at the off-site maximum exposed receptors (MER). The off-site MER is a residence along Jones Road to the east of the project site. The MER location is the receptor location associated with the maximum predicted AERMOD concentrations from the on-site emission source. The calculated on-site emission rates are approximately 2 to 3 orders of magnitude higher than the calculated off-site emission rates (see Appendix A). Therefore, the maximum concentrations associated with the on-site emission sources produce the highest overall ground-level MER concentrations and, consequently, higher calculated health risks.

The air dispersion model output for the emission sources is presented in Appendix B. The model output DPM and $PM_{2.5}$ concentrations from the construction emission sources are provided in Appendix C.

1.5 RISK CHARACTERIZATION

1.5.1 Carcinogenic Chemical Risk

A threshold of ten in a million ($10x10^{-6}$) has been established as a level posing no significant risk for exposures to carcinogens. Health risks associated with exposure to carcinogenic compounds can be defined in

terms of the probability of developing cancer as a result of exposure to a chemical at a given concentration. The cancer risk probability is determined by multiplying the chemical's annual concentration by its cancer potency factor (CPF), a measure of the carcinogenic potential of a chemical when a dose is received through the inhalation pathway. It is an upper-limit estimate of the probability of contracting cancer as a result of continuous exposure to an ambient concentration of one microgram per cubic meter ($\mu g/m^3$) over a lifetime of 70 years.

Recent guidance from OEHHA recommends a refinement to the standard point estimate approach with the use of age-specific breathing rates and age sensitivity factors (ASFs) to assess risk for susceptible subpopulations such as children. For the inhalation pathway, the procedure requires the incorporation of several discrete variates to effectively quantify dose for each age group. Once determined, contaminant dose is multiplied by the cancer potency factor in units of inverse dose expressed in milligrams per kilogram per day $(mg/kg/day)^{-1}$ to derive the cancer risk estimate. Therefore, to accommodate the unique exposures associated with the residential receptors, the following dose algorithm was used.

$$\text{Dose}_{\text{AIR,per age group}} = \left(C_{air} \times EF \times \left[\frac{BR}{BW}\right] \times A \times CF\right)$$

Where:

$Dose_{AIR}$	=	dose by inhalation (mg/kg-day), per age group
C_{air}	=	concentration of contaminant in air ($\mu g/m^3$)
EF	=	exposure frequency (number of days/365 days)
BR/BW	=	daily breathing rate normalized to body weight (L/kg-day)
A	=	inhalation absorption factor (default = 1)
CF	=	conversion factor ($1x10^{-6}$, µg to mg, L to m^3)

The inhalation absorption factor (A) is a unitless factor that is only used if the cancer potency factor included a correction for absorption across the lung. For this assessment, the default value of 1 was used. For residential receptors, the exposure frequency (EF) of 0.96 is used to represent 350 days per year to allow for a two week period away from home each year (OEHHA, 2015). The 95th percentile daily breathing rates (BR/BW), exposure duration (ED), age sensitivity factors (ASFs), and fraction of time at home (FAH) for the various age groups are provided herein:

Age Groups	BR/BW (L/kg-day)	ED	ASF	FAH
Third trimester	361	0.25	10	0.85
0-2 age group	1,090	2	10	0.85
2-9 age group	861	7	3	0.72
2-16 age group	745	14	3	0.72
16-30 age group	335	14	1	0.73
16-70 age group	290	54	1	0.73

For construction analysis, the exposure duration spans the length of construction (e.g. 415 work days). As the length of construction is less than 2 years, only the third trimester and 0-2 age bins apply to the construction analysis for the off-site residential receptors.

To calculate the overall cancer risk, the risk for each appropriate age group is calculated per the following equation:

$$\text{Cancer Risk}_{\text{AIR}} = \text{Dose}_{\text{AIR}} \times \text{CPF} \times \text{ASF} \times \text{FAH} \times \frac{\text{ED}}{AT}$$

Where:

Dose_{AIR}	=	dose by inhalation (mg/kg-day), per age group
CPF	=	cancer potency factor, chemical-specific $(\text{mg/kg-day})^{-1}$
ASF	=	age sensitivity factor, per age group
FAH	=	fraction of time at home, per age group (for residential receptors only)
ED	=	exposure duration (years)
AT	=	averaging time period over which exposure duration is averaged (70 years)

The CPFs used in the assessment were obtained from OEHHA guidance. The excess lifetime cancer risks during the construction period to the maximally exposed resident were calculated based on the factors provided above. The cancer risks for each age group are summed to estimate the total cancer risk for each toxic chemical species. For purposes of this assessment and as stated, the calculated residential cancer risks associated with construction activities are based on the 3rd trimester and 0-2 year old age groups. The final step converts the cancer risk in scientific notation to a whole number that expresses the cancer risk in "chances per million" by multiplying the cancer risk by a factor of $1x10^6$ (i.e. 1 million).

The calculated results are provided in Appendix C.

1.5.2 Non-Carcinogenic Hazards

An evaluation of the potential non-cancer effects of chronic chemical exposures was also conducted. Adverse health effects are evaluated by comparing the annual receptor level (flagpole) concentration of each chemical compound with the appropriate reference exposure limit (REL). Available RELs promulgated by OEHHA were considered in the assessment.

To quantify non-carcinogenic impacts, the hazard index approach was used. The hazard index assumes that chronic sub-threshold exposures adversely affect a specific organ or organ system (toxicological endpoint). For each discrete chemical exposure, target organs presented in regulatory guidance were used. To calculate the hazard index, each chemical concentration or dose is divided by the appropriate toxicity value. For compounds affecting the same toxicological endpoint, this ratio is summed. Where the total equals or exceeds one, a health hazard is presumed to exist.

The chronic hazard analysis for DPM is provided in Appendix C. The calculations contain the relevant exposure concentrations and corresponding reference dose values used in the evaluation of non-carcinogenic exposures.

1.5.3 Criteria Pollutants

The BAAQMD has recently incorporated $PM_{2.5}$ into the District's CEQA significance thresholds due to recent studies that show adverse health impacts from exposure to this pollutant. An incremental increase of greater than 0.3 $\mu g/m^3$ for the annual average $PM_{2.5}$ concentration is considered to be a significant impact.

1.6 CONSTRUCTION HRA RESULTS

The calculated results are provided in Appendix C and the results are summarized in Table 1.

TABLE 1. CONSTRUCTION RISK SUMMARY - UNMITIGATED

Receptor	Cancer Risk (per million)	Chronic Hazards	$PM_{2.5}$ ($\mu g/m^3$)[a]
Maximum Exposed Receptor – Offsite Residence	14.6	0.033	0.09
BAAQMD Threshold	10	1.0	0.30
Exceeds Threshold?	Yes	No	No

Note: Cancer risk calculated using 2015 OEHHA HRA guidance.
a. From year 2019 which represents the highest maximum annual $PM_{2.5}$ concentration.
Source: Lakes AERMOD View, 9.4 (2017).

Cancer risk for the maximum exposed receptor (MER) from project-related construction emissions was calculated to be 14.6 in a million, which would exceed the 10 in a million significance threshold. In accordance with the latest 2015 OEHHA guidance, the calculated total cancer risk conservatively assumes that the risk for the MER consists of a pregnant woman in the third trimester that subsequently gives birth to an infant during the approximately 19-month construction period; therefore, all calculated risk values were multiplied by a factor of 10. In addition, it was conservatively assumed that the residents were outdoors 24 hours a day, 350 days per year and exposed to all of the daily construction emissions.

For non-carcinogenic effects, the chronic hazard index identified for each toxicological endpoint totaled less than one for all the off-site sensitive receptors. Therefore, chronic non-carcinogenic hazards are within acceptable limits. The highest $PM_{2.5}$ annual concentration would not exceed the BAAQMD significance threshold of 0.3 micrograms per cubic meter ($\mu g/m^3$).

Because cancer risk for nearby sensitive receptors would exceed BAAQMD's significance thresholds during construction activities associated with the proposed project, mitigation measures are needed.

Mitigation Measure AQ-2: During construction, the construction contractor(s) shall use construction equipment fitted with Level 2 Diesel Particulate Filters (DPF) or higher for all equipment over 50 horsepower. The construction contractor shall maintain a list of all operating equipment in use on the project site for verification by the City of Walnut Creek Building Division official or his/her designee. The construction equipment list shall state the makes, models, and number of construction equipment on-site. Equipment shall be properly serviced and maintained in accordance with manufacturer recommendations. The construction contractor shall ensure that all non-essential idling of construction equipment is restricted to five minutes or less in compliance with California Air Resources Board Rule

2449. Prior to issuance of any construction permit, the construction contractor shall ensure that all construction plans submitted to the City of Walnut Creek Planning Division and/or Building Division clearly show the requirement for Level 2 DPF or higher emissions standards for construction equipment over 50 horsepower.

Cancer risk for the maximum exposed off-site resident would exceed BAAQMD's significance thresholds due to construction activities associated with the proposed Project. However, Mitigation Measure AQ-2 requires using construction equipment fitted with Level 2 Diesel Particulate Filters (DPF), which would reduce the Project's localized construction emissions. The mitigated health risk values were calculated and are summarized in Table 2. As shown in the table, incorporation of mitigation would reduce cancer risk at the maximum exposed receptor to 7.9 in a million, which would be below the BAAQMD's significance threshold. Therefore, the Project would not expose sensitive receptors to substantial concentrations of air pollutant emissions during construction and impacts would be *less than significant with mitigation*.

Table 2 Construction Risk Summary – Mitigated

Receptor	Cancer Risk (per million)	Chronic Hazards	$PM_{2.5}$ ($\mu g/m^3$)[a]
Maximum Exposed Receptor – Residences	8.6	0.019	0.05
BAAQMD Threshold	10	1.0	0.3
Exceeds Threshold?	No	No	No

Note: Cancer risk calculated using 2015 OEHHA HRA guidance.
Risks incorporate Mitigation Measure AQ-2, which includes using construction equipment with Level 2 Diesel Particulate Filters for equipment over 50 horsepower.
a. From year 2019 which represents the highest maximum annual $PM_{2.5}$ concentration.
Source: Lakes AERMOD View, 9.4 (2017).

2. References

Bay Area Air Quality Management District. 2017. *California Environmental Quality Act Air Quality Guidelines.*

———. 2012. *Recommended Methods for Screening and Modeling Local Risks and Hazards.* Version 3.0. Dated May 2012.

———. 2010. Screening Tables for Air Toxics Evaluation During Construction. Version 1.0. Dated May 2010.

———. 2009-2013. Meteorological Data Set for Livermore Municipal Airport.

California Air Pollution Control Officers Association (CAPCOA). 2016. California Emissions Estimator Model (CalEEMod). Version 2016.3.2. Prepared by: ENVIRON International Corporation and the California Air Districts.

California Air Resources Board (CARB). 2000. *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles.*

———. 2015. *Meteorological Files.* https://www.arb.ca.gov/toxics/harp/metfiles2.htm

Office of Environmental Health Hazard Assessment (OEHHA). 2015. *Air Toxics Hot Spots Program Guidance Manual for the Preparation of Health Risk Assessments.* Dated February, 2015.

United States Environmental Protection Agency (USEPA). 2011. *Exposure Factors Handbook 2011 Edition (Final).* EPA/600/R-09/052F, 2011.

_____. 2005. *Guideline on Air Quality Models* (Revised). EPA-450/2-78-027R.

Appendix A. Emission Rate Calculations

Construction Emissions - DPM and PM2.5
Input to ISCST3 Model
Mitigated Run - Level 2 Diesel Particulate Filters

On-site Construction Emissions - Mitigated		DPM [1]	$PM_{2.5}$ [2]
2018 On-site Emissions	Average Daily Emissions (lbs/day)	0.11	0.11
	Average Daily Emissions (lbs/hr)	1.43E-02	1.33E-02
	Emission Rate (g/s)	1.80E-03	1.68E-03
2019 On-site Emissions	Average Daily Emissions (lbs/day)	0.32	0.31
	Average Daily Emissions (lbs/hr)	4.05E-02	3.82E-02
	Emission Rate (g/s)	5.11E-03	4.82E-03
2020 On-site Emissions	Average Daily Emissions (lbs/day)	0.12	0.11
	Average Daily Emissions (lbs/hr)	1.48E-02	1.39E-02
	Emission Rate (g/s)	1.86E-03	1.75E-03

Note: Emissions assumed to be evenly distributed over entire construction phase area.

Off-site Construction Emissions - Mitigated		DPM [1]	$PM_{2.5}$ [2]
2019 Off-site Emissions	Haul Length Daily Emissions (lbs/day)	0.011	0.011
	Hauling Emissions w/in 1,000 ft (lbs/day) [3]	9.75E-04	9.35E-04
	Emission Rate (lbs/hr)	1.22E-04	1.17E-04
	Emission Rate (g/s)	1.54E-05	1.47E-05
2019 Off-site Emissions	Haul Length Daily Emissions (lbs/day)	0.020	0.019
	Hauling Emissions w/in 1,000 ft (lbs/day) [3]	1.74E-03	1.66E-03
	Emission Rate (lbs/hr)	2.18E-04	2.07E-04
	Emission Rate (g/s)	2.75E-05	2.61E-05
2020 Off-site Emissions	Haul Length Daily Emissions (lbs/day)	0.005	0.004
	Hauling Emissions w/in 1,000 ft (lbs/day) [3]	4.28E-04	3.77E-04
	Emission Rate (lbs/hr)	5.35E-05	4.72E-05
	Emission Rate (g/s)	6.74E-06	5.94E-06

Note: Emissions evenly distributed over 158 modeled volume sources.

Hours per work day (7:00 AM to 4:00 PM, 1-hour of breaks) [4] 8 hours

	2018-2020	Workdays	Risk Scalar [5]
Total construction days per year	2018	86	0.33
	2019	261	1.00
	2020	68	0.26

	Demo	Grading
Number of Haul Trips	196	126
Hauling Length (miles)	10	20
Hauling Length (miles)	**13.9**	
Haul Length within 1,000 ft of Site (mile) [3]	**1.19**	

[1] DPM emissions taken as PM_{10} exhaust emissions from CalEEMod average daily emissions.

[2] $PM_{2.5}$ emissions taken as $PM_{2.5}$ exhaust emissions from CalEEMod average daily emissions.

[3] Emissions from CalEEMod offsite average daily emissions, which is based on proportioned haul truck trip distance of 10 miles for demolition and 20 miles for grading (provided by the Applicant), are proportioned to evaluate emissions from the **1.19-**mile route within 1,000 of the project site.

[4] Work hours applied in By Hour/Day (HRDOW) variable emissions module in air dispersion model (see App B - Air Dispersion Model Output Files).

[5] Residential risk scalars determined for each year of construction to adjust receptor exposures to the exposure durations for each construction year (see App C - Risk Calculations).

Table C1a
MER Concentrations for Risk Calculations

Residential Receptors - Unmitigated				
Emission Source	Model Output [1] ($\mu g/m^3$)	Pollutant	Emission Rates [2] (g/s)	MER Concentrations ($\mu g/m^3$)
(a)	(b)	(c)	(d)	(f)
	Annual Average		Average Daily	Annual Average
2018 On-site	10.94	DPM	3.26E-03	**3.57E-02**
		$PM_{2.5}$	3.03E-03	**3.31E-02**
2018 Off-site	3.13	DPM	1.54E-05	**4.80E-05**
		$PM_{2.5}$	1.47E-05	**4.60E-05**
2019 On-site	10.94	DPM	8.64E-03	**9.45E-02**
		$PM_{2.5}$	8.07E-03	**8.83E-02**
2019 Off-site	3.13	DPM	2.75E-05	**8.58E-05**
		$PM_{2.5}$	2.61E-05	**8.16E-05**
2020 On-site	10.94	DPM	3.26E-03	**3.57E-02**
		$PM_{2.5}$	3.04E-03	**3.33E-02**
2020 Off-site	3.13	DPM	6.74E-06	**2.10E-05**
		$PM_{2.5}$	5.94E-06	**1.86E-05**
Residential Receptors - Mitigation: Level 2 DPF for equipment > 50 HP				
Source	Model Output [1] ($\mu g/m^3$)	Pollutant	Emission Rates [2] (g/s)	Mass GLC ($\mu g/m^3$)
(a)	(c)	(b)	(d)	(f)
	Annual Average		Average Daily	Annual Average
2018 On-site	10.94	DPM	1.80E-03	**1.97E-02**
		$PM_{2.5}$	1.68E-03	**1.84E-02**
2018 Off-site	3.13	DPM	1.54E-05	**4.80E-05**
		$PM_{2.5}$	1.47E-05	**4.60E-05**
2019 On-site	10.94	DPM	5.11E-03	**5.58E-02**
		$PM_{2.5}$	4.82E-03	**5.27E-02**
2019 Off-site	3.13	DPM	2.75E-05	**8.58E-05**
		$PM_{2.5}$	2.61E-05	**8.16E-05**
2020 On-site	10.94	DPM	1.86E-03	**2.04E-02**
		$PM_{2.5}$	1.75E-03	**1.92E-02**
2020 Off-site	3.13	DPM	6.74E-06	**2.10E-05**
		$PM_{2.5}$	5.94E-06	**1.86E-05**

Maximum Exposed Receptor (MER) UTM coordinates: 582336.81 E, 4196660.55 N

[1] Model Output at the MER based on unit emission rates for sources (1 g/s).

[2] Emission Rates from Emission Rate Calculations (Appendix A - Construction Emissions).

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Appendix B. Air Dispersion Model Output

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**
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**
** AERMOD Input Produced by:
** AERMOD View Ver. 9.4.0
** Lakes Environmental Software Inc.
** Date: 1/5/2018
** File: C:\Lakes\AERMOD
View\Hilton_Inn_Walnut_Creek\Hilton_Inn_Walnut_Creek\Hilton_Inn_Walnut
_Creek.ADI
**
**************************************
**
**
**************************************
** AERMOD Control Pathway
**************************************
**
**
CO STARTING
   TITLEONE Hilton Inn Walnut Creek
   TITLETWO Construction HRA
   MODELOPT DFAULT CONC
   AVERTIME PERIOD
   URBANOPT 69122
   POLLUTID OTHER
   FLAGPOLE 1.50
   RUNORNOT RUN
   ERRORFIL Hilton_Inn_Walnut_Creek.err
CO FINISHED
**
**************************************
** AERMOD Source Pathway
**************************************
**
**
SO STARTING
** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
   LOCATION PAREA1       AREAPOLY   582193.237  4196764.497
38.700
** DESCRSRC Construction
**
------------------------------------------------------------------------
** Line Source Represented by Adjacent Volume Sources
** LINE VOLUME Source ID = SLINE1
** DESCRSRC
** PREFIX
** Length of Side = 12.19
** Configuration = Adjacent
** Emission Rate = 1.0
** Vertical Dimension = 1.93
```

```
** SZINIT = 0.90
** Nodes = 22
** 582027.643, 4196746.790, 41.99, 4.15, 5.67
** 582032.140, 4196801.643, 42.74, 4.15, 5.67
** 582010.558, 4196857.395, 42.53, 4.15, 5.67
** 581969.193, 4196937.427, 42.89, 4.15, 5.67
** 581974.589, 4196983.288, 42.11, 4.15, 5.67
** 582007.860, 4197048.932, 42.38, 4.15, 5.67
** 582127.458, 4197056.126, 42.31, 4.15, 5.67
** 582114.869, 4196992.281, 42.75, 4.15, 5.67
** 582157.133, 4196452.740, 42.33, 4.15, 5.67
** 582241.661, 4196445.546, 41.85, 4.15, 5.67
** 582273.134, 4196581.330, 37.46, 4.15, 5.67
** 582283.026, 4196732.402, 36.00, 4.15, 5.67
** 582256.049, 4196821.426, 35.89, 4.15, 5.67
** 582220.979, 4196780.061, 36.91, 4.15, 5.67
** 582140.947, 4196751.286, 42.72, 4.15, 5.67
** 582140.947, 4196763.875, 42.71, 4.15, 5.67
** 582220.080, 4196789.054, 36.91, 4.15, 5.67
** 582229.072, 4196813.333, 36.97, 4.15, 5.67
** 582225.475, 4196843.008, 36.93, 4.15, 5.67
** 582194.901, 4196859.194, 36.11, 4.15, 5.67
** 582166.126, 4196852.899, 36.22, 4.15, 5.67
** 582136.451, 4196812.434, 42.29, 4.15, 5.67
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*** MODELOPTs: RegDFAULT CONC ELEV FLGPOL URBAN

*** THE SUMMARY OF MAXIMUM PERIOD (43872 HRS) RESULTS ***

** CONC OF OTHER IN MICROGRAMS/M**3 **

NETWORK GROUP ID	AVERAGE CONC				RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG)	OF TYPE	GRID-ID
ONSITE	1ST HIGHEST VALUE IS	10.93988	AT	(	582336.81, 4196660.55, 38.72, 38.72, 1.50)	DC	
	2ND HIGHEST VALUE IS	9.75483	AT	(	582336.81, 4196660.55, 38.72, 38.72, 6.10)	DC	
	3RD HIGHEST VALUE IS	9.36593	AT	(	582356.43, 4196719.11, 38.90, 38.90, 1.50)	DC	
	4TH HIGHEST VALUE IS	9.34989	AT	(	582356.43, 4196689.83, 39.00, 39.00, 1.50)	DC	
	5TH HIGHEST VALUE IS	8.76011	AT	(	582336.81, 4196631.27, 38.41, 38.41, 1.50)	DC	
	6TH HIGHEST VALUE IS	8.56718	AT	(	582356.43, 4196689.83, 39.00, 39.00, 6.10)	DC	
	7TH HIGHEST VALUE IS	8.55581	AT	(	582356.43, 4196719.11, 38.90, 38.90, 6.10)	DC	
	8TH HIGHEST VALUE IS	8.46066	AT	(	582356.43, 4196748.39, 37.92, 37.92, 1.50)	DC	
	9TH HIGHEST VALUE IS	8.41172	AT	(	582356.43, 4196660.55, 39.77, 39.77, 1.50)	DC	
	10TH HIGHEST VALUE IS	7.83990	AT	(	582336.81, 4196631.27, 38.41, 38.41, 6.10)	DC	
OFFSITE	1ST HIGHEST VALUE IS	3.12516	AT	(	582336.81, 4196660.55, 38.72, 38.72, 1.50)	DC	
	2ND HIGHEST VALUE IS	3.11345	AT	(	582356.43, 4196748.39, 37.92, 37.92, 1.50)	DC	
	3RD HIGHEST VALUE IS	3.04485	AT	(	582356.43, 4196777.67, 36.95, 36.95, 1.50)	DC	
	4TH HIGHEST VALUE IS	2.98338	AT	(	582356.43, 4196719.11, 38.90, 38.90, 1.50)	DC	
	5TH HIGHEST VALUE IS	2.92626	AT	(	582336.81,		

```
4196631.27,    38.41,    38.41,    1.50)  DC
          6TH HIGHEST VALUE IS       2.90540 AT (  582356.43,
4196748.39,    37.92,    37.92,    6.10)  DC
          7TH HIGHEST VALUE IS       2.90150 AT (  582356.43,
4196777.67,    36.95,    36.95,    6.10)  DC
          8TH HIGHEST VALUE IS       2.76265 AT (  582356.43,
4196806.95,    36.06,    36.06,    1.50)  DC
          9TH HIGHEST VALUE IS       2.76136 AT (  582356.43,
4196689.83,    39.00,    39.00,    1.50)  DC
         10TH HIGHEST VALUE IS       2.73597 AT (  582336.81,
4196601.99,    38.76,    38.76,    1.50)  DC


 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
```

*** MODELOPTs: RegDFAULT CONC ELEV FLGPOL URBAN

*** Message Summary : AERMOD Model Execution ***

--------- Summary of Total Messages --------

A Total of   0 Fatal Error Message(s)
A Total of   0 Warning Message(s)
A Total of   15235 Informational Message(s)

A Total of   43872 Hours Were Processed

A Total of   13448 Calm Hours Identified

A Total of   1787 Missing Hours Identified (4.07 Percent)

******** FATAL ERROR MESSAGES ********
*** NONE ***

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

****
*** AERMOD Finishes Successfully ***
****

Results Summary

Hilton Inn Walnut Creek
Construction HRA

Concentration - Source Group: OFFSITE

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
PERIOD		3.12516	ug/m^3	582336.81	4196660.55	38.72	1.50	38.72	

Concentration - Source Group: ONSITE

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
PERIOD		10.93988	ug/m^3	582336.81	4196660.55	38.72	1.50	38.72	

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Appendix C. Construction Risk Calculations

Construction Emissions - DPM and PM2.5
Input to ISCST3 Model

On-site Construction Emissions		DPM [1]	$PM_{2.5}$ [2]
2018 On-site Emissions	Average Daily Emissions (lbs/day)	0.21	0.19
	Average Daily Emissions (lbs/hr)	2.59E-02	2.40E-02
	Emission Rate (g/s)	3.26E-03	3.03E-03
2019 On-site Emissions	Average Daily Emissions (lbs/day)	0.55	0.51
	Average Daily Emissions (lbs/hr)	6.86E-02	6.41E-02
	Emission Rate (g/s)	8.64E-03	8.07E-03
2020 On-site Emissions	Average Daily Emissions (lbs/day)	0.21	0.19
	Average Daily Emissions (lbs/hr)	2.59E-02	2.42E-02
	Emission Rate (g/s)	3.26E-03	3.04E-03

Note: Emissions assumed to be evenly distributed over entire construction phase area.

Off-site Construction Emissions		DPM [1]	$PM_{2.5}$ [2]
2018 Off-site Emissions	Haul Length Daily Emissions (lbs/day)	0.011	0.011
	Hauling Emissions w/in 1,000 ft (lbs/day) [3]	9.75E-04	9.35E-04
	Emission Rate (lbs/hr)	1.22E-04	1.17E-04
	Emission Rate (g/s)	1.54E-05	1.47E-05
2019 Off-site Emissions	Haul Length Daily Emissions (lbs/day)	0.020	0.019
	Hauling Emissions w/in 1,000 ft (lbs/day) [3]	1.74E-03	1.66E-03
	Emission Rate (lbs/hr)	2.18E-04	2.07E-04
	Emission Rate (g/s)	2.75E-05	2.61E-05
2020 Off-site Emissions	Haul Length Daily Emissions (lbs/day)	0.005	0.004
	Hauling Emissions w/in 1,000 ft (lbs/day) [3]	4.28E-04	3.77E-04
	Emission Rate (lbs/hr)	5.35E-05	4.72E-05
	Emission Rate (g/s)	6.74E-06	5.94E-06

Note: Emissions evenly distributed over 158 modeled volume sources.

Hours per work day (7:00 AM to 4:00 PM, 1-hour of breaks) [4] 8 hours

	2018-2020	Workdays	Risk Scalar [5]
Total construction days per year	2018	86	0.33
	2019	261	1.00
	2020	68	0.26

	Demo	Grading
Number of Haul Trips	196	126
Hauling Length (miles)	10	20
Average Hauling Length (miles)	**13.9**	
Haul Length within 1,000 ft of Site (mile) [3]	**1.19**	

[1] DPM emissions taken as PM_{10} exhaust emissions from CalEEMod average daily emissions.

[2] $PM_{2.5}$ emissions taken as $PM_{2.5}$ exhaust emissions from CalEEMod average daily emissions.

[3] Emissions from CalEEMod offsite average daily emissions, which is based on proportioned haul truck trip distance of 10 miles for demolition and 20 miles for grading (provided by the Applicant), are proportioned to evaluate emissions from the **1.19**-mile route within 1,000 of the project site.

[4] Work hours applied in By Hour/Day (HRDOW) variable emissions module in air dispersion model (see App B - Air Dispersion Model Output Files).

[5] Residential risk scalars determined for each year of construction to adjust receptor exposures to the exposure durations for each construction year (see App C - Risk Calculations).

Table C1b
Quantification of Carcinogenic Risks for Off-site Residents

Source		MER Conc. ($\mu g/m^3$)	Weight Fraction	Contaminant	URF $(\mu g/m^3)^{-1}$	CPF $(mg/kg/day)^{-1}$	Dose (by age bin) 3rd Trimester (mg/kg-day)	Dose (by age bin) 0 < 2 years (mg/kg-day)	Carcinogenic Risks (by age bin) 3rd Trimester per million	Carcinogenic Risks (by age bin) 0 < 2 years per million	**Total Risk** per million
(a)		(b)	(c)	(d)	(e)	(f)	(g)	(h)	(k)	(l)	(o)
Residential Receptors - Unmitigated											
2018	On-Site Emissions	3.57E-02	1.00E+00	Diesel Particulate	3.0E-04	1.1E+00	1.24E-05	3.7E-05	3.94E-01	3.78E-01	0.77
	Truck Route	4.80E-05	1.00E+00		3.0E-04	1.1E+00	1.66E-08	5.0E-08	5.29E-04	5.08E-04	0.00
2019	On-Site Emissions	9.45E-02	1.00E+00		3.0E-04	1.1E+00	3.27E-05	9.9E-05		1.26E+01	12.6
	Truck Route	8.58E-05	1.00E+00		3.0E-04	1.1E+00	2.97E-08	9.0E-08		1.14E-02	0.01
2020	On-Site Emissions	3.57E-02	1.00E+00		3.0E-04	1.1E+00	1.24E-05	3.7E-05		1.23E+00	1.23
	Truck Route	2.10E-05	1.00E+00		3.0E-04	1.1E+00	7.29E-09	2.2E-08		7.28E-04	0.00
									Total Cancer Risk		**14.6**
Residential Receptors - Mitigated Run: Level 2 Diesel Particulate Filters for equipment 50 HP or greater											
2018	On-Site Emissions	1.97E-02	1.00E+00	Diesel Particulate	3.0E-04	1.1E+00	6.8E-06	2.1E-05	2.17E-01	2.08E-01	0.43
	Truck Route	4.80E-05	1.00E+00		3.0E-04	1.1E+00	1.7E-08	5.0E-08	5.29E-04	5.08E-04	0.00
2019	On-Site Emissions	5.58E-02	1.00E+00		3.0E-04	1.1E+00	1.9E-05	5.8E-05		7.44E+00	7.44
	Truck Route	8.58E-05	1.00E+00		3.0E-04	1.1E+00	3.0E-08	9.0E-08		1.14E-02	0.01
2020	On-Site Emissions	2.04E-02	1.00E+00		3.0E-04	1.1E+00	7.1E-06	2.1E-05		7.05E-01	0.70
	Truck Route	2.10E-05	1.00E+00		3.0E-04	1.1E+00	7.3E-09	2.2E-08		7.28E-04	0.00
									Total Cancer Risk		**8.6**

Maximum Exposed Receptor (MER) UTM coordinates: 582336.81 E, 4196660.55 N

		OEHHA age bin	3rd Trimester	0 < 2 years
		exposure year(s)	2018	2018-2020
Dose Exposure Factors:		exposure frequency (days/year)	350	350
		inhalation rate (L/kg-day) [1]	361	1090
		inhalation absorption factor	1	1
Risk Calculation Factors:		age sensitivity factor	10	10
		averaging time (years)	70	70
		fraction of time at home	0.85	0.85

exposure durations per age bin			exposure durations (year)	
	Construction Year	Risk Scalar [2]	3rd Trimester	0 < 2 years
	2018	0.33	0.25	0.08
	2019	1.00		1.00
	2020	0.26		0.26
	Total	1.59	0.25	1.34

[1] Inhalation rate taken as the 95th percentile breathing rates (OEHHA, 2015).

[2] Residential risk scalar determined for each year of construction to adjust receptor exposures to the exposure durations for each construction year (see App A - Construction Emissions

Table C1c
Quantification of Non-Carcinogenic Risks
Chronic Hazards for Off-site Residents

Source		REL Type	MER Conc. ($\mu g/m^3$)	Weight Fraction	Contaminant	Chronic Hazards / Toxicological Endpoints*								
						REL ($\mu g/m^3$)	RESP	CNS/PNS	CV/BL	IMMUN	KIDN	GI/LV	REPRO	EYES
(a)		(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)
Residential Receptors - Unmitigated														
2018	On-Site Emissions	Chronic	3.57E-02	1.00E+00	Diesel Particulate	5.0E+00	7.1E-03							
	Truck Route		4.80E-05	1.00E+00		5.0E+00	9.6E-06							
2019	On-Site Emissions		9.45E-02	1.00E+00		5.0E+00	1.9E-02							
	Truck Route		8.58E-05	1.00E+00		5.0E+00	1.7E-05							
2020	On-Site Emissions		3.57E-02	1.00E+00		5.0E+00	7.1E-03							
	Truck Route		2.10E-05	1.00E+00		5.0E+00	4.2E-06							
TOTAL							3.3E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
					Maximum Chronic Hazard		**0.033**							
Residential Receptors - Mitigated Run: Level 2 Diesel Particulate Filters for equipment 50 HP or greater														
2018	On-Site Emissions	Chronic	1.97E-02	1.00E+00	Diesel Particulate	5.0E+00	3.9E-03							
	Truck Route		4.80E-05	1.00E+00		5.0E+00	9.6E-06							
2019	On-Site Emissions		5.58E-02	1.00E+00		5.0E+00	1.1E-02							
	Truck Route		8.58E-05	1.00E+00		5.0E+00	1.7E-05							
2020	On-Site Emissions		2.04E-02	1.00E+00		5.0E+00	4.1E-03							
	Truck Route		2.10E-05	1.00E+00		5.0E+00	4.2E-06							
TOTAL							1.9E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
					Maximum Chronic Hazard		**0.019**							

Maximum Exposed Receptor (MER) UTM coordinates: 582336.81 E, 4196660.55 N

* Key to Toxicological Endpoints

RESP	Respiratory System
CNS/PNS	Central/Peripheral Nervous System
CV/BL	Cardiovascular/Blood System
IMMUN	Immune System
KIDN	Kidney
REPRO	Reproductive System
EYES	Eye irritation and/or other effects

Table C1d
PM2.5 Concentrations at Off-Site Residents

Contaminant	Source		MER Conc. ($\mu g/m^3$)	Concentration Annual Average ($\mu g/m^3$)
(a)	(b)		(c)	(d)
Residential Receptors - Unmitigated				
$PM_{2.5}$	2018	On-Site Emissions	3.31E-02	0.03
		Truck Route	4.60E-05	
	2018	On-Site Emissions	8.83E-02	0.09
		Truck Route	8.16E-05	
	2020	On-Site Emissions	3.33E-02	0.03
		Truck Route	1.86E-05	
	Maximum Annual $PM_{2.5}$ Concentration			**0.09**

Residential Receptors - Mitigated Run: Level 2 DPF for eq. > 50 HP				
$PM_{2.5}$	2018	On-Site Emissions	1.84E-02	0.02
		Truck Route	4.60E-05	
	2019	On-Site Emissions	5.27E-02	0.05
		Truck Route	8.16E-05	
	2020	On-Site Emissions	1.92E-02	0.02
		Truck Route	1.86E-05	
	Maximum Annual $PM_{2.5}$ Concentration			**0.05**

Maximum Exposed Receptor (MER) UTM coordinates: 582336.81 E, 4196660.55 N

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