Appendix C Risk Assessment

Appendices

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June 2020 | Health Risk Assessment

SAN BERNARDINO COUNTYWIDE PLAN

for County of San Bernardino

Prepared for:

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1. Health Risk Assessment

1.1 REPORT OBJECTIVES AND CONCLUSIONS

Implementation of the Countywide Plan (CWP) would result in added diesel-fueled trucking to roadways within the incorporated and unincorporated county areas compared to the existing conditions. In support of the County of San Bernardino (County) Policy Plan Hazards Element, PlaceWorks conducted a health risk assessment (HRA) to evaluate potential health risk impacts from diesel particulate matter (DPM) exposure within disadvantaged communities already affected by poor air quality (i.e., Muscoy and Bloomington).

For residential receptors in Bloomington and Muscoy, the incremental cancer risks and chronic hazard indices were calculated at the maximum exposed receptor (MER) due to CWP implementation. The results of the HRA are show in the HRA Summary table, *Health Risk Assessment Results for Maximum Exposed Receptors*.

HRA Summary Health Risk Assessment Results for Maximum Exposed Receptors

Scenario	Incremental Cancer Risk[1] (per million)	Chronic Hazard Index
Bloomington – Existing No Project[2]	261	0.0765
Bloomington – Existing with Project[2]	263	0.0772
Bloomington – Net Change Due to CWP Implementation[2]	2.4	0.0007
South Coast AQMD Threshold	10	1.0
Exceeds Threshold Due to CWP Implementation?	**No**	**No**
Muscoy – Existing No Project[3]	49.1	0.0144
Muscoy – Existing with Project[3]	50.4	0.0148
Muscoy – Net Change Due to CWP Implementation[3]	1.3	0.0004
South Coast AQMD Threshold	10	1.0
Exceeds Threshold Due to CWP Implementation?	**No**	**No**

[1] OEHHA (2015) recommends that a 30-year (high-end residency time) exposure duration be used to estimate individual cancer risk for the residential MER. 2040 DPM emission rates used for cancer risk calculations (EMFAC2017).
[2] The Bloomington residential maximum exposed receptor (MER) is on Church Street, east of Cedar Avenue and north of I-10.
[3] The Muscoy residential maximum exposed receptor (MER) is on W Highland Avenue, east of N State Street and north of SR-210.

As shown in the HRA Summary table, the incremental cancer risk for the residential MER in Bloomington and Muscoy due to CWP implementation are 2.4 and 1.3 per million, respectively. Therefore, the incremental cancer risks are below the significance threshold of 10 in a million with CWP implementation. For non-carcinogenic health risks, the chronic hazard indices were well below the significance threshold of 1.0 for the residential MERs for both Bloomington and Muscoy. The existing cancer risks from the existing truck traffic volumes, prior to CWP implementation, are 261 in a million in Bloomington and 49 in a million in Muscoy. For Bloomington, increased truck traffic due to CWP implementation is projected to potentially increase total cancer risk by 0.9 percent. For Muscoy, CWP implementation is projected to potentially increase the total cancer risk by 2.6 percent.

1.2 EXISTING SETTING

The existing environmental setting is described in the air quality section of the draft environmental impact report (DEIR) for the Countywide Plan. Relevant portions pertaining to the HRA evaluation are included below.

In response to Assembly Bill (AB) 617 (C. Garcia, Chapter 136, Statutes of 2017), the California Air Resources Board (CARB) has established the Community Air Protection Program. AB 617 requires local air districts to monitor and implement air pollution control strategies that reduce localized air pollution in communities that bear the greatest burdens. In the county, the Muscoy community has been identified as a "year 1" disadvantaged community for its air pollution burden. Communities under consideration for subsequent years (i.e., years 2 through 5), include Bloomington/Fontana/Rialto; Colton/Grand Terrace/San Bernardino (southwest); and Rancho Cucamonga/Ontario (east). The South Coast Air Quality Management District (South Coast AQMD) adopted the Community Emissions Reduction Plan (CERP) for Muscoy under AB 617 on September 6, 2019. The AB 617 "year 1" communities identified by South Coast AQMD share common air quality priorities that are driven by the movement of goods throughout the region (e.g., trucks, equipment used at railyards, off-road diesel equipment, and trains). Mobile sources are the overwhelming source of DPM and cancer risk in these communities. Air quality priorities for the Muscoy community include:

- Reducing emissions from heavy-duty trucks transiting the community by working with local land use agencies to establish designated truck routes.
- Promoting the installation of infrastructure needed to support zero emission vehicles and equipment at warehouses.
- Supporting a transition to zero emission transit buses.
- Replacing older diesel-fueled equipment with cleaner technologies at railyards.
- Reducing children's exposure to harmful air pollutants by working with local schools to install high efficiency filtrations systems (South Coast AQMD 2019).

The Multiple Air Toxics Exposure Study (MATES) is a monitoring and evaluation study on ambient concentrations of toxic air contaminants (TACs) and the potential health risks from air toxics in the South Coast Air Basin (SoCAB). In 2015, South Coast AQMD released the fourth update of MATES, MATES IV, which was based on the Office of Environmental Health Hazard Assessment's (OEHHA) 2003 HRA Guidance Manual. The results showed that the overall monitored risk for excess cancer from a lifetime exposure to ambient levels of air toxics is 418 in one million for San Bernardino County. The estimated excess cancer risk ranges from 727 to 840 in one million in Bloomington and 636 to 764 in one million in Muscoy (South Coast AQMD 2018). It should be noted that the MATES results are based on all emission sources within the air basin (ports, railyards, mobile sources, permitted stationary sources, etc.) and are not specific to any single localized source. The largest contributor to this risk was diesel exhaust, which accounted for approximately 68 percent of the air toxics risk. Compared to MATES III (2008 study), MATES IV found substantial improvement in air quality and associated decrease in air toxics exposure. As a result, the estimated basinwide, population-weighted risk decreased by approximately 57 percent since MATES III (South Coast AQMD 2015).

1.3 METHODOLOGY AND SIGNIFICANCE THRESHOLDS

The HRA analysis focuses on how increases in truck volumes generated by implementation of the CWP (project) would impact health risks in the AB 617–disadvantaged communities of Bloomington and Muscoy for the 2040 horizon year. Traffic modeling was conducted by Fehr & Peers (F&P) to identify existing and projected truck volumes along roadway segments within incorporated and unincorporated parts of the county, including the fleet mix or percentage breakdown of light, medium, and heavy duty trucks for each segment.

The results of the traffic modeling indicate that overall truck traffic throughout the county would increase as a result of the project, future growth in incorporated areas, and planned roadway network improvements through the horizon year of 2040. The amount and significance of the increase in truck traffic due to CWP implementation, and its associated generation of diesel particulate emissions, is the primary concern of this HRA. Study area roadway segments with an increase of 100 or more trucks per day due to implementation of the CWP were selected for analysis. The 100 trucks per day cutoff was selected consistent with CARB's recommendation of this threshold for use in the health risk evaluation of truck distribution centers within 1,000 feet of sensitive land uses (CARB 2005). Although a higher threshold (more than 100 trucks per day) is being considered by agencies in recognition of improvements in technology and emissions reductions strategies, this HRA opts to retain the threshold of 100 trucks per day to be conservative and evaluate more roadways and sensitive receptors. Roadway segments with increased truck traffic over 100 trucks per day due to CWP implementation were mapped for the Bloomington and Muscoy communities, and existing routes that prohibit trucks were accounted for in the traffic modeling results provided by F&P.

The following South Coast AQMD significance thresholds for health risks were deemed appropriate and were used for this HRA:

- Excess cancer risk of more than 10 in a million
- Noncancer hazard index (chronic or acute) greater than 1.0

These thresholds are typically applied to new industrial projects. However, for purposes of this analysis, these thresholds are used to determine whether CWP implementation would result in significant health risk impacts from DPM emissions. Traffic modeling was conducted for all areas of the unincorporated county, but Bloomington and Muscoy were the only unincorporated communities that have sensitive receptors and exhibited more than 10 roadway segments with truck trips expected to exceed 100 compared to existing conditions. Projected truck traffic increases in all other unincorporated communities were either less than 100 per segment or less than the levels modeled in Bloomington and Muscoy. Accordingly, analysis was first conducted on Bloomington and Muscoy. Once it was determined that the incremental increase in cancer risk due to CWP implementation was below the South Coast AQMD significance thresholds for the MER in those communities, it can be concluded that the incremental increase in cancer risk for other communities is also below the threshold—in almost all cases, substantially below.

The methodology used in this HRA is consistent with South Coast AQMD and the Office of Environmental Health Hazard Assessment (OEHHA) guidance documents:

- OEHHA. *Air Toxics Hot Spots Program Guidance Manual for the Preparation of Health Risk Assessments*. February 2015.
- South Coast AQMD. Health Risk Assessment Guidance for Analyzing Cancer Risks from Mobile Source Diesel Idling Emissions for CEQA Air Quality Analysis. August 2003.

Cumulative Thresholds

The South Coast AQMD has published a report on how to address cumulative impacts from air pollution: "White Paper on Potential Control Strategies to Address Cumulative Impacts from Air Pollution" (Goss and Kroeger 2003). Page D-3 of the South Coast AQMD report states:

> …the South Coast AQMD uses the same significance thresholds for project specific and cumulative impacts for all environmental topics analyzed in an Environmental Assessment or EIR. The only case where the significance thresholds for project specific and cumulative impacts differ is the Hazard Index (HI) significance threshold for toxic air contaminant (TAC) emissions. The project specific (project increment) significance threshold is HI > 1.0 while the cumulative (facility-wide) is HI > 3.0. It should be noted that the HI is only one of three TAC emission significance thresholds considered (when applicable) in a CEQA analysis. The other two are the maximum individual cancer risk (MICR) and the cancer burden, both of which use the same significance thresholds (MICR of 10 in 1 million and cancer burden of 0.5) for project specific and cumulative impacts.
>
> Projects that exceed the project-specific significance thresholds are considered by the South Coast AQMD to be cumulatively considerable. This is the reason project-specific and cumulative significance thresholds are the same. Conversely, projects that do not exceed the project-specific thresholds are generally not considered to be cumulatively significant.

Therefore, if the project's projected impacts are below the project-specific significance thresholds, the project would not result in significant cumulative impacts.

1.4 ROADWAY EMISSIONS

To estimate the increase in truck trips associated with buildout of the CWP, F&P used data outputs from travel demand forecasting runs of the San Bernardino County Transportation Analysis Model (SBTAM). F&P used the most current land use data available for within the study area (the unincorporated areas of San Bernardino County) and outside the study area. For purposes of this analysis, these traffic scenarios were evaluated:

- Existing No Project. Includes the Southern California Association of Governments (SCAG) 2016 land data use set for unincorporated areas; SCAG 2012 land use for incorporated areas; SCAG 2012 roadway network data; and 2020 vehicle emission factors from EMFAC2017 for light-heavy, medium-heavy, and heavy-heavy duty trucks in San Bernardino County (CARB 2017).

- Existing with Project. Includes County 2040 land data use set for unincorporated areas with CWP implementation; SCAG 2012 land use for incorporated areas; SCAG 2012 roadway network data; and 2040 vehicle emission factors from EMFAC2017 for light-heavy, medium-heavy, and heavy-heavy duty trucks in San Bernardino County (CARB 2017).

- Cumulative No Project (qualitative analysis). Includes SCAG 2040 land data use set for unincorporated areas, SCAG 2040 land use for incorporated areas, and SCAG 2040 roadway network data.

- Cumulative with Project (qualitative analysis). Includes County 2040 land data use set for unincorporated areas with CWP implementation, SCAG 2040 land use for incorporated areas, and SCAG 2040 roadway network data.

The Existing with Project condition is compared to the Existing No Project condition to determine the potential impacts of CWP implementation. This approach represents the worst-case scenario because it compares the added trucks from CWP implementation (horizon year 2040) to the existing roadway network (SCAG 2012). Future development in the surrounding incorporated county areas and roadway network improvements would result in potentially changing vehicle travel patterns within the traffic study areas (SCAG 2016). Thus, comparison of these two scenarios better gauges the potential impacts from the change in truck traffic from CWP implementation and eliminates the impact of nonproject-related ambient traffic growth.

F&P provided truck volumes for three types of heavy duty trucks—light-heavy (8,501 to 14,000 lbs, 2-axle), medium-heavy (14,001 to 33,000 lbs, 2–3-axle) and heavy-heavy (>33,001 lbs, 3–5-axle)—in the incorporated and unincorporated county areas. Changes in traffic distribution within the traffic study area due to CWP implementation were modeled for:

- Change in heavy vehicle trips on roadways and Interstate 10 (I-10) within 1,000 feet of Bloomington's AB 617 boundary (see Figure 1).

- Change in heavy vehicle trips on roadways and State Route 210 (SR-210) within 1,000 feet of Muscoy's AB 617 boundary (see Figure 2).

This HRA involved the following:

- Evaluation of emissions associated with light-heavy, medium-heavy, and heavy-heavy duty trucks on roadway segments experiencing a net change of 100 trucks per day or more due to CWP implementation and truck rerouting in the larger study area.

- Air dispersion modeling using the AERMOD computer model to quantify maximum ground-level concentrations for residential receptors in the AB 617 communities that are within 1,000 feet of the impacted roadways. Meteorological data from the nearest South Coast AQMD monitoring station with similar meteorological conditions (Fontana, 2011–2013, 2015–2016) were used to represent local weather conditions and prevailing winds (South Coast AQMD 2016).

- Determination of cancer and noncancer risks to residents in the Bloomington and Muscoy AB 617 communities based on the results of the air dispersion model. The assessment considered exposure through the inhalation pathway. Unit risk factors and cancer potency factors were used to determine carcinogenic risk, and recommended exposure limits were used to determine noncarcinogenic risk.
- Preparation of a health risk assessment report that that compares the calculated risks with thresholds established by the South Coast AQMD and OEHHA (OEHHA 2015).

1.4.1 Bloomington

For the Bloomington evaluation, the selected roadways are shown in Table 1, *Bloomington: Evaluated Roadway Segments*, and Figure 1, *Bloomington: Increase in Trucks per Day Due to CWP Implementation*.

Table 1 Bloomington: Evaluated Roadway Segments, Segments with Truck Increases of 100 per Day Due to CWP Implementation

Roadway	Segment
Valley Boulevard	East of Cedar Avenue
I-10 Westbound	East of Alder Avenue
I-10 Westbound	Cedar Avenue underpass
I-10 Westbound	West of Cactus Avenue
I-10 Eastbound	East of Alder Avenue
I-10 Eastbound	Cedar Avenue underpass
Slover Avenue	East of Alder Avenue
Slover Avenue	West of Locust Avenue
Slover Avenue	East of Locust Avenue
Slover Avenue	West of Spruce Avenue
Slover Avenue	West of Cactus Avenue
Cactus Avenue	North of Santa Ana Avenue
Cactus Avenue	North of Jurupa Avenue
Cactus Avenue	South of Jurupa Avenue

Source: Fehr & Peers 2020.
Note: Table only lists roadways with an increase in traffic volume of 100 trucks per day or more due to CWP implementation (Existing with Project compared to Existing No Project scenarios).

Figure 1 Bloomington: Increase in Trucks per Day Due to CWP Implementation

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Figure 2 Muscoy: Increase in Trucks per Day Due to CWP Implementation

1. Health Risk Assessment

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Table 2, *Increase in Average Daily Truck Traffic, Bloomington*, lists the average truck volumes with CWP implementation for the selected roadway segments. Figure 1 shows the roadway segments that were studied and the change in daily truck traffic due to the implementation of the project.

The emission factor (gram per mile) used for the analysis is derived from EMFAC2017 for light-heavy (LHDT1), medium-heavy (MHDT), and heavy-heavy duty (HHDT) vehicle classes (CARB 2017). The PM_{10} emission factor for diesel-fueled vehicles was used as the surrogate for DPM for the horizon year of 2040 (CARB 2017).

Table 2 Increase in Average Truck Daily Traffic, Bloomington

#	Roadway	Segment	Existing No Project Average Daily Traffic (trucks/day)	Existing with Project Average Daily Traffic (trucks/day)	Increase in Average Daily Traffic (trucks/day)
1	Valley Boulevard	EO Cedar Ave	59	206	147
2	I-10 Westbound	EO Alder Ave	9,927	10,274	347
3	I-10 Westbound	Cedar Ave underpass	9,307	9,699	392
4	I-10 Westbound	WO Cactus Ave	9,560	9,930	370
5	I-10 Eastbound	EO Alder Ave	11,253	11,612	359
6	I-10 Eastbound	Cedar Ave underpass	10,463	10,850	387
7	Slover Avenue	EO Alder Ave	521	646	125
8	Slover Avenue	WO Locust Ave	511	622	111
10	Slover Avenue	EO Locust Ave	729	990	261
9	Slover Avenue	WO Spruce Ave	433	540	107
11	Slover Avenue	WO Cactus Ave	346	533	187
12	Cactus Avenue	NO Santa Ana Ave	149	315	166
13	Cactus Avenue	NO Jurupa Ave	203	427	224
14	Cactus Avenue	SO Jurupa Ave	71	367	296

Source: F&P 2020.
Notes: EO = east of; WO = west of; NO = north of; SO = south of

1.4.2 Muscoy

For the Muscoy evaluation, the selected roadways are shown in Table 3, *Muscoy: Evaluated Roadway Segments*, and Figure 2, *Muscoy: Increase in Trucks per Day Due to CWP Implementation*.

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Table 3 Muscoy: Evaluated Roadway Segments, Segments with Truck Increases of 100 per Day Due to CWP Implementation

Roadway	Segment
W 1st Street	West of Cajon Boulevard
University Parkway	North of Interchange Drive
University Parkway	South of Interchange Drive
N State Street	North of Blake Street
N State Street	South of Blake Street
SR-210 Westbound	East of California Street
SR-210 Westbound	West of California Street
SR-210 Westbound	West of Macy Street
SR-210 Eastbound	West of State Street Offramp
SR-210 Eastbound	East of State Street Offramp
SR-210 Eastbound	East of State Street Onramp
Hallway Parkway	West of University Parkway
SR-210 State Street Eastbound Offramp	West of State Street
State Street	North of Eastbound Offramp

Source: Fehr & Peers 2020.
Note: Table only lists roadways with an increase in traffic volume of 100 trucks per day or more due to CWP implementation (Existing with Project compared to Existing No Project scenarios).

Table 4, *Increase in Average Daily Traffic, Muscoy*, lists the average truck volumes with CWP implementation for the selected roadway segments. Figure 2 shows the roadway segments that were studied and the change in daily truck traffic due to the implementation of the project.

Table 4 Increase in Average Truck Daily Traffic, Muscoy

#	Roadway	Segment	Existing No Project Average Daily Traffic (trucks/day)	Existing with Project Average Daily Traffic (trucks/day)	Increase in Average Daily Traffic (trucks/day)
1	W 1st Street	WO Cajon Boulevard	54	203	149
2	University Parkway	NO Interchange Dr	348	613	265
3	University Parkway	SO Interchange Dr	294	520	226
4	N State Street	NO Blake St	371	546	175
5	N State Street	SO Blake St	371	546	175
6	SR-210 Westbound	EO California St	3,988	4,514	526
7	SR-210 Westbound	WO California St	3,908	4,457	549
8	SR-210 Westbound	WO Macy St	4,465	5,012	547
10	SR-210 Eastbound	WO State St Offramp	5,217	5,770	553
9	SR-210 Eastbound	EO State St Offramp	4,745	5,160	415
11	SR-210 Eastbound	EO State St Onramp	4,794	5,197	403
12	Hallway Parkway	WO University Pkwy	111	884	773
13	SR-210 State Street Eastbound Offramp	WO State St	471	608	137
14	State Street	NO SR-210 Eastbound Offramp	620	735	115

Source: F&P 2020.
Notes: EO = east of; WO = west of; NO = north of; SO = south of

1.5 AIR DISPERSION MODELING

Air quality modeling was performed using the AERMOD atmospheric dispersion model. The model is a steady-state Gaussian plume model and is approved by South Coast AQMD for estimating ground-level impacts from point and fugitive sources in simple and complex terrain. The model requires additional input parameters, including chemical emission data and local meteorology. Meteorological data was provided by South Coast AQMD from the Fontana meteorological station for the years 2011 to 2013 and 2015 to 2016 to represent local weather conditions and prevailing winds. According to the wind rose for the Fontana meteorological station, presented in Appendix B, the prevailing wind direction in the area of the study areas is toward the east-northeast (ENE).

The modeling 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.

Adjacent volume sources were used to model the roadways in AERMOD. A release height of 3.5 meters (m) was used to represent truck traffic, based on a vehicle height of 4.12 m and plume height of 7 m. The roadway emissions were applied to all hours of the day in the model because residents are conservatively assumed to be present 24 hours a day. The graphical representation of the model sources and receptors is in Appendix B, and the AERMOD model outputs are in Appendix C.

1.6 RISK CHARACTERIZATION

1.6.1 Carcinogenic Chemical Risk

A threshold risk of ten in a million ($10E^{-06}$) has been established as 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 of the standard point-estimate approach to use age-specific breathing rates and age sensitivity factors (ASF) 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 CPF 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.

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

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 CPF 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 two weeks away from home each year (OEHHA 2015). The 95th percentile daily breathing rates (BR/BW), exposure duration (ED), age sensitivity factors (ASF), and fraction of time at home (FAH) for the various age groups are provided below.

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

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. 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 $1\text{x}10^6$ (i.e., 1 million).

The assessment was based on reasonable maximum exposure, defined as the "highest exposure that is reasonably expected to occur" for a given receptor population. Lifetime risk values for the adult residents were calculated for an exposure of 350 days per year for 30 years (high-end estimate) in accordance with OEHHA's guidance. It was assumed that the residential MER spent 24 hours/day, 7 days/week, 350 days/year outside near the residence, per default exposure parameters.

The calculated results are provided in Section 2.0 and HRA Appendix D.

1.6.2 Noncarcinogenic Hazards

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

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The hazard index approach was used to quantify noncarcinogenic impacts. The hazard index assumes that chronic and acute subthreshold exposures adversely affect a specific organ or organ system (toxicological endpoint). Target organs identified in regulatory guidance were used for each discrete chemical exposure. Each chemical concentration or dose is divided by the appropriate toxicity value to calculate the hazard index. This ratio is summed for compounds affecting the same toxicological endpoint. A health hazard is presumed to exist where the total equals or exceeds one.

The chronic hazard analysis from DPM exposure is provided Section 2.0 and in HRA Appendix D.

2. Results and Discussion

2.1 CWP IMPLEMENTATION HEALTH RISK RESULTS

For residential receptors in Bloomington and Muscoy, the incremental cancer risks and chronic hazard indices were calculated at the maximum exposed receptor (MER). The MER locations are depicted in Figures 3 and 4. The residential MER location in Bloomington is a receptor on Church Street, east of Cedar Avenue and north of I-10 (Figure 3). The residential MER location in Muscoy is a receptor on W Highland Avenue, east of N State Street and north of SR-210 (Figure 4). The results of the HRA are show in Table 5, *Health Risk Assessment Results for Maximum Exposed Receptors*.

Table 5 Health Risk Assessment Results for Maximum Exposed Receptors

Scenario	Incremental Cancer Risk[1] (per million)	Chronic Hazard Index
Bloomington – Existing No Project[2]	261	0.0765
Bloomington – Existing with Project[2]	263	0.0772
Bloomington – Net Change Due to With CWP Implementation[2]	2.4	0.0007
South Coast AQMD Threshold	10	1.0
Exceeds Threshold Due to CWP Implementation?	**No**	**No**
Muscoy – Existing No Project[3]	49.1	0.0144
Muscoy – Existing with Project[3]	50.4	0.0148
Muscoy – Net Change Due to CWP Implementation[3]	1.3	0.0004
South Coast AQMD Threshold	10	1.0
Exceeds Threshold Due to CWP Implementation?	**No**	**No**

1 OEHHA (2015) recommends that a 30-year (high-end residency time) exposure duration be used to estimate individual cancer risk for the residential MER. 2040 DPM emission rates used for cancer risk calculations (EMFAC2017).
2 The Bloomington residential maximum exposed receptor (MER) is on Church Street, east of Cedar Avenue and north of I-10 (Figure 3).
3 The Muscoy residential maximum exposed receptor (MER) is on W Highland Avenue, east of N State Street and north of SR-210 (Figure 4).

As shown in Table 5, the incremental cancer risk due to CWP implementation for the residential MER in Bloomington and Muscoy are 2.4 and 1.3 per million, respectively. Therefore, the incremental cancer risks with CWP implementation are below the significance threshold of 10 in a million. For noncarcinogenic health risks, the chronic hazard indices were well below the significance threshold of 1.0 for the residential MERs for both Bloomington and Muscoy. The overwhelming majority of sensitive receptors in both Bloomington and Muscoy are projected to experience much lower increases in cancer risk due to CWP implementation, compared to their respective MER locations. The existing cancer risks from the existing truck traffic volumes, prior to CWP implementation, are 261 in a million in Bloomington and 49 in a million in Muscoy. For Bloomington, CWP

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implementation is projected to potentially increase total cancer risk by less than 1 percent (0.9 percent). For Muscoy, CWP implementation is projected to potentially increase the total cancer risk by 2.6 percent.

In addition to the cancer risk calculations in Table 5, risks were also calculated using 2020 vehicle emission factors from EMFAC2017. The use of 2020 emission factors for trucks creates an upper-bound incremental cancer risk for the hypothetical scenario wherein the addition truck traffic from CWP implementation would occur immediately in the current year (2020). Even in this hypothetical and nearly impossible scenario, the incremental cancer risks were projected to increase by 8.1 in a million for Bloomington and 4.7 in a million for Muscoy. Similar to the results in Table 5, the incremental cancer risks with CWP implementation remain below the significance threshold of 10 in a million.

It should be noted that these health impacts were based on conservative (i.e., health protective) assumptions. The USEPA (2005) and OEHHA (2015) note that conservative assumptions used in a risk assessment are intended to ensure that the estimates do not underestimate the actual risks. Therefore, the estimated risks do not necessarily represent actual risks experienced by populations at or near a site.

For this HRA, the following conservative assumptions were used:

- For the residential exposure scenario, it was assumed that the children and adults at the MER reside at their current location for 30 years. Most residents do not live at the same location for 30 years. Approximately 11 percent of the residents of San Bernardino County have lived in their homes since 1989 (US Census, 2020).

- The cancer risks were determined for residential receptors, which produce higher calculated cancer risks compared to other receptor types. For instances, the cancer risk calculation for worker receptors includes an exposure duration of 25 years and an exposure frequency of 8 hours/day, 5 days/week, 250 days/year at their workplace. Additionally, the worker scenario uses the 16- to 70-year age bin with no added age sensitivity factors (OEHHA 2015). Therefore, the 30-year residential cancer risk calculation produces much higher risks compared to the worker scenario. Similarly, the cancer risk calculations for day cares and schools produce lower risks compared to residential receptors due to shorter exposure durations (5 to 13 years for day cares and schools) and lower exposure frequencies (typically 180 to 250 days per year, 8 hours per day, Monday through Friday) compared to residential receptors (350 days per year, 24 hours per day).

- The calculated risk for third-trimester pregnancies and children from 0 to 2 years is multiplied by a factor of 10 (age sensitivity factor), and the calculated risk for children from 2 to 16 years is multiplied by a factor of 3 to account for early life exposure and uncertainty in child vs. adult exposure impacts. Thus, the estimated risks are conservative.

Figure 3 Bloomington: Increase in Diesel Particulate Matter Concentrations Due to CWP Implementation

2. Results and Discussion

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Figure 4 **Muscoy: Increase in Diesel Particulate Matter Concentrations Due to CWP Implementation**

2. Results and Discussion

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2.2 CUMULATIVE GROWTH EVALUATION

This HRA also presents an evaluation of the cumulative growth in the county, comparing the change in truck traffic due to CWP implementation to truck traffic changes from planned growth in the incorporated county areas and using a roadway network with planned improvements (SCAG 2016).

For the evaluated roadway segments in Bloomington, the average daily truck traffic is compared between the Cumulative No Project and Existing No Project scenarios in Table 6, *Cumulative Increase in Average Daily Traffic, Bloomington*. As shown in Table 6, six of the evaluated roadway segments showed a net decrease in truck traffic along I-10 Eastbound and Slover Avenue, east of Cedar Avenue. For the evaluated roadway segments in Bloomington, the overall increase in traffic due to cumulative growth in the incorporated county areas and roadway network improvements is 2,723 trucks per day (not counting segments where traffic decreased). This increase in truck traffic is less than the increase due to CWP implementation in comparison to the Existing No Project scenario (3,479 trucks per day, Table 2). Therefore, in Bloomington the contribution of truck traffic from CWP implementation is higher than the contribution of truck traffic from cumulative growth in the surrounding areas.

Table 6 Cumulative Increase in Average Daily Traffic, Bloomington

#	Roadway	Segment	Existing No Project 2020 Average Daily Traffic (trucks/day)	Cumulative No Project 2040 Average Daily Traffic (trucks/day)	Change in Average Daily Traffic (trucks/day)[1]	CWP Implementation 2040 Average Daily Traffic (trucks/day)	Cumulative with Project 2040 Average Daily Traffic (trucks/day)[2]
1	Valley Boulevard	EO Cedar Ave	59	245	186	23	268
2	I-10 Westbound	EO Alder Ave	9,927	10,383	456	118	10,501
3	I-10 Westbound	Cedar Ave underpass	9,307	9,889	582	118	10,007
4	I-10 Westbound	WO Cactus Ave	9,560	10,126	566	128	10,254
5	I-10 Eastbound	EO Alder Ave	11,253	8,886	-2,367	155	9,041
6	I-10 Eastbound	Cedar Ave underpass	10,463	8,274	-2,189	141	8,415
7	Slover Avenue	EO Alder Ave	521	751	230	29	780
8	Slover Avenue	WO Locust Ave	511	711	200	5	716
10	Slover Avenue	EO Locust Ave	729	1,039	310	-25	1,014
9	Slover Avenue	WO Spruce Ave	433	274	-159	50	324
11	Slover Avenue	WO Cactus Ave	346	272	-74	55	327
12	Cactus Avenue	NO Santa Ana Ave	149	85	-64	62	147
13	Cactus Avenue	NO Jurupa Ave	203	134	-39	32	166
14	Cactus Avenue	SO Jurupa Ave	71	264	193	23	287

Source: F&P 2020.
Notes: Negative values mean a predicted decrease in the amount of truck traffic in the cumulative growth scenario.
EO = east of; WO = west of; NO = north of; SO = south of
[1] Represents net change in truck traffic due to cumulative growth in incorporated areas (Cumulative No Project trucks/day minus Existing No Project trucks/day).
[2] Represents trucks/day from CWP implementation added to Cumulative No Projects truck/day (Cumulative with Project scenario).

2. Results and Discussion

For the evaluated roadway segments in Muscoy, the average daily truck traffic is compared between the Cumulative No Project and Existing No Project scenarios in Table 7, *Cumulative Increase in Average Daily Traffic, Muscoy*. Three of the evaluated roadway segments showed a decrease in truck traffic along W 1st Street, SR-210 State Street eastbound offramp, and State Street north of the SR-210 eastbound offramp. For the evaluated roadway segments in Muscoy, the overall increase in traffic due to cumulative growth in the incorporated county areas and roadway network improvements is 10,307 trucks per day (9,918 trucks per day including segments where traffic decreased). This increase in truck traffic is higher than the increase due to CWP implementation in comparison to the Existing No Project scenario (5,008 trucks per day, Table 4). Therefore, in Muscoy the contribution of truck traffic from CWP implementation is less than the contribution of truck traffic from cumulative growth in the surrounding areas.

Table 7 Cumulative Increase in Average Daily Traffic, Muscoy

#	Roadway	Segment	Existing No Project 2020 Average Daily Traffic (trucks/day)	Cumulative No Project 2040 Average Daily Traffic (trucks/day)	Change in Average Daily Traffic (trucks/day)[1]	CWP Implementation 2040 Average Daily Traffic (trucks/day)	Cumulative with Project 2040 Average Daily Traffic (trucks/day)[2]
1	W 1st Street	WO Cajon Blvd	54	23	-31	63	86
2	University Pkwy	NO Interchange Dr	348	602	254	6	608
3	University Pkwy	SO Interchange Dr	294	602	308	6	608
4	N State Street	NO Blake St	371	546	175	3	549
5	N State Street	SO Blake St	371	534	163	2	536
6	SR-210 Westbound	EO California St	3,988	5,363	1,375	154	5,517
7	SR-210 Westbound	WO California St	3,908	5,304	1,396	149	5,453
8	SR-210 Westbound	WO Macy St	4,465	5,777	1,312	152	5,929
10	SR-210 Eastbound	WO State St Offramp	5,217	6,637	1,420	142	6,779
9	SR-210 Eastbound	EO State St Offramp	4,745	6,329	1,584	127	6,456
11	SR-210 Eastbound	EO State St Onramp	4,794	6,367	1,573	129	6,496
12	Hallway Parkway	WO University Pkwy	111	858	747	0	858
13	SR-210 State Street Eastbound Offramp	WO State St	471	308	-163	14	322
14	State Street	NO SR-210 Eastbound Offramp	620	425	-195	23	448

Source: F&P 2020.
Notes: Negative values mean a predicted decrease in the amount of truck traffic in the cumulative growth scenario.
EO = east of; WO = west of; NO = north of; SO = south of
[1] Represents net change in truck traffic due to cumulative growth in incorporated areas (Cumulative No Project trucks/day minus Existing No Project trucks/day).
[2] Represents trucks/day from CWP implementation added to Cumulative No Projects truck/day (Cumulative with Project scenario).

The cancer risks in Table 5 are based on the existing year roadway network and 2012 land use data set for the incorporated portions of the county (SCAG 2012). As shown in Tables 6 and 7, the number of roadway segments whose truck traffic increases by over 100 trucks per day is much lower compared to cumulative growth in the incorporated areas with roadway network improvements (consistent with the 2016 SCAG Regional Transportation Plan / Sustainable Communities Strategy growth through 2040). When comparing the Cumulative with Project to the Cumulative No Project scenarios, only 5 roadway segments in Bloomington (all freeway-related segments) result in an increase of 100 trucks per day due to CWP implementation, compared to 14 segments for the Existing with Project/Existing No Project comparison.

No surface streets would result in an increase in daily trucks over 100 in Bloomington in the Cumulative with Project/Cumulative No Project comparison. A similar reduction in roadway segments with an increase in 100 trucks per day is noted for Muscoy (6 freeway related segments, no surface streets) for the Cumulative with Project/Cumulative No Project comparison. Additionally, the roadway segment net increase in trucks from CWP implementation does not exceed 154 trucks per day for the Cumulative with Project/Cumulative No Project comparison, which is a lesser increase in trucks than for the Existing with Project/Existing No Project comparison (see Tables 2 and 4). Therefore, the incremental cancer risks due to CWP implementation for residents in Bloomington and Muscoy would be reduced for the Cumulative with Project/Cumulative No Project scenario because the number of segments and overall increase in trucks due to CWP implementation are projected to be less for the cumulative growth scenario than the existing setting scenario.

Overall, residents and other sensitive receptors in Bloomington and Muscoy would not be subject to excess cancer risk and noncancer hazards due to implementation of the project, and impacts of the project would be less than significant.

2. Results and Discussion

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Appendix A. Emissions Calculations

Appendices

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Appendix B. Model Setup

Appendices

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Appendix C. Air Dispersion Model Output

Appendices

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Appendix D. Risk Calculations

Appendices

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