Appendix N

Air Quality Impacts

The air quality impact modeling described in this appendix is reorganized from the 2012 KHSA EIS/EIR analysis. Although there have since been some modifications to the project schedule, the 2011 air quality impact modeling has not been re-run because the construction-related air pollutant-generating activities for the Proposed Project are materially similar to those modeled below. Minor changes in construction activities between the 2012 KHSA EIS/EIR analysis and the Proposed Project are primarily due to the timing associated with removing each dam (Table 2.7-1). The Proposed Project and the data modeled as part of the 2012 KHSA EIS/EIR in this attachment are within the thresholds noted in this EIR Section 3.9.3 *[Air Quality] Significance Criteria* and analyzed in Section 3.9.5 *[Air Quality] Potential Impacts, Impacts, and Mitigation*.

3. Alternative Name Key	
4. 2012 KHSA EIS/EIR Alternative Name	**5. Lower Klamath Project EIR Alternative Name**
6. Alternative 2 Full Facilities Removal	7. Proposed Project
	8. Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2)
	9. No Hatchery
10. Alternative 3 Partial Facilities Removal	11. Partial Removal
12. Alternative 4 Fish Passage at Four Dams	13. Continued Operations with Fish Passage
14. Alternative 5 Fish Passage at Two Dams, Remove Copco 1 and Iron Gate	15. Two Dam Removal (Iron Gate and Copco No. 1)

N.1 Existing Emission Sources and Monitoring Data

This section provides estimates of the existing emissions in Siskiyou, California to identify the major sources of emissions. Existing monitoring data is also provided as context for the county's attainment status.

N.1.1 Emission Sources

Table N-1 presents estimates of existing emissions in Siskiyou County for 2015, the latest year for which an inventory is available. Miscellaneous area-wide processes are the major sources of volatile organic compounds (VOC), carbon monoxide (CO), sulfur oxides (SOx), inhalable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$) emissions in Siskiyou County, while on-road motor vehicles are the major sources of nitrogen oxides (NOx) emissions. Managed burning and disposal is the major source of VOC, CO, PM_{10}, and $PM_{2.5}$ emissions within the area-wide sources, and residential fuel combustion is the major driver of NOx and SOx emissions within the area-wide sources.

Table N-1. Siskiyou County (California) 2015 Emission Inventories.

Source Type/Category	Estimated Annual Average Emissions (tons per day)			
	ROG	NO_X	PM_{10}	$PM_{2.5}$
Stationary Sources				
Fuel Combustion	0.09	0.33	0.25	0.24
Waste Disposal	0.00	0.00	0.00	0.00
Cleaning and Surface Coating	0.19	-	-	-
Petroleum Production and Marketing	0.40	-	-	-
Industrial Processes	0.14	-	0.35	0.15
Subtotal (Stationary Sources)	**0.82**	**0.33**	**0.61**	**0.39**
Area wide Sources				
Solvent Evaporation	4.63	-	-	-
Miscellaneous Processes	3.89	0.70	17.05	4.80
Subtotal (Area-wide Sources)	**8.52**	**0.70**	**17.05**	**4.80**
Mobile Sources				
On-Road Motor Vehicles	1.74	4.96	0.24	0.13
Other Mobile Sources	0.90	2.40	0.11	0.10
Subtotal (Mobile Sources)	**2.64**	**7.36**	**0.36**	**0.23**
Grand Total for Siskiyou County	**11.98**	**8.39**	**18.01**	**5.42**

Source: CARB 2015
Notes: "-" = less than 0.1 ton per day
Totals shown in this table are rounded, and therefore may not appear to add exactly.

N.1.2 Monitoring Data

Table N-2 summarizes the air quality data from the monitoring station near the area of analysis in California. Data from the City of Yreka monitoring station was used to characterize ambient air quality, since it is the closest monitoring station to the Proposed Project in the Northeast Plateau Air Basin (NPAB). Because the City of Yreka monitoring station only monitors for ozone (O_3), PM_{10}, and $PM_{2.5}$, other pollutants are not summarized in the table.

Table N-2. Summary of Ambient Air Quality Data (2014–2016).

	2014	2015	2016
Ozone			
Maximum concentration (1-hour/8-hour average, ppm)	0.082/0.065	0.076/0.066	0.092/0.068
Number of days state standard exceeded (1-hour)	0	0	0
Number of days 8-hour standard exceeded (National/California)	0/0	0/0	0/0
Fine Particulate Matter ($PM_{2.5}$)			
Maximum concentration (µg/m^3) (National/California)	71.9/71.9	51.0/51.0	25.1/25.1
Number of days national standard exceeded (estimated/measured)	*/2	*/2	0.0/0
Annual average (µg/m^3) (National/California)	*/*	*/*	4.9/*
Respirable Particulate Matter (PM_{10})			
Maximum concentration (µg/m^3) (National/California)	90.6/82.9	65.5/59.6	*/*
Number of days state standard exceeded (estimated/measured)	*/3	6.1/1	*/0
Number of days national standard exceeded (estimated/measured)	0.0/0	0.0/0	*/0
Annual average (µg/m^3) (California)	*	12.9	*

Source: CARB 2017
Notes:
µg/m3 = micrograms per cubic meter
$PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter
PM_{10} = particulate matter less than or equal to 10 microns in diameter
ppm = parts per million
ppb = parts per billion
* Insufficient data available to determine the value.

Table N-3 shows the attainment status of Siskiyou County with respect to national ambient air quality standards (NAAQS) (CARB 2016) and California ambient air quality standards (CAAQS) (CARB 2016). As indicated in Table N-3, Siskiyou County is designated as attainment or unclassified for all federal and state ambient air quality standards.

Table N-3. Attainment Status Summary, Siskiyou County.

Criteria Pollutant	Federal Designation	State Designation
Ozone (O_3) (1-hour)	(no federal standard)	Attainment
Ozone (O_3) (8-hour)	Unclassified/Attainment*	Attainment
Nitrogen Dioxide (NO_2)	Unclassified/Attainment*	Attainment
Sulfur Dioxide (SO_2)	Unclassified*	Attainment
Carbon Monoxide (CO)	Unclassified/Attainment*	Unclassified*
Particulates (as PM_{10})	Unclassified*	Attainment
Particulates (as $PM_{2.5}$)	Unclassified/Attainment*	Attainment
Lead (Pb)	Unclassified/Attainment*	Attainment
Sulfates (as SO_4)	(no federal standard)	Attainment
Hydrogen Sulfide (H_2S)	(no federal standard)	Unclassified*
Vinyl Chloride (C_2H_3Cl)	(no federal standard)	n/d
Visibility Reducing Particles	(no federal standard)	Unclassified*

Source: CARB 2015

Notes:

* At the time of designation, if the available data does not support a designation of attainment or non-attainment, the area is designated as unclassified.

n/d—no data/information available

N.2 Assessment Methods

This section describes the methodology used to develop the emission inventories and the comparison of the analysis results for the California site activities to the Siskiyou County Air Pollution Control District (SCAPCD) significance thresholds.

N.2.1 Emission Calculation Methodology

In general, the construction emissions were estimated from various emission models and spreadsheet calculations, depending on the source type and data availability. The California Air Resources Board (CARB) Urban Emissions Model (URBEMIS) – Version 9.2.4 was used to estimate fugitive dust emissions from the general movement of the construction equipment on unpaved surfaces and excavation activities (cut/fill). Although URBEMIS is capable of estimating emissions from trucks and construction worker commuting vehicles, it is difficult to modify the model's default settings. Additionally, the model was developed specifically for activities completed in California and the exhaust emission components are not suitable for the construction activities that occur in Oregon. URBEMIS was therefore only used to estimate emissions from fugitive dust, which would be applicable in both states, and other methods were used to estimate emissions from non-dust sources.

Although URBEMIS is suitable for estimating fugitive dust emissions from the operation of the construction equipment and excavation activities, it is not suitable for estimating emissions from unpaved haul roads. Emissions from travel on unpaved roads were estimated using the methodology identified in the *Compilation of Air Pollutant Emission Factors (AP-42)* maintained by the United States Environmental Protection Agency (USEPA). Chapter 13.2.2 (USEPA 2006) was used to estimate the appropriate emission rate for unpaved roads.

Exhaust emissions from the off-road construction equipment operating at each dam site were estimated using the OFFROAD2007 and NONROAD2008a emission factor models for California and Oregon, respectively. Since California is unique amongst other states because it can set its own vehicular emission standards as prescribed in Section 209 of the federal Clean Air Act, it developed its own emissions factor model to estimate emissions from off-road equipment. It was assumed in these calculations that all off-road equipment would be diesel-fueled unless specifically identified as non-diesel fueled (e.g., gasoline) by the project consultants.

In a similar vein, exhaust emissions from on-road vehicles, specifically trucks and construction worker vehicles, were estimated using the EMFAC and MOBILE6.2 emission factor models for California and Oregon, respectively. It was assumed that construction workers would only be operating light-duty passenger cars and trucks; therefore, the emission factor calculations were restricted to only these vehicle classes. A combination of gasoline-fueled (catalyst and non-catalyst) and diesel-fueled engines was also used in the calculations. The default fleet mixes for Siskiyou County, California and Klamath County, Oregon were also used based on information contained in EMFAC for California and provided by the Oregon Department of Environmental Quality for Oregon.

Daily emissions for construction were estimated from appropriate emission factors, number of facilities and features being worked, and the associated schedules that were provided by the project consultants. The following sections provide additional discussion of emission estimation methodologies used for each source group.

N.2.1.1 On-site Building Demolition and Excavation Activities

The URBEMIS model was developed to estimate construction emissions from land development projects. It treats construction in three phases: Phase 1—demolition, Phase 2—site grading, and Phase 3—building construction. For the Proposed Project and alternatives, URBEMIS was used for fugitive particulate matter, or dust, emissions from demolition and grading (earth cut/fill) activities. The earth cut/fill activity is included in URBEMIS Phase 2—Site Grading, which allows the user to select one of four tiers of detail to calculate fugitive dust emissions.

Fugitive (re-entrained) dust emissions would occur from the movement of construction equipment at each of the construction sites. As a result, the default emission factor in URBEMIS for average construction activities (10 pounds per acre per day of PM_{10}) was used to estimate fugitive dust emissions from the equipment at the site. It was assumed in the calculations that fugitive dust emissions could occur from the construction equipment during the entire construction schedule. Table N-4 summarizes the size of the construction footprint for each 2012 KHSA EIS/EIR alternative used in URBEMIS to estimate fugitive dust emissions from the equipment.

Table N-4. Estimated Construction Area (acres).

2012 KHSA EIS/EIR Alternative Name[1]	Lower Klamath Project EIR Alternative Name	Iron Gate[1]	Copco No. 1[1]	Copco No. 2[1]	J.C. Boyle[1]
Full Facilities Removal	Proposed Project Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) No Hatchery	13.1	2.3	2.8	9.7
Partial Facilities Removal	Partial Removal	11.7	1.0	0.6	5.1
Fish Passage at Four Dams	Continued Operations with Fish Passage	5.1	1.5	1.0	2.1
Fish Passage at Two Dams, Remove Copco 1 and Iron Gate	Two Dam Removal (Iron Gate and Copco No. 1)	13.1	2.3	1.0	2.1

[1] Source: S. Wright, River Design Group, Inc., pers. comm., November 2010.

In addition to the re-entrained dust emissions from the movement of equipment at the construction site, emissions could also occur from excavation activities. The next tier in URBEMIS (“Low Level”) was used to refine the emissions estimates for any phase or location that involved soil excavation. The construction window for excavation activities was limited to a shorter window than the entire construction schedule during which excavation activities could occur. Table N-5 summarizes the volumes of the excavated earth for each 2012 KHSA EIS/EIR alternative, which is based on the estimated volume of excavated material (spoils/cut material) increased by a factor of 20 percent to account for the bulk volume. This adjustment was made to account for the fact that the excavated material would take up more volume when removed from the ground than when compacted.

Table N-5. Estimated Bulk Waste Volume for Earth Materials (cubic yards).

2012 KHSA EIS/EIR Alternative[1]	Lower Klamath Project EIR Alternative Name	Iron Gate[1,2]	Copco No. 1[1]	Copco No. 2[1,2]	J.C. Boyle[1,2]
Full Facilities Removal	Proposed Project Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) No Hatchery	1,300,000	n/a	1,800	170,000
Partial Facilities Removal	Partial Removal	1,300,000	n/a	1,800	170,000
Fish Passage at Four Dams	Continued Operations with Fish Passage	n/a	n/a	n/a	n/a
Fish Passage at Two Dams, Remove Copco No. 1 and Iron Gate	Two Dam Removal (Iron Gate and Copco No. 1)	1,300,000	n/a	n/a	n/a

[1] Source: Appendix B: *Detailed Plan*.
[2] Volumes increased 20 percent for loose earth materials.

The estimates of earthen material waste that would require on-site disposal has decreased by approximately 80,000 cubic yards under the Proposed Project (Appendix B: *Definite Plan*). As such, there is the potential to generate fewer equipment engine exhaust, haul truck engine exhaust, and fugitive dust emissions during the excavation and on-site disposal of earthen materials from the Lower Klamath Project dams. This issue is discussed further below in Section N.3 *Emissions Inventories*.

In addition to fugitive dust emissions from the construction equipment and cut/fill activities, emissions would also occur from the demolition of existing structures at each of the sites. The quantity of building waste expected to be removed during demolition activities is summarized below.

- Copco No. 1 Dam: 300 cubic yards
- Copco No. 2 Dam: 600 cubic yards
- Iron Gate Dam: 400 cubic yards
- J.C. Boyle Dam: 2,000 cubic yards

Building demolition was only assumed to occur in the alternatives that would involve dam removal (i.e., all but the Continued Operations with Fish Passage Alternative). The building removal at Copco No. 1, however, is required to allow the mobilization of large equipment at the site. As a result, its building demolition is assumed to occur under all alternatives.

The estimates of building waste that would require off-site disposal has increased by approximately 2,600 cubic yards under the Proposed Project (Appendix B: *Definite Plan*). As such, there is the potential to generate greater equipment engine exhaust, haul truck engine exhaust, and fugitive dust emissions during the demolition and off-site disposal of building waste. This issue is discussed further below in Section N.3 *Emissions Inventories*.

N.2.1.2 On-site (Off-road) Equipment Engine Exhaust Emissions

Emissions would also occur from the combustion of fuel during operation of the off-road construction equipment at each of the dams. As was previously stated, separate emission factor models (i.e., OFFROAD and NONROAD) are used to estimate emissions in California and Oregon.

Preliminary estimates of the type, size (horsepower), and quantity of construction proposed to be used at each of the dam locations was provided by the project consultants. Engine load factors are also incorporated into the emission factor models. Emission factors for each piece of equipment were then selected based on the equipment type (e.g., cranes, excavators, loaders, etc.) and the engine size. It was conservatively assumed that all equipment located at a dam site could operate simultaneously for the entire shift. The total hours of operation for each piece of equipment was also provided with the equipment list provided by the project consultants.

In addition to the mobile construction equipment, several stationary generators would be present at each of the dam locations to provide power for electric-operated equipment. Emission factors from Chapter 3.3 (USEPA 1996) of AP-42 were used to estimate emissions from these generators.

Furthermore, speciation profiles were needed in many cases to convert emissions of PM_{10} to $PM_{2.5}$. CARB maintains particulate matter size fractions for various types of equipment (CARB 2010). Profile number 425 (Diesel Vehicle Exhaust) was used to determine the ratio of $PM_{2.5}$ to PM_{10} for equipment located in California. The USEPA also maintains generalized particle size distributions in Appendix B.2 to AP-42 (1996); these size fractions were used to estimate $PM_{2.5}$ emissions from diesel equipment located in Oregon. Finally, the NONROAD model provides emission estimates in terms of total hydrocarbon emissions. The conversion of total hydrocarbons to VOC was estimated from information contained in the USEPA's *Conversion Factors for Hydrocarbon Emission Components* (2003) document.

N.2.1.3 Off-site (On-road) Haul Truck Engine Exhaust Emissions and Paved Road Dust

The haul truck engine exhaust emissions were calculated based on EMFAC and MOBILE6.2 emission factors for heavy-duty diesel trucks in Siskiyou County, California and Klamath County, Oregon, respectively. Information on the peak daily and project total round trips was provided by the project consultants. The total project trips were assumed to occur evenly throughout the project schedule. The total vehicle miles traveled was determined from the number of trips and estimated distance to haul each component (e.g., earth, concrete, metal, etc.) to disposal sites near the Lower Klamath Project facilities and to disposal/recycling facilities in Klamath Falls, Medford, and the City of Yreka depending on the component.

Emission factors vary by year based on changes in the vehicle fleet mix by older engines retiring from service and improved emission control technologies and standards in newer engines joining the fleet. As a result, two different emission factors are provided by location (state) and pollutant to reflect these changes in the fleet mix.

Re-entrained road dust from haul truck travel was estimated for paved roads. Paved road dust was estimated using emission factors developed by the Midwest Research Institute (MRI 1996). Table N-6 presents the paved road dust emission factors. The emission factor for average road conditions and average daily trips (ADT) was used throughout the emission calculations.

Table N-6. Paved Road Re-entrained Dust Emission Factors.

Road Condition	Average Daily Trips (ADT)[1]		
	High	Low	Average[2]
Average conditions[3]	0.37	1.3	0.81
Worst-case conditions[4]	0.64	3.9	2.1

Source: MRI 1996.
Notes:
[1] Arterials" and "major streets" were classified by MRI as high-ADT roads, while "collectors" or "local streets" were classified as low-ADT roads.
[2] Based on 65 percent of high- and 35 percent of low-ADT silt loading values.
[3] Based on median value of MRI sampling data and average vehicle weight of 2.4 tons.
[4] Based on 90th percentile of MRI sampling data and average vehicle weight of 2.4 tons.
Key:
PM_{10} = inhalable particulate matter

Additionally, since the MRI emission factors are specific to PM_{10}, CARB size fraction profile number 471 (Paved Road Dust, 97 and after) was used to estimate emissions of $PM_{2.5}$.

N.2.1.4 Construction Worker Commuting

Emissions associated with construction workers commuting to and from the various dam locations were also estimated for each alternative. It was assumed that construction worker vehicles would consist of a mix of passenger cars and light-duty trucks. The combination of diesel and gasoline (catalyst and non-catalyst) vehicles from the various emission factor models was retained in the emission factor estimates. As explained in Section N.2.1.2 for trucks, the EMFAC and MOBILE6.2[12] emission factor models were used to estimate emissions. Re-entrained road dust was estimated using the emission factors provided in Table N-6 for average road conditions and average ADT.

N.2.1.5 Unpaved Road Dust

Fugitive dust emissions would also occur from unpaved roads that are used to haul waste materials. The methodology documented in Section 13.2.2 (USEPA 2006) of AP-42 was used to estimate fugitive dust emissions from the trucks operating on these roads.

The unpaved roads section of AP-42 requires an emission factor to be calculated using variables like the surface material silt content and mean vehicle weight on the roads. Two different equations are provided in AP-42 depending on whether the road is located at an industrial site or a publicly accessible road. The latter equation for publicly accessible roads assumes that the road will be dominated by light-duty vehicles; since trucks will be the primary equipment on the various haul roads, the equation for industrial sites (shown below) was used to estimate emissions.

$$E = k(s/12)^a (W/3)^b$$

Where:
E = size-specific emission factor, pounds per vehicle mile traveled (lb/vehicle miles traveled [VMT])
k, a, and b = empirical constants (see Table N-8)
s = surface material silt content, %
W = mean vehicle weight, tons

A silt content of 0.1 percent was used for all haul roads, which is the lowest silt content estimated for gravel roads by the USEPA (2006). The vehicular weight was estimated at 36.5 tons for empty trucks and 80 tons for loaded trucks (Caterpillar 2018). Table N-7 summarizes the empirical constants used in the preceding equation and the calculated emission factors for empty and loaded trucks.

[12] In 2010, the USEPA approved the use of the Motor Vehicle Emissions Simulator (MOVES) model for official State implementation air quality plan submissions to the USEPA and for transportation conformity analyses outside of California (75 FR 9411). The approval also started a two-year grace period that ends on March 2, 2012; the use of MOVES is not required during this timeframe. Since this analysis was completed during the grace period and project-level data was not available for MOVES, MOBILE6.2 was used for the analysis.

Table N-7. Empirical Constants and Emission Factors for Unpaved Roads.

Constant	$PM_{2.5}$	PM_{10}
k (lb/VMT)	0.15	1.5
a	0.9	0.9
b	0.45	0.45
E, Empty (lb/VMT)	0.0062	0.062
E, Loaded (lb/VMT)	0.0088	0.088

Source: USEPA 2006.
Key:
lb/VMT = pounds per vehicle mile traveled
$PM_{2.5}$ = fine particulate matter
PM_{10} = inhalable particulate matter

The emission factors provided in Table N-7 are for uncontrolled fugitive dust emissions. Natural mitigation occurs from annual precipitation, the control efficiency of which can be estimated from the following equation.

$$E_{ext} = E[(365 - P)/365]$$

Where:
E_{ext} = annual size-specific emission factor extrapolated for natural mitigation, lb/VMT
E = unpaved road dust emission factor (see Table N-8)
P = number of days in a year with at least 0.254 mm (0.01 in) of precipitation

The number of days of precipitation was estimated at approximately 88 days for Klamath County and 84 days for Siskiyou County. The control efficiency of natural mitigation was therefore estimated as 76 percent and 77 percent, respectively, for Klamath and Siskiyou Counties.

N.2.1.6 Restoration Activities

Restoration activities may use, in part, helicopters or other small aircraft and barges for reseeding. A combination of techniques was used to estimate emissions from the restoration activities. The Federal Aviation Administration's Emissions and Dispersion Modeling System was used to simulate emissions that could occur from landing and takeoff operations associated with aerial seed application. Barges would also be used during reseeding activities. Emission factors for propulsion engines were derived from the USEPA's *Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data* (2000), while generator emissions for the seed sprayer were estimated from the USEPA's *Compilation of Air Pollutant Emission Factors* for diesel engines (1996).

N.2.1.7 City of Yreka Water Supply Pipeline Construction

Fugitive dust and exhaust emission factors associated with constructing the City of Yreka pipeline were estimated using the Sacramento Metropolitan Air Quality Management District's Road Construction Emissions Model, Version 6.3.2 (2009). Although this model is used by a different air district than the Siskiyou County Air Pollution Control District, this model is recommended to estimate emissions for linear projects like the pipeline construction (USBR and CDFG 2012).

N.2.1.8 Recreation Facility Removal

The California Emissions Estimator Model (CalEEMod) was used to estimate exhaust emissions that would occur from grading activities associated with restoring parking lots associated with recreational facilities proposed for relocation and demolition. CalEEMod makes general assumptions about the quantity and types of construction equipment needed to grade a site based on its size (acreage).

N.3 Emission Inventories

Emission inventories were completed for each of the dam locations and alternatives as described in the previous sections. Table N-8 provides a summary of the peak daily emissions by alternative.

For the purposes of the Lower Klamath Project air quality analysis, the emissions from the Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) Alternative are considered substantially similar to the emissions from the Proposed Project. Instead of including a duplicate of the emissions inventory for the Proposed Project, the discussion below refers to the Proposed Project and Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) together.

Table N-8. Summary of Peak Daily Emissions by Alternative.

2012 KHSA EIS/EIR Alternative Name[1]	Lower Klamath Project EIR Alternative Name	Peak Daily Emissions (pounds per day)[1,2]					
		VOC	CO	NOx	SOx	PM_{10}	$PM_{2.5}$
Full Facilities Removal	Proposed Project Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) No Hatchery	165	739	**921**	29	**523**	**261**
Partial Facilities Removal	Partial Removal	162	725	**896**	29	**514**	**257**
Fish Passage at Four Dams	Continued Operations with Fish Passage	11	63	59	4	11	6
Fish Passage at Two Dams	Two Dam Removal (Iron Gate and Copco No. 1)	146	673	**857**	27	**425**	237
Threshold of Significance[2]	Proposed Project	250	2,500	250	250	250	250

Notes:

[1] Data from 2012 KHSA EIS/EIR.

[2] Values shown in **bold** exceed the Siskiyou County Air Pollution Control District's (SCAPCD) thresholds of significance in Rule 6.1 (Construction Permit Standards for Criteria Air Pollutants).

As shown in Table N-8, with the exception of the Continued Operations with Fish Passage Alternative, the project alternatives would exceed the significance thresholds for NOx and PM_{10}. In addition, the Proposed Project, Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) Alternative, and Partial Removal Alternative would exceed the significance thresholds for $PM_{2.5}$. As such, the construction emissions from these alternatives would be significant.

As noted above in Section N.2.1.1 *On-Site Building Demolition and Excavation Activities*, the estimates of earthen material waste that would require on-site disposal has decreased by approximately 80,000 cubic yards under the Proposed Project (Appendix B: *Definite Plan*). As such, there is the potential to generate fewer equipment engine exhaust, haul truck engine exhaust, and fugitive dust emissions during the excavation and on-site disposal of earthen materials from the dams. However, the estimates of building waste that would require off-site disposal has increased by approximately 2,600 cubic yards under the Proposed Project (Appendix B: *Definite Plan*). As such, there is the potential to generate greater equipment engine exhaust, haul truck engine exhaust, and fugitive dust emissions during the demolition and off-site disposal of building waste.

The decrease in emissions from the excavation and hauling of earthen material waste would partially off-set the increase in emissions from the demolition and hauling of building waste. However, the building waste would require disposal at off-site locations that range from 22 to 28 miles (44 to 56 miles round-trip) from the dams. The earthen material waste would be disposed of at on-site locations that range from 0.25 to 4 miles (0.5 to 8 miles round-trip) from the dams. As such, it is anticipated that the emissions from dam removal activities under the current proposal (Appendix B: *Definite Plan*) would be greater than the emissions estimates calculated for the 2012 KHSA EIS/EIR. This increase would primarily be due to haul truck engine exhaust because of the hauling distance required for the off-site disposal of building waste. As applicable, this issue is addressed further under the discussion of emissions from the alternatives.

The discussion below provides more detailed information about the emissions from the Proposed Project and the alternatives.

N.3.1 Emissions from the Proposed Project and Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) Alternative

A summary of the total daily emissions associated with the Proposed Project and Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) Alternative is provided in Table N-9. As described in the previous sections, construction emissions were calculated for various project activities including dam and powerhouse deconstruction, restoration activities, relocation and demolition of recreational facilities, and the Yreka supply pipeline relocation.

Table N-9. Total Uncontrolled Daily Emissions from the Proposed Project and Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) Alternative.[1]

Project Activity	Daily Emissions (pounds per day)[2]					
	VOC	CO	NOx	SOx	PM_{10}	$PM_{2.5}$
Dam and Powerhouse Deconstruction	131	584	650	9	503	248
Restoration Activities	19	62	168	20	3	3
Recreation Facilities	12	77	85	0	17	7
Yreka Water Supply Pipeline Relocation	3	16	18	0	10	3
Total	165	739	**921**	29	**523**	**261**
Significance Criterion[2]	250	2,500	250	250	250	250

[1] Data from 2012 KHSA EIS/EIR.
[2] Values shown in **bold** exceed the Siskiyou County Air Pollution Control District's (SCAPCD) thresholds of significance in Rule 6.1 (Construction Permit Standards for Criteria Air Pollutants).

As shown in Table N-9, total daily emissions from the Proposed Project and Three Dam Removal Alternative (Iron Gate, Copco No. 1, and Copco No. 2) Alternative are estimated to exceed the SCAPCD's significance thresholds for NOx, PM_{10}, and $PM_{2.5}$. As such, the construction emissions from the Proposed Project and Three Dam Removal Alternative (Iron Gate, Copco No. 1, and Copco No. 2) Alternative would be significant. Since the Yreka water pipeline relocation will occur prior to initiating drawdown of the Iron Gate Reservoir, the construction emissions from this project activity do not have the potential to occur at the same time as the other activities and should be analyzed separately.

As discussed above, it is anticipated that the emissions from dam removal activities under the current proposal (Appendix B: *Definite Plan*) would be greater than the emissions estimates calculated for the 2012 KHSA EIS/EIR. This increase would primarily be due to haul truck engine exhaust because of the hauling distance required for the off-site disposal of building waste. As such, it is anticipated that these additional emissions would contribute to the finding of significant impacts for the emissions of NOx, PM_{10}, and $PM_{2.5}$ from the Proposed Project. It is not anticipated that these additional emissions would cause the Proposed Project to exceed the significance thresholds for VOC, CO, or SOx for the following reasons: 1) the emissions of these criteria air pollutants from the Proposed Project are well below the SCAPCD's significance thresholds (Table N-9); and 2) the hauling of waste from dam removal activities only constitutes a small portion of the emissions of these criteria air pollutants (Table N-10).

The discussion below provides more detailed information about the emissions from the various project activities that would occur under the Proposed Project and Three Dam Removal Alternative (Iron Gate, Copco No. 1, and Copco No. 2) Alternative.

N.3.1.2 Emissions from Dam and Powerhouse Deconstruction

A breakdown of peak daily emissions associated with dam and powerhouse deconstruction under the Proposed Project and Three Dam Removal Alternative (Iron Gate, Copco No. 1, and Copco No. 2) Alternative is provided in Table N-10. Emissions are identified for each of the major components of construction, including off-road construction equipment, on-road trucks, construction worker commuting vehicles, and fugitive dust from vehicle re-entrainment on unpaved roads and excavation/grading activities.

Table N-10. Peak Daily Emissions from Dam and Powerhouse Deconstruction.[1]

Source	Peak Daily Emissions (pounds per day)[2]					
	VOC	CO	NOx	SOx	PM_{10}	$PM_{2.5}$
Iron Gate						
Construction Equipment	63	248	**313**	2	12	11
Haul Trucks	3	12	34	0	5	2
Employee Commuting Vehicles	1	11	1	0	4	1
Unpaved Roads	--	--	--	--	31	3
Excavation/Grading	--	--	--	--	157	33
Iron Gate Subtotal	67	272	**348**	2	210	50
Copco No. 1						
Construction Equipment	26	159	117	1	6	5
Haul Trucks	1	4	11	0	2	1
Employee Commuting Vehicles	1	13	1	0	3	1
Unpaved Roads	--	--	--	--	2	<1
Excavation/Grading	--	--	--	--	161	159
Copco No. 1 Subtotal	27	176	129	1	174	165
Copco No. 2						
Construction Equipment	19	56	80	1	4	3
Haul Trucks	3	12	32	0	5	2
Employee Commuting Vehicles	1	16	2	0	2	<1
Unpaved Roads	--	--	--	--	4	<1
Excavation/Grading	--	--	--	--	3	1
Copco No. 2 Subtotal	19	56	80	1	4	3
J.C. Boyle						
Construction Equipment	13	22	54	5	9	8
Haul Trucks	1	1	4	0	2	<1
Employee Commuting Vehicles	2	31	1	0	2	<1
Unpaved Roads	--	--	--	--	5	1
Excavation/Grading	--	--	--	--	84	17
J.C. Boyle Subtotal	15	54	60	5	103	27
Total Emissions	131	584	**650**	9	**503**	248
California Emissions	116	531	**590**	4	**401**	221
Oregon Emissions	15	54	60	5	103	27
Significance Criterion[2]	250	2,500	250	250	250	250

[1] Data from 2012 KHSA EIS/EIR.
[2] Values shown in **bold** exceed the Siskiyou County Air Pollution Control District's (SCAPCD) thresholds of significance in Rule 6.1 (Construction Permit Standards for Criteria Air Pollutants).

N.3.1.3 Emissions from Restoration Activities

A summary of peak daily emissions associated with restoration activities is provided in Table N-11.

Table N-11. Peak Daily Emissions from Restoration Activities.[1]

Phase	Peak Daily Emissions (pounds per day)					
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Ground Equipment	3	8	15	2	0	0
Barges	16	54	153	18	3	3
Aircraft	15	39	3	1	0	0
Maximum Daily[2]	19	62	168	20	3	3

[1] Data from 2012 KHSA EIS/EIR.
[2] Barge and aerial application would not happen simultaneously; therefore, maximum daily emissions summarize the peak day tha consists of ground equipment and barges operating at the same time.

N.3.1.4 Emissions from Recreation Facilities

A summary of peak daily emissions associated with the relocation and demolition of recreation facilities is provided in Table N-12.

Table N-12. Peak Daily Emissions from Recreation Facilities.[1]

Location	Peak Daily Emissions (pounds per day)					
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
J.C. Boyle	4	32	31	0	4	1
Copco No. 1 Reservoir	2	13	16	0	4	2
Iron Gate Reservoir	6	32	38	0	9	4
Total Emissions	12	77	85	0	17	7

[1] Data from 2012 KHSA EIS/EIR.

N.3.1.5 Emissions from Yreka Water Supply Pipeline Relocation

A summary of peak daily emissions associated with the relocation of the Yreka water supply pipeline is provided in Table N-13.

Table N-13. Peak Daily Emissions from Yreka Water Supply Pipeline Relocation.[1]

Location	Peak Daily Emissions (pounds per day)					
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
J.C. Boyle	4	32	31	0	3	1
Copco No. 1 Reservoir	2	13	16	0	2	1
Iron Gate Reservoir	6	32	38	0	5	3
Total Emissions	12	77	85	0	11	5
Significance Criterion	250	2,500	250	250	250	250

[1] Data from 2012 KHSA EIS/EIR.

As noted above, the Yreka water pipeline relocation will occur prior to initiating drawdown of the Iron Gate Reservoir and the construction emissions from this project activity do not have the potential to occur at the same time as the other activities. Therefore, this project activity is analyzed separately from the other project activities. As shown in Table N-13, emissions from the relocation of the Yreka water supply pipeline are below the significance criteria.

N.3.2 Emissions from the Partial Removal Alternative

A summary of the total daily emissions associated with the Partial Removal Alternative is provided in Table N-14. As described in the previous sections, construction emissions were calculated for various project activities including dam and powerhouse deconstruction, restoration activities, relocation and demolition of recreational facilities, and the Yreka supply pipeline relocation.

Table N-14. Total Uncontrolled Daily Emissions from the Partial Removal Alternative.[1]

Project Activity	Daily Emissions (pounds per day)[2]					
	VOC	**CO**	**NOx**	**SOx**	**PM_{10}**	**$PM_{2.5}$**
Dam and Powerhouse Deconstruction	128	570	625	9	484	244
Restoration Activities	19	62	168	20	3	3
Recreation Facilities	12	77	85	0	17	7
Yreka Water Supply Pipeline Relocation	3	16	18	0	10	3
Total	162	725	**896**	29	**514**	**257**
Significance Criterion[2]	250	2,500	250	250	250	250

[1] Data from 2012 KHSA EIS/EIR.
[2] Values shown in **bold** exceed the Siskiyou County Air Pollution Control District's (SCAPCD) thresholds of significance in Rule 6.1 (Construction Permit Standards for Criteria Air Pollutants).

As shown in Table N-14, total daily emissions from the Partial Removal Alternative are estimated to exceed the SCAPCD's significance thresholds for NOx, PM_{10}, and $PM_{2.5}$. As such, the construction emissions from the Partial Removal Alternative would be significant. Since the Yreka water pipeline relocation will occur prior to initiating drawdown of the Iron Gate Reservoir, the construction emissions from this project activity do not have the potential to occur at the same time as the other activities and should be analyzed separately. As shown in Table N-14, the emissions from the relocation of the Yreka water supply pipeline are below the significance criteria.

Compared to the Proposed Project, this alternative generally results in fewer NOx, PM_{10}, and $PM_{2.5}$ emissions associated with excavation and cut/fill activities because the footprint on which equipment would be operating is smaller than the Proposed Project. Emissions associated with the other components are relatively unaffected because the peak number of truck trips, construction equipment, or employees does not substantially change between the Proposed Project and this alternative. An exception occurs at J.C. Boyle, which requires fewer workers and less construction equipment under the Partial Removal Alternative compared to the Proposed Project.

As discussed above, it is anticipated that the emissions from dam removal activities under the current proposal (Appendix B: *Definite Plan*) would be greater than the emissions estimates calculated for the 2012 KHSA EIS/EIR. This increase would primarily be due to haul truck engine exhaust because of the hauling distance required for the off-site disposal of building waste. As such, it is anticipated that these additional emissions would contribute to the finding of significant impacts for the emissions of NOx,

PM_{10}, and $PM_{2.5}$ from the Partial Removal Alternative. It is not anticipated that these additional emissions would cause the Partial Removal Alternative to exceed the significance thresholds for VOC, CO, or SOx for the following reasons: (1) the emissions of these criteria air pollutants from the Partial Removal Alternative are well below the SCAPCD's significance thresholds (Table N-14); and (2) the hauling of waste from dam removal activities only constitutes a small portion of the emissions of these criteria air pollutants (Table N-15).

A breakdown of peak daily emissions associated with dam removal activities that would occur under the Partial Removal Alternative is provided in Table N-15.

Table N-15. Peak Daily Emissions for Dam Removal Activities for the Partial Removal Alternative.[1]

Source	Peak Daily Emissions (pounds per day)[2]					
	VOC	**CO**	**NOx**	**SOx**	**PM_{10}**	**$PM_{2.5}$**
Iron Gate						
Construction Equipment	63	248	**313**	2	12	11
Haul Trucks	2	11	30	<1	5	1
Employee Commuting	1	11	1	<1	4	1
Unpaved Roads	--	--	--	--	31	3
Excavation/Grading	--	--	--	--	156	33
Iron Gate Subtotal	66	**270**	**344**	2	208	49
Copco No. 1						
Construction Equipment	26	159	117	1	6	5
Haul Trucks	1	2	6	<1	1	<1
Employee Commuting	1	11	1	<1	3	1
Unpaved Roads	--	--	--	--	2	<1
Excavation/Grading	--	--	--	--	159	158
Copco No. 1 Subtotal	27	173	124	1	171	165
Copco No. 2						
Construction Equipment	19	56	80	1	4	3
Haul Trucks	2	8	22	<1	3	1
Employee Commuting	1	16	2	<1	2	<1
Unpaved Roads	--	--	--	--	2	<1
Excavation/Grading	--	--	--	--	1	<1
Copco No. 2 Subtotal	21	80	103	1	12	5
J.C. Boyle						
Construction Equipment	12	19	49	5	8	7
Haul Trucks	<1	1	3	<1	1	<1
Employee Commuting	1	28	1	<1	2	<1
Unpaved Roads	--	--	--	--	5	1
Excavation/Grading	--	--	--	--	77	16
J.C. Boyle Subtotal	14	48	53	5	94	25
Total Emissions	128	570	**625**	9	**484**	244
California Emissions	115	522	**571**	4	**390**	219
Oregon Emissions	14	48	53	5	94	25
Significance Criteria[1]	250	2,500	250	250	250	250

1 Data from 2012 KHSA EIS/EIR.
2 Values shown in **bold** exceed the Siskiyou County Air Pollution Control District's (SCAPCD) thresholds of significance in Rule 6.1 (Construction Permit Standards for Criteria Air Pollutants).

N.3.3 Emissions from the Continued Operations with Fish Passage Alternative

A breakdown of peak daily emissions associated with construction activities under the Continued Operation with Fish Passage Alternative is provided in Table N-16. Emissions estimates for this alternative only include construction activities related to the construction of fish passage since this alternative does not include the other project activities that would occur under the other alternatives.

Table N-16. Peak Daily Emissions for Construction Activities for the Continued Operations with Fish Passage Alternative.[1]

Source	Peak Daily Emissions (pounds per day)[2]					
	VOC	CO	NOx	SOx	PM_{10}	$PM_{2.5}$
Iron Gate						
Construction Equipment	10	54	52	<1	2	2
Haul Trucks	1	3	7	<1	1	<1
Employee Commuting	1	6	1	<1	2	<1
Unpaved Roads	--	--	--	--	--	--
Excavation/Grading	--	--	--	--	2	<1
Iron Gate Subtotal	11	63	59	<1	8	3
Copco No. 1						
Construction Equipment	9	51	37	<1	2	1
Haul Trucks	1	3	7	<1	2	<1
Employee Commuting	1	4	<1	<1	1	<1
Unpaved Roads	--	--	--	--	--	--
Excavation/Grading	--	--	--	--	1	<1
Copco No. 1 Subtotal	9	51	37	<1	2	1
Copco No. 2						
Construction Equipment	9	51	42	<1	2	2
Haul Trucks	1	3	8	<1	2	<1
Employee Commuting	<1	3	<1	<1	1	<1
Unpaved Roads	--	--	--	--	--	--
Excavation/Grading	--	--	--	--	<1	<1
Copco No. 2 Subtotal	10	58	50	<1	5	2
J.C. Boyle						
Construction Equipment	8	14	45	3	6	5
Haul Trucks	1	1	5	<1	3	1
Employee Commuting	<1	<1	<1	<1	1	<1
Unpaved Roads	--	--	--	--	--	--
Excavation/Grading	--	--	--	--	1	<1
J.C. Boyle Subtotal	9	16	50	4	11	6
Maximum Daily Emissions	11	63	59	4	11	6
Significance Criterion	250	2,500	250	250	250	250

1 Data from 2012 KHSA EIS/EIR.
2 Values shown in **bold** exceed the Siskiyou County Air Pollution Control District's (SCAPCD) thresholds of significance in Rule 6.1 (Construction Permit Standards for Criteria Air Pollutants).

As shown in Table N-16, emissions from the Continued Operations with Fish Passage Alternative are below the significance criteria. Peak daily emissions of each pollutant would be substantially lower than emissions under the Proposed Project. This is largely based on the fact that the dams will remain in place and fugitive dust emissions will be minimal. The reduced level of construction activities compared to that under the

Proposed Project also results in fewer emissions from the components (i.e., construction equipment, trucks, and construction worker commuting vehicles).

N.3.4 Emissions from the Two Dam Removal (Iron Gate and Copco No. 1) Alternative

A summary of the total daily emissions associated with the Two Dam Removal (Iron Gate and Copco No. 1) Alternative is provided in Table N-17. As described in the previous sections, construction emissions were calculated for various project activities including dam and powerhouse deconstruction, restoration activities, relocation and demolition of recreational facilities, and the Yreka supply pipeline relocation.

Table N-17. Total Uncontrolled Daily Emissions from the Two Dam Removal (Iron Gate and Copco No. 1) Alternative.[1]

Project Activity	Daily Emissions (pounds per day)[2]					
	VOC	CO	NOx	Sox	PM_{10}	$PM_{2.5}$
Dam and Powerhouse Deconstruction	117	552	620	7	399	225
Restoration Activities	18	60	165	20	3	3
Recreation Facilities	8	45	54	0	13	6
Yreka Water Supply Pipeline Relocation	3	16	18	0	10	3
Total	146	673	**857**	27	**425**	237
Significance Criterion[2]	250	2,500	250	250	250	250

[1] Data from 2012 KHSA EIS/EIR.
[2] Values shown in **bold** exceed the Siskiyou County Air Pollution Control District's (SCAPCD) thresholds of significance in Rule 6.1 (Construction Permit Standards for Criteria Air Pollutants).

As shown in Table N-17, total daily emissions from the Two Dam Removal (Iron Gate and Copco No. 1) Alternative are estimated to exceed the SCAPCD's significance thresholds for NOx and PM_{10}. As such, the construction emissions from the Two Dam Removal (Iron Gate and Copco No. 1) Alternative would be significant. Since the Yreka water pipeline relocation will occur prior to initiating drawdown of the Iron Gate Reservoir, the construction emissions from this project activity do not have the potential to occur at the same time as the other activities and should be analyzed separately. As shown in Table N-17, the emissions from the relocation of the Yreka water supply pipeline are below the significance criteria.

Peak daily emissions of each pollutant under this alternative are substantially less than emissions from the Proposed Project. This is largely based on the fact that two dams will remain in place and fugitive dust emissions will be substantially reduced. The reduced level of construction activities compared to that under the Proposed Project also results in fewer emissions from the components (i.e., construction equipment, trucks, and construction worker commuting vehicles).

As discussed above, it is anticipated that the emissions from dam removal activities under the current proposal (Appendix B: *Definite Plan*) would be greater than the emissions estimates calculated for the 2012 KHSA EIS/EIR. This increase would primarily be due to haul truck engine exhaust because of the hauling distance required for the off-site disposal of building waste. As such, it is anticipated that these additional emissions would contribute to the finding of significant impacts for the emissions of NOx and PM_{10} from the Two Dam Removal (Iron Gate and Copco No. 1) Alternative. Since the emissions of $PM_{2.5}$ under this alternative are just below the SCAPCD's significance threshold, it is conservatively assumed that these additional emissions would cause this alternative to exceed the significance threshold for $PM_{2.5}$. It is not anticipated that these additional emissions would cause the Two Dam Removal (Iron Gate and Copco No. 1) Alternative to exceed the significance thresholds for VOC, CO, or SOx for the following reasons: 1) the emissions of these criteria air pollutants from the Two Dam Removal (Iron Gate and Copco No. 1) Alternative are well below the SCAPCD's significance thresholds (Table N-17); and 2) the hauling of waste from dam removal activities only constitutes a small portion of the emissions of these criteria air pollutants (Table N-18).

A breakdown of peak daily emissions associated with dam removal activities under the Two Dam Removal (Iron Gate and Copco No. 1) Alternative is provided in Table N-18.

Table N-18. Peak Daily Emissions for Dam Removal Activities for the Two Dam Removal (Iron Gate and Copco No. 1) Alternative.[1]

Source	Peak Daily Emissions (pounds per day)[2]					
	VOC	CO	NOx	SOx	PM_{10}	$PM_{2.5}$
Iron Gate						
Construction Equipment	63	248	**313**	2	12	11
Haul Trucks	2	11	30	0	5	1
Employee Commuting	1	22	2	0	5	1
Unpaved Roads	--	--	--	--	31	3
Excavation/Grading	--	--	--	--	157	33
Iron Gate Subtotal	67	**282**	**345**	2	209	49
Copco No. 1						
Construction Equipment	26	159	117	1	6	5
Haul Trucks	1	4	11	0	2	1
Employee Commuting	1	16	2	0	3	1
Unpaved Roads	--	--	--	--	2	0
Excavation/Grading	--	--	--	--	160	159
Copco No. 1 Subtotal	28	179	129	1	173	165
Copco No. 2						
Construction Equipment	11	52	70	0	3	3
Haul Trucks	1	4	12	0	2	1
Employee Commuting	0	4	0	0	1	0
Unpaved Roads	--	--	--	--	--	--
Excavation/Grading	--	--	--	--	0	0
Copco No. 2 Subtotal	12	61	82	0	6	4

Source	Peak Daily Emissions (pounds per day)[2]					
	VOC	CO	NOx	SOx	PM_{10}	$PM_{2.5}$
J.C. Boyle						
Construction Equipment	8	18	56	4	6	6
Haul Trucks	1	2	6	0	3	1
Employee Commuting	1	12	0	0	1	0
Unpaved Roads	--	--	--	--	--	--
Excavation/Grading	--	--	--	--	1	0
J.C. Boyle Subtotal	10	32	63	4	11	7
Total Emissions	117	552	**620**	7	**399**	225
California Emissions	107	521	**557**	3	**388**	218
Oregon Emissions	10	32	63	4	11	7
Significance Criterion[1]	250	2,500	250	250	250	250

[1] Data from 2012 KHSA EIS/EIR.
[2] Values shown in **bold** exceed the Siskiyou County Air Pollution Control District's (SCAPCD) thresholds of significance in Rule 6.1 (Construction Permit Standards for Criteria Air Pollutants).

N.4 Mitigation Measures

Several mitigation measures were proposed as part of the analysis in the 2012 KSHA EIS/EIR to reduce emissions of NOx, PM_{10}, and $PM_{2.5}$. The mitigation measures included the following:

- AQ-1 – Any off-road construction equipment (e.g., loaders, excavators, etc.) must be equipped with engines that meet the model year (MY) 2015 emission standards for off-road compression-ignition (diesel) engines (13 CCR 2420-2425.1). Older model year engines may also be used if they are retrofit with control devices to reduce emissions to the applicable emission standards.
- AQ-2 – Any on-road construction equipment (e.g., pick-up trucks at the construction sites) must be equipped with engines that meet the MY 2000 or on-road emission standards.
- AQ-3 – Any trucks used to transport materials to or from the construction sites must be equipped with engines that meet the MY 2010 or later emission standards for on-road heavy-duty engines and vehicles (13 CCR 1956.8). Older model engines may also be used if they are retrofit with control devices to reduce emissions to the applicable emission standards.
- AQ-4 – Dust control measures will be incorporated to the maximum extent feasible during blasting operations at Copco No. 1 Dam. The following control measures will be used during blasting activities:
    - Conduct blasting on calm days to the extent feasible. Wind direction with respect to nearby residences must be considered.
    - Design blast stemming to minimize dust and to control fly rock.
    - Install wind fence for control of windblown dust

Below is a discussion of the mitigated emissions by alternative for dam removal activities and the mitigated emissions by alternative with all project activities combined. As noted above, the other project activities for which emissions were estimated include restoration activities, relocation and demolition of recreational facilities, and replacement of the Yreka water supply pipeline.

N.4.1 Mitigated Emissions by Alternative for Dam Removal Activities

The mitigated emissions for each of the dam locations and alternatives were calculated as described in the previous sections. Table N-19 summarizes the mitigated emissions by alternative for dam removal activities.

Table N-19. Summary of Mitigated Emissions by Alternative for Dam Removal Activities.[1]

Alternative[2]	Peak Daily Emissions (lbs/day)[3]					
	VOC	CO	NOx	SOx	PM_{10}	$PM_{2.5}$
Proposed Project and Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) Alternative	66	405	146	3	**309**	74
Partial Removal	64	394	137	3	**294**	60
Two Dam Removal (Iron Gate and Copco No. 1)	54	372	156	3	209	44
Significance Criterion[3]	250	2,500	250	250	250	250

1 Data from 2012 KHSA EIS/EIR.
2 The Continued Operations with Fish Passage Alternative not included in the table because mitigation would not be required for this alternative.
3 Values shown in **bold** exceed the Siskiyou County Air Pollution Control District's (SCAPCD) thresholds of significance in Rule 6.1 (Construction Permit Standards for Criteria Air Pollutants).

As shown in Table N-19, emissions of PM_{10} would remain significant for the Proposed Project, Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) Alternative, and Partial Removal Alternative.

N.5 Mitigated Emissions by Alternative with All Project Activities

In addition to criteria pollutant emissions that would occur from dam removal activities, emissions would also occur from restoration activities, relocation and demolition of recreation facilities, and replacement of the Yreka water supply pipeline. Table N-20 summarizes the total mitigated daily emissions that would occur when all of these components are considered together. Mitigated emissions estimates are not provided for the Continued Operations with Fish Passage Alternative because mitigation would not be required and the other project activities would not occur under this alternative.

Table N-20. Total Mitigated Daily Emissions by Alternative with All Project Activities.[1]

Alternative/Project Activity	Daily Emissions (pounds per day)[2]					
	VOC	CO	NOx	SOx	PM_{10}	$PM_{2.5}$
Proposed Project and Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) Alternative						
Dam and Powerhouse Deconstruction	66	405	146	3	**309**	74
Restoration Activities	19	62	168	20	3	3
Recreation Facilities	12	77	85	<1	11	5
Yreka Water Supply Pipeline	3	16	18	<1	10	3
Total	100	560	**418**	24	**332**	84
Partial Removal Alternative						
Dam and Powerhouse Deconstruction	64	394	137	3	**294**	60
Restoration Activities	19	62	168	20	3	3
Recreation Facilities	12	77	85	<1	11	5
Yreka Water Supply Pipeline	3	16	18	<1	10	3
Total	98	549	**409**	24	**317**	71
Two Dam Removal (Iron Gate and Copco No. 1) Alternative						
Dam and Powerhouse Deconstruction	54	372	156	3	209	44
Restoration Activities	18	60	165	20	3	3
Recreation Facilities	8	45	54	<1	7	4
Yreka Water Supply Pipeline	3	16	18	<1	10	3
Total	83	494	**393**	22	230	53
Significance Criterion[1]	250	2,500	250	250	250	250

[1] Data from 2012 KHSA EIS/EIR.
[2] Values shown in **bold** exceed the Siskiyou County Air Pollution Control District's (SCAPCD) thresholds of significance in Rule 6.1 (Construction Permit Standards for Criteria Air Pollutants).

As shown in Table N-20, emissions of NOx would remain significant for the Proposed Project, Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) Alternative, Partial Removal Alternative, and Two Dam Removal (Iron Gate and Copco No. 1) Alternative. In addition, emissions of PM_{10} would remain significant for the Proposed Project, Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) Alternative, and Partial Removal Alternative.

As indicated in Table N-20, the mitigation measures result in the greatest reductions in emissions for construction activity related to dam and powerhouse deconstruction. Due to the proposed construction techniques and equipment (e.g., aircraft, barges, etc.), the mitigated emissions for the other project activities (i.e., restoration activities, relocation and demolition of recreation facilities, and relocation of the Yreka water supply pipeline) would be similar or slightly reduced as compared to the unmitigated emissions.

The current proposal for the Proposed Project (Appendix B: *Detailed Plan*) lacks sufficient detail concerning construction activities and it is too speculative to determine whether the mitigation measures proposed in the 2012 KHSA EIS/EIR are feasible and enforceable. Since similar minimization measures may be implemented during project construction, it is assumed that the emissions generated by the Proposed Project and the project alternatives would fall somewhere in the range between the uncontrolled and mitigated emissions estimates.

Due to this uncertainty, the emissions of NOx, PM_{10}, and $PM_{2.5}$ from the Proposed Project, Three Dam Removal (Iron Gate, Copco No. 1, and Copco No. 2) Alternative, Partial Removal Alternative, and Two Dam Removal (Iron Gate and Copco No. 1) Alternative are found to be significant.

N.6 References

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