APPENDIX C

EMISSION CALCULATIONS

Vehicle Exhaust

Vehicle Exhaust From Construction Worker Trips

Equation

E= EF*VMT
where
E= Emissions (g)
EF = Emission Factor (g/mi)
VMT=vehicle miles traveled

Assumptions

Number of Worker Cars=	65	
Average Miles Traveled/one way trip=	10 mi	Assume traveling from Roseville
Season=	winter	
Vehicle Mix=	75% LDA	
	25% LDT	
Year=	2004	
Model=	emfac2000 v2.2	
Region=	Placer County	

Calculations

	Units	ROG	NO_X	PM_{10}	CO
Emission Factors-LDA	g/mi	0.89	0.67	0.04	7.39
Emission Factors-LDT1	g/mi	1.72	1.22	0.03	15.7
Weighted Average Emission Factors	g/mi	1.10	0.81	0.04	9.47
Total Miles	mi/day	1,300	1,300	1,300	1,300
Emissions	g/day	1,427	1,050	49	12,308
Total Emissions	lb/day	3.15	2.31	0.11	27.14

LDA = Light-Duty Automobiles
LDT = Light-Duty Trucks

Equipment Exhaust

Construction Equipment Exhaust

Equation

ROG, NO_X, PM_{10}, and CO Emissions

E= EF*N

where

E= Emissions (lb)

EF = Emission Factor (lb/day)

N = Number of Pieces of Equipment

SO_X Emissions

E=EF*M

where

E=Emissions

EF=Emission Factor (lb/yd^3)

M=Amount of material moved (yd^3)

Calculations

ROG, NO_X, PM_{10}, and CO Emissions

Equipment	Number of Pieces	Emission Factors (lb/day)			
		ROG	NO_X	PM_{10}	CO
Scraper	15	3.64	26.86	1.04	26.94
Grader	2	1.76	11.46	0.4	14.21
Bulldozer	6	3.66	31.01	1.32	24.07
Water Truck	4	3.6	23.42	0.82	29.03
Excavator	2	1.84	10.96	0.36	15.64
Compactor	4	1.84	15.6	0.67	12.11
Concrete Mixer	1	3.6	23.42	0.82	29.03
Trucks	2	3.6	23.42	0.82	29.03
Forklift	2	0.79	4.68	0.15	6.7

Source: SMAQMD Draft CEQA Guidelines, September 2001. Assuming work commences in 2004

SO_X Emissions

Emission Factor	4.6	grams per cubic yard
Earth Moved	18,000	cubic yard per day
Emissions	82,800	grams per day
	183	pounds per day

Source: BAAQMD CEQA Guidelines, December 1999

Summary

Equipment	Emissions (lb/day)				
	ROG	NO_x	PM_{10}	CO	SO_X*
Scraper	54.60	402.90	15.60	404.10	
Grader	3.52	22.92	0.80	28.42	
Bulldozer	21.96	186.06	7.92	144.42	
Water Truck	14.40	93.68	3.28	116.12	
Excavator	3.68	21.92	0.72	31.28	
Compactor	7.36	62.40	2.68	48.44	
Concrete Mixer	3.60	23.42	0.82	29.03	
Trucks	7.20	46.84	1.64	58.06	
Forklift	1.58	9.36	0.30	13.40	
Total	117.90	869.50	33.76	873.27	182.57

* Detailed SO_X emissions are listed above summary tables.

Basin Excavation

Description: Fugitive Dust Emission From Basin Excavation

Type of Activities

1. Excavation of 18,000 cubic yards per day (740,000 cubic yards total)
   - A. Mass Grading of low-flow channel and bypass channel using scrapers (15).
   - B. Fine Grading of low-flow channel and bypass channel using graders and bulldozers.
2. Most material will be taken directly to new embankment. Stockpiles of topsoil will also be created to cover a maximum of 500,000 square feet in a day.

Note: Assuming total emissions during excavation equivalent to using all scrapers for excavation. Stockpiles will be relatively flat.

Fugitive Dust From Grading/Excavation (Using Scrapers, bulldozers, and graders)

Dust Emission Factor

EF= 0.037 lb per ton

Source: AP-42 5th Edition, Table 11.9-3 (EPA 1998)
64% of Total Suspended Particulates is PM_{10}
(Per BAAQMD CEQA Guidelines, 1999)

Assumptions

Assuming emissions equivalent to case of using all scrapers since majority of work done by scrapers.

Soil Density	1.59	tons per cubic yard
Material Excavated	18000	cubic yard per day
	28620	tons per day

Calculations

Dust Emissions: 1062.4 lbs/day No Control

Wind Erosion of Stockpiles

Dust Emissions

$E = EF * A$

$EF = k*P*N$

$P = 58*(u^*-u^*_t)^2 + 25*(u^*-u^*_t)$

$P=0$ if $u^* <= u^*_t$

$u^* = 0.053u^+_{10}$ for large flat piles with a height to base ratio <= 0.2

where

A = area disturbed (m^2)
E = Emissions (g/day)
EF = emission factor (g/(m^2-day))
k = particle size multiplier
N=number of disturbances over area per day
P = erosion potential (g/(m^2-day)) for each disturbance
u^* = friction velocity (m/s)
u^*_t = threshold friction velocity (m/s)
u^+_{10} = fastest mile at reference anemometer height of 10m

Source: AP-42 5th Edition, Section 13.2.5 (EPA 1995)

Assumptions

Relatively flat piles

k=	0.5		Source: AP-42 5th Edition, Section 13.2.5 (EPA 1995)
u^+_{10} =	40	mph	Assuming construction activity to be stopped if gust winds
	17.9	m/s	reach 40 mph
u^*_t=	1.02	m/s	Source: AP-42 5th Edition, Section 13.2.5 (EPA 1995)
A=	46450	m^2/day	500,000 square feet
N=	2		Each area is disturbed once when filled and once when removed per day.

Calculations

u^* (m/s)	P (g/(m^2-day)	Emissions (g/day)	Emissions (lb/day)
0.9487	0	0	0

IF $u^* <= u^*_t$, P=0

Total Emissions= 0 With No Control
(Assuming no activity if winds > 40 mph)

Basin Excavation

Summary of Basin Excavation Emissions

PM_{10}	Uncontrolled (lb/day)	With control(lb/day)	
Grading	1062.37	531.19	50% Control
Stockpiles	0.00	0.00	50% Control
Total	1062.37	531.19	

Embankments

Description: Fugitive Dust Emissions from Formation of Embankments
Type of Activities
1. Clear area of vegetation and stockpile topsoil.
2. Excavate and compact key trench when needed.
3. Fill and compact embankment using scrapers and compactor.

Notes: Assume clearing of vegetation does not occur at the same time as activities 2 and 3.
Assume excavation of key trench is already taken into acount in basin excavation calculation.
(Excavated trench material will be less than 5% of total basin excavation.)

Fugitive Dust From Unloading of Scrapers (Using Scrapers)

Dust Emission Factor
EF= 0.0256 lb per ton — Source: AP-42 5th Edition, Table 11.9-4 (EPA 1998)
Assume equivalent to all equipment being scrapers

Assumptions
64% of TSP is PM_{10} (Per BAAQMD CEQA Guidelines, 1999)

Soil Density	1.59	tons per cubic yard
Material Unloaded	18000	cubic yard per day
	28620	tons per day

Calculations

Dust Emissions	733	lbs/day	No Control

Fugitive Dust from Compacting

Dust Emission Factor
$E = EF * H$
$EF = k * s^{1.5} / M^{1.4}$

where
E= emissions (lbs/day)
EF= emission factor (lbs/hr)
H= Hours of operation (hrs/day)
k= factor to determine PM_{10}
M= moisture content of material (%)
s= silt content of material (%)

Source: AP-42 5th Edition, Table 11.9-1 (EPA 1998)

Assumptions

k=	0.75	Source: AP-42 5th Edition, Table 11.9-1 (EPA 1998)
s=	6.9 %	Source: AP-42 5th Edition, Table 11.9-3 (EPA 1998)
M=	7.9 %	Source: AP-42 5th Edition, Table 11.9-3 (EPA 1998)

Equipment	Number of Pieces	Daily Use (hr/day)
Compactor	3	8
	Total	24

Calculations

EF=	0.75 lbs/hr	
E=	18 lbs/day	No Control

Summary of Embankment Emissions

PM_{10}	Uncontrolled (lb/day)	With control(lb/day)	
Unloading of Scrapers	732.67	366.34	50% Control
Compacting	18.00	3.60	80% Control
Total	750.67	369.94	

Unpaved Roads

Description: Fugitive Dust Emissions From Travel on Unpaved Roads
During construction of the inlet and outlet structures, 15 concrete trucks drive onto site. The access road to the north basin is unpaved. Conservatively assume all concrete trucks coming from this north access road.

• Vehicle Re-Entrained Dust

Dust Emissions for Unpaved Roads

$E=EF*VMT$

$EF=2.6*(s/12)^{0.8}*(W/3)^{0.4}/(M/0.2)^{0.3}*(365-p)/365$

where
E=Emissions (lb/day)
EF=Emission factor (lb/vmt)
M=surface material moisture content (%)
p=number of days with at least 0.254mm of precipitation per year
s=surface material silt content (%)
VMT=vehicle miles traveled/day
W=mean vehicle weight (tons)

Source: AP-42 5th Edition, Section 13.2.2 (EPA 1998)

Assumptions

s=	4.3	%	Source: AP-42 5th Edition,Table 11.9-3 average (EPA 1998)
W=	25	tons	Average Weight(loaded weight is 33 tons)
M=	2.4	%	Source: AP-42 5th Edition,Table 11.9-3 average (EPA 1998)
p=	60	days	Source: AP-42 5th Edition,Figure 13.2.2-1 (EPA 1998)
VMT=	15	miles	15 truck round trips/day, 1 mile on unpaved roads/round trip

Calculations

EF=	1.06	lb/VMT	
E=	15.9	lbs/day	No Control

• Summary of Backfill Emissions

PM_{10}	Uncontrolled (lb/day)	With control(lb/day)	
Unpaved Roads	15.90	7.95	50% control