

APPENDIX B

UPDATED STATEWIDE POPULATION AND EMISSION INVENTORY FOR  
DIESEL-FUELED AGRICULTURAL IRRIGATION PUMPS



Winston H. Hickox  
Agency Secretary

# Air Resources Board

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Chairman

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Gray Davis  
Governor

## MEMORANDUM

TO: Mike Tollstrup, Chief  
Project Assessment Branch  
Stationary Source Division

FROM: Randy Pasek, Chief  
Emission Inventory Branch  
Planning and Technical Support Division

DATE: April 30, 2003

SUBJECT: UPDATED STATEWIDE POPULATION AND EMISSION INVENTORY  
FOR DIESEL-FUELED AGRICULTURAL IRRIGATION PUMPS

With the assistance of local air district staff, we have updated the statewide emission inventory for diesel-fueled agricultural irrigation pumps. As part of this update process, we contacted seventeen air districts with significant irrigated agricultural acreage to obtain their best estimates of the current population and emissions from stationary and mobile diesel-fueled agricultural irrigation pumps. We also worked with district staff to ensure the updated inventory reflects the number of pumps that have been replaced to date under the Carl Moyer Program.

Table 1 provides the statewide population of diesel-fueled agricultural pumps and annual average emissions of ROG, NO<sub>x</sub>, and PM by region, district, and county. It should be noted that districts estimated to have fewer than 100 agricultural irrigation pumps were not contacted as part of this update and therefore are not reflected in the statewide inventory presented here. We estimate the updated emission inventory presented here represents over 90% of the total statewide population and emissions from diesel-fueled agricultural irrigation pumps. As shown in Table 1, we estimate there are approximately 8,200 diesel-fueled agricultural irrigation pumps statewide that emit 3.3 tons per day (tpd) of ROG, 32.4 tpd of NO<sub>x</sub>, and 2.4 tpd of PM on an average annual day. Based on discussions with district staff, we estimate that on a statewide basis, 65% of the pumps are stationary while 35% are mobile, with the stationary to mobile split varying considerably from district to district.

*The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Website:*

<http://www.arb.ca.gov>

California Environmental Protection Agency

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Since ROG and NO<sub>x</sub> emissions from agricultural irrigation pumps are of greatest concern during the summer months due to their role in ozone formation, we have also provided average summer day emissions in Table 2. The summer day emissions were developed from the annual average emissions using a statewide temporal profile that assumes 67% of the agricultural pump emissions occur in the summer months (May through October). As shown in Table 2, agricultural irrigation pumps are estimated to emit 4.3 tpd of ROG, 43.6 tpd of NO<sub>x</sub>, and 3.2 tpd of PM on an average summer day.

Annual emissions in tons per year from agricultural irrigation pumps can be calculated by multiplying the annual average emissions shown in Table 1 by 365 days. Using this approach, we estimate diesel-fueled agricultural irrigation pumps statewide emit 1,179 tons per year (tpy) of ROG, 11,839 tpy of NO<sub>x</sub>, and 868 tpy of PM. In estimating annual emissions, do not use the summer emissions provided in Table 2 as these are representative only of the summer months.

If you have any questions regarding the agricultural irrigation pump inventory described in this memorandum, please contact Michael Benjamin of my staff at (916) 323-2915.

cc: Peter Venturini, Chief  
SSD

Bob Fletcher, Chief  
PTSD

Table 1. Statewide Population and Annual Average Emissions for Diesel-Fueled Agricultural Irrigation Pumps

Region	Air District	County	COUNTY TOTALS				REGION TOTALS				
			POPULATION	ROG	NOx	PM	ANNUAL-AVERAGE EMISSIONS (TPD)	POPULATION	ROG	NOx	PM
North Central Coast	Monterey Bay Unified APCD	Monterey	450	0.09	0.72	0.06	ADJ-ARB				
North Central Coast	Monterey Bay Unified APCD	Santa Cruz	62	0.01	0.10	0.01	ARB				
North Central Coast	Monterey Bay Unified APCD	San Benito	56	0.01	0.09	0.01	ARB	568	0.12	0.91	0.06
Sacramento Nonattainment	El Dorado County APCD	El Dorado	20	<0.01	0.05	<0.01	DIS				
Sacramento Nonattainment	Feather River AQMD	Sutter	181	0.18	2.06	0.15	DIS				
Sacramento Nonattainment	Placer County APCD	Placer	64	0.02	0.21	0.02	DIS				
Sacramento Nonattainment	Sacramento Metropolitan AQMD	Sacramento	122	0.03	0.38	0.03	DIS				
Sacramento Nonattainment	Yolo/Solano AQMD	Solano	134	0.05	0.65	0.05	DIS				
Sacramento Nonattainment	Yolo/Solano AQMD	Yolo	643	0.32	3.64	0.26	DIS	1164	0.60	6.98	0.50
Sacramento Valley Attainment	Butte County AQMD	Butte	163	0.03	0.26	0.02	ARB				
Sacramento Valley Attainment	Colusa County APCD	Colusa	100	0.02	0.16	0.01	ARB				
Sacramento Valley Attainment	Glenn County APCD	Glenn	130	0.03	0.21	0.01	ARB				
Sacramento Valley Attainment	Tahama County APCD	Tahama	200	0.04	0.32	0.02	ADJ-ARB	593	0.12	0.95	0.07
Salton Sea	Imperial County APCD	Imperial	200	0.04	0.32	0.02	ADJ-ARB	200	0.04	0.32	0.02
San Diego	San Diego County APCD	San Diego	75	0.02	0.12	0.01	ADJ-ARB	75	0.02	0.12	0.01
San Francisco	Bay Area AQMD	Alameda	35	0.01	0.06	<0.01	ARB				
San Francisco	Bay Area AQMD	San Francisco	44	0.01	0.07	0.01	ARB				
San Francisco	Bay Area AQMD	Contra Costa	17	<0.01	0.03	<0.01	ARB				
San Francisco	Bay Area AQMD	Marin	74	0.01	0.12	0.01	ARB				
San Francisco	Bay Area AQMD	Napa	0	0.00	0.00	0.00	ARB				
San Francisco	Bay Area AQMD	San Francisco	21	<0.01	0.03	<0.01	ARB				
San Francisco	Bay Area AQMD	San Mateo	82	0.02	0.13	0.01	ARB				
San Francisco	Bay Area AQMD	Santa Clara	0	0.00	0.00	0.00	ARB				
San Francisco	Bay Area AQMD	Solano	147	0.03	0.23	0.02	ARB	420	0.08	0.67	0.04
San Francisco	Bay Area AQMD	Sonoma	1415	0.42	5.09	0.39	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	Fresno	1066	0.44	4.15	0.30	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	Kern	525	0.15	1.91	0.16	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	Kings	414	0.13	1.48	0.11	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	Madera	270	0.10	0.98	0.07	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	Merced	111	0.12	1.47	0.11	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	San Joaquin	286	0.03	0.40	0.03	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	Stanislaus	100	0.14	1.71	0.12	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	Tulare	335	0.15	1.87	0.15	DIS	435	0.29	3.57	0.28
South Central Coast	Santa Barbara County APCD	Santa Barbara	54	0.02	0.35	0.02	DIS				
South Central Coast	Ventura County APCD	Ventura	28	0.01	0.18	0.01	DIS				
South Coast	South Coast AQMD	Los Angeles	139	0.06	0.90	0.06	DIS				
South Coast	South Coast AQMD	Orange	36	0.02	0.23	0.02	DIS	257	0.12	1.67	0.12
South Coast	South Coast AQMD	Riverside	8212	3.23	32.44	2.38	DIS	8212	3.22	32.44	2.37
	Grand Total (tons/day)										

1 Data Source:

DIS = District Estimate

ARB = ARB OFFROAD Model

ADJ-ARB = ARB OFFROAD Model adjusted to reflect district estimate

Table 2. Statewide Population and Summer Emissions for Diesel-Fueled Agricultural Irrigation Pumps

Region	Air District	County	COUNTY TOTALS				REGION TOTALS				
			POPULATION	ROG	NOx	PM	POPULATION	ROG	NOx	PM	
North Central Coast	Monterey Bay Unified APCD	Monterey	450	0.12	0.97	0.07					
North Central Coast	Monterey Bay Unified APCD	Santa Cruz	62	0.02	0.13	0.01					
North Central Coast	Monterey Bay Unified APCD	San Benito	56	0.02	0.12	0.01	568	0.15	1.22	0.09	
Sacramento Nonattainment	El Dorado County APCD	El Dorado	20	0.01	0.07	0.01					
Sacramento Nonattainment	Feather River AQMD	Sutter	181	0.24	2.77	0.20					
Sacramento Nonattainment	Placer County APCD	Placer	64	0.02	0.26	0.02					
Sacramento Nonattainment	Sacramento Metropolitan AQMD	Sacramento	122	0.04	0.51	0.04					
Sacramento Nonattainment	Yolo/Solano AQMD	Solano	134	0.07	0.87	0.06					
Sacramento Nonattainment	Yolo/Solano AQMD	Yolo	643	0.43	4.89	0.35	1164	0.81	9.39	0.68	
Sacramento Valley Attainment	Butte County AQMD	Butte	163	0.04	0.35	0.03					
Sacramento Valley Attainment	Colusa County APCD	Colusa	100	0.03	0.21	0.02					
Sacramento Valley Attainment	Glenn County APCD	Glenn	130	0.03	0.28	0.02					
Sacramento Valley Attainment	Tehama County APCD	Tehama	200	0.05	0.43	0.03	593	0.16	1.27	0.09	
Salton Sea	Imperial County APCD	Imperial	200	0.05	0.43	0.03	200	0.05	0.43	0.03	
San Diego	San Diego County APCD	San Diego	75	0.02	0.16	0.01	75	0.02	0.16	0.01	
San Francisco	Bay Area AQMD	Alameda	35	0.01	0.08	0.01					
San Francisco	Bay Area AQMD	San Francisco	44	0.01	0.10	0.01					
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San Francisco	Bay Area AQMD	Marin	74	0.02	0.16	0.01					
San Francisco	Bay Area AQMD	Napa	0	0.00	0.00	0.00					
San Francisco	Bay Area AQMD	San Francisco	21	0.01	0.05	<0.01					
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San Francisco	Bay Area AQMD	Sonoma	147	0.04	0.31	0.02	420	0.11	0.90	0.06	
San Joaquin Valley	San Joaquin Valley Unified APCD	Fresno	1415	0.57	6.84	0.53					
San Joaquin Valley	San Joaquin Valley Unified APCD	Kern	1066	0.59	5.50	0.41					
San Joaquin Valley	San Joaquin Valley Unified APCD	Kings	525	0.20	2.57	0.22					
San Joaquin Valley	San Joaquin Valley Unified APCD	Madera	414	0.17	1.99	0.15					
San Joaquin Valley	San Joaquin Valley Unified APCD	Merced	270	0.13	1.31	0.10					
San Joaquin Valley	San Joaquin Valley Unified APCD	San Joaquin	413	0.16	1.97	0.15					
San Joaquin Valley	San Joaquin Valley Unified APCD	Stanislaus	111	0.04	0.54	0.04					
San Joaquin Valley	San Joaquin Valley Unified APCD	Tulare	286	0.63	2.40	0.11	4500	2.48	23.20	1.70	
South Central Coast	Santa Barbara County APCD	Santa Barbara	100	0.19	2.29	0.17					
South Central Coast	Ventura County APCD	Ventura	335	0.20	2.51	0.21	435	0.39	4.81	0.37	
South Coast	South Coast AQMD	Los Angeles	54	0.03	0.47	0.03					
South Coast	South Coast AQMD	Orange	28	0.02	0.25	0.02					
South Coast	South Coast AQMD	Riverside	139	0.09	1.21	0.09					
South Coast	South Coast AQMD	San Bernardino	36	0.02	0.30	0.02	257	0.16	2.24	0.16	
<b>Grand Total (tons/day)</b>			<b>8212</b>	<b>4.34</b>	<b>43.63</b>	<b>3.20</b>	<b>8212</b>	<b>4.34</b>	<b>43.63</b>	<b>3.20</b>	

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 DIS = District Estimate  
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