Chapter 8
Air Quality

The air quality of a particular area is influenced by several factors, including the amount of pollutants released into the atmosphere and the atmosphere's ability to transport and dilute the pollutants. Wind, atmospheric stability, terrain, and geographic isolation influence air pollution transport. This chapter analyzes the effects on air quality related to the No Action/No Project Alternative, the Flexible Purchase Alternative, and the Fixed Purchase Alternative.

8.1 Affected Environment/Existing Conditions

The following paragraphs provide a brief explanation of the regulatory setting for air quality. Sections 8.1.3 through 8.1.5 describe the factors that influence pollutant levels on a regional level, including geographical location, weather patterns, and pollutant sources.

Figure 8-1
Air Quality Area of Analysis

8.1.1 Area of Analysis

This chapter focuses on the areas where EWA actions would take place. Effects are assessed in the Upstream from the Delta Region and in the Export Service Area as described below and presented in Figure 8-1.

- Upstream from the Delta Region: Shasta, Glenn, Colusa, Yolo, Sutter, Butte, Yuba, Placer, Sacramento, and Merced Counties; and
- Export Service Area: Fresno, Kern, Kings, and Tulare Counties.

8.1.2 Regulatory Setting

Air quality in California is regulated by the United States Environmental Protection Agency, (USEPA) and the California Air Resources Board (CARB), and locally by Air Pollution Control or Air Quality Management Districts (APCD and AQMD respectively). The following APCD/AQMDs regulate air quality within the area of analysis:

- Butte County AQMD
- Colusa County APCD
- Feather River AQMD
- Glenn County APCD
- Sacramento Metro AQMD
- San Joaquin Valley APCD
- Shasta County AQMD
- Yolo-Solano AQMD

The Federal Clean Air Act (CAA) requires the USEPA to establish and maintain standards for common air pollutants. These standards are used to manage air quality across the country. The State of California has also adopted standards for these pollutants. In most cases, California standards are more stringent than USEPA standards. Pollutants for which national and State standards have been established are termed “criteria” pollutants, because the standards are based on studies of health effects criteria that show a relationship between the pollutant concentration and its effect. From this relationship the USEPA and the State also establishes acceptable pollutant concentration levels and ambient air quality standards. Table 8-1 describes the criteria pollutants of primary concern (ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, and particulate matter). Table 8-2 lists the California and Federal ambient air quality standards for these criteria pollutants.

If pollutant concentration levels of any of the criteria pollutants exceed the State or Federal standards established for those pollutants, the area is designated as being in “nonattainment” for those pollutants. An area can be designated as a moderate, severe, serious, or extreme nonattainment area depending upon the level of pollutant concentrations. Likewise, if standards for pollutants are met in a particular area, the area is designated as being in “attainment” for those pollutants. Where standards may not have been established for certain criteria pollutants, the areas are considered “unclassified” for those pollutants.

The Federal CAA requires states with nonattainment areas to develop plans, known as State Implementation Plans, (SIPs) describing the measures the State will take to achieve attainment with national ambient air quality standards. Local air districts and other agencies prepare SIP elements for the areas under their regulatory jurisdiction, and submit these elements to CARB for review and approval. CARB incorporates the individual air district elements into a statewide SIP and the plan is then submitted to USEPA for approval and publication in the Federal Register.

Table 8-1
Criteria Pollutants

Pollutant	***Characteristics***	***Health Effects***	***Major Sources***
Ozone	A highly reactive photochemical pollutant created by the action of sunshine on ozone precursors (reactive organic gasses and oxides of nitrogen).	• Eye irritation. • Respiratory function impairment.	Combustion sources, such as factories and automobiles, and evaporation of solvents and fuels.
Carbon Monoxide	Odorless, colorless gas that is highly toxic. Formed by the incomplete combustion of fuels.	• Impairment of oxygen transport in the bloodstream. • Aggravation of cardiovascular disease. • Fatigue, headache, dizziness.	Automobile exhaust, combustion of fuels, and combustion of wood in woodstoves and fireplaces.
Nitrogen Dioxide	Reddish-brown gas formed during combustion.	• Increased risk of acute and chronic respiratory disease.	Automobile and diesel truck exhaust, industrial processes, fossil-fueled powerplants.
Sulfur Dioxide	Colorless gas with a pungent odor.	• Increased risk of acute and chronic respiratory disease.	Diesel vehicle exhaust, oil-powered powerplants, industrial processes.
PM_{10}	Small particles that measure 10 microns or less are termed PM_{10}. Solid and liquid particles of dust, soot, aerosols, smoke, ash, and pollen and other matter that are small enough to remain suspended in the air for a long period.	• Aggravation of chronic disease and heart/lung disease symptoms.	Dust, erosion, incinerators, automobile and aircraft exhaust, and open fires.

Table 8-2
Ambient Air Quality Standards

Pollutant	***Averaging Time***	***California Standard***	***Federal Standard***
Ozone	1 Hour	0.09 ppm	0.12 ppm
	8 Hour	--	0.08 ppm
PM_{10}	Annual Mean	30 (20 ug/m^3)[(1)]	50 ug/m^3
	24 Hour	50 ug/m^3	150 ug/m^3
$PM_{2.5}$	Annual Mean	12 ug/m^3 [(1)]	15 ug/m^3
	24 Hour	--	65 ug/m^3
Carbon Monoxide	1 Hour	20 ppm	35 ppm
	8 Hour	9.0 ppm	9.0 ppm
Nitrogen Dioxide	Annual Arithmetic Mean	--	0.053 ppm
	1 Hour	0.25 ppm	--
Sulfate	24 Hour	25 ug/m^3	--
Sulfur Dioxide	24 Hour	0.04 ppm	0.14 ppm
	Annual Arithmetic Mean	--	0.03 ppm
	1 Hour	0.25 ppm	--

Source: California Air Resources Board.
[(1)] Adopted by the California Air Resources Board on June 20, 2002; however, final action has not been taken to fully implement standard. For the purposes of this document, 30 ug/m^3 is used as the State standard for PM_{10}.

In addition to a description of the measures to be taken to reduce pollutant levels within the State, the SIP also includes an inventory of existing and projected emissions, by source for each County within the State. Because agricultural irrigation pumps have been exempt from air quality permit requirements however, local air districts have limited quantitative data regarding the number of irrigation pumps and the total emissions estimated from the pumps within their districts. CARB has recently developed an updated statewide population and emission inventory for diesel-fueled agricultural irrigation pumps. This inventory is presented in Table 8-3. CARB obtained the agricultural pump population estimates through coordination with air district staff and a survey of pump sale information from pump manufacturers and suppliers. CARB has collected the information shown in Table 8-3 for use in the next SIP. While the inventory may be modified prior to adoption of the next SIP, this inventory represents the best available data on agricultural irrigation pump emissions within the State.

Under the conformity provisions of the Federal CAA, no Federal agency can approve a project unless the project has been demonstrated to conform to Federal Ambient Air Quality Standards. These conformity provisions were put in place to ensure that Federal agencies would contribute to the efforts of attaining the National Ambient Air Quality Standards. The USEPA has issued two conformity guidelines: transportation conformity rules that apply to transportation plans and projects; and general conformity rules that apply to all other Federal actions. A conformity determination[1] is only required for the alternative that is ultimately approved and selected.

The conformity determination is submitted in the form of a written finding, issued after a minimum 30-day public comment period on the draft determination. A project that produces emissions that exceed conformity standards is required to be mitigated. A project is exempt from the conformity rule if the project-related emissions are less than the *de minimis* thresholds established by the conformity rule. The threshold for a severe ozone nonattainment area is 25 tons/year. The threshold for PM_{10}[2] moderate and serious nonattainment areas is 100 and 70 tons/year, respectively.

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1 A conformity determination is a process that demonstrates how an action would conform to the applicable implementation plan. If the emissions cannot be reduced sufficiently, and if air dispersion modeling cannot demonstrate conformity, then either a plan for mitigating or a plan for offsetting the emissions would need to be pursued.

2 PM_{10} = small particles that measure 10 microns or less.

Table 8-3
Statewide Population and Annual Average Emissions for Diesel-Fueled Agricultural Irrigation Pumps

Region	Air District	County	County Totals Annual Average Emissions (TPD)					Region Totals Annual Average Emissions (TPD)			
			Population	ROG	NOx	PM	Source[1]	Population	ROG	NOx	PM
North Central Coast	Monterey Bay Unified APCD	Monterey	450	0.09	0.72	0.05	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	Tehama County APCD	Tehema	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 APD	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	Contra Costa	44	0.01	0.07	0.01	ARB				
San Francisco	Bay Area AQMD	Marin	17	<0.01	0.03	<0.01	ARB				
San Francisco	Bay Area AQMD	Napa	74	0.01	0.12	0.01	ARB				
San Francisco	Bay Area AQMD	San Francisco	0	0.00	0.00	0.00	ARB				
San Francisco	Bay Area AQMD	San Mateo	21	<0.01	0.03	<0.01	ARB				
San Francisco	Bay Area AQMD	Santa Clara	82	0.02	0.13	0.01	ARB				
San Francisco	Bay Area AQMD	Solano	0	0.00	0.00	0.00	ARB				
San Francisco	Bay Area AQMD	Sonoma	147	0.03	0.23	0.02	ARB	420	0.08	0.67	0.04

Table 8-3
Statewide Population and Annual Average Emissions for Diesel-Fueled Agricultural Irrigation Pumps

Region	Air District	County	County Totals Annual Average Emissions (TPD)					Region Totals Annual Average Emissions (TPD)			
			Population	ROG	NOx	PM	Source	Population	ROG	NOx	PM
San Joaquin Valley	San Joaquin Valley Unified APCD	Fresno	1415	0.42	5.09	0.39	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	Kern	1066	0.44	4.15	0.30	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	Kings	525	0.15	1.91	0.16	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	Madera	414	0.13	1.48	0.11	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	Merced	270	0.10	0.98	0.07	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	San Joaquin	412	0.12	1.47	0.11	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	Stanislaus	111	0.03	0.40	0.03	DIS				
San Joaquin Valley	San Joaquin Valley Unified APCD	Tulare	286	0.47	1.79	0.08	DIS	4500	1.85	17.25	1.26
South Central Coast	Santa Barbara County APCD	Santa Barbara	100	0.14	1.71	0.12	DIS				
South Central Coast	Ventura County APCD	Ventura	335	0.15	1.87	0.15	DIS	435	0.29	3.57	0.28
South Coast	South Coast AQMD	Los Angeles	54	0.02	0.35	0.02	DIS				
South Coast	South Coast AQMD	Orange	28	0.01	0.18	0.01	DIS				
South Coast	South Coast AQMD	Riverside	139	0.06	0.90	0.06	DIS				
South Coast	South Coast AQMD	San Bernardino	36	0.02	0.23	0.02	DIS	257	0.12	1.67	0.12
Grand Total (tons/day)			8212	3.23	32.44	2.38		8212	3.22	32.44	2.37

Source: Benjamin 2003
[1] Data Source:
DIS = District Estimate
ARB – ARB OFFROAD Model
ADJ – ARB – ARB OFFROAD Model adjusted reflect district estimate

The CAA includes provisions for prevention of significant deterioration (PSD) of air quality in areas designated as in attainment or unclassifiable. The basic goals of the USEPA's PSD rules, as published at 40 CFR 52.21, are:

- To ensure that clean air resources are preserved during economic growth;
- To protect human health and welfare from adverse effects of air pollution; and
- To preserve, protect, and enhance air quality in especially sensitive areas such as national parks or wilderness.

The PSD rules distinguish between two thresholds: (1) 28 major sources that are held to 100 tons per year and (2) remaining stationary sources that emit, or have the potential to emit, 250 tons per year. Emissions above either threshold require a PSD permit.

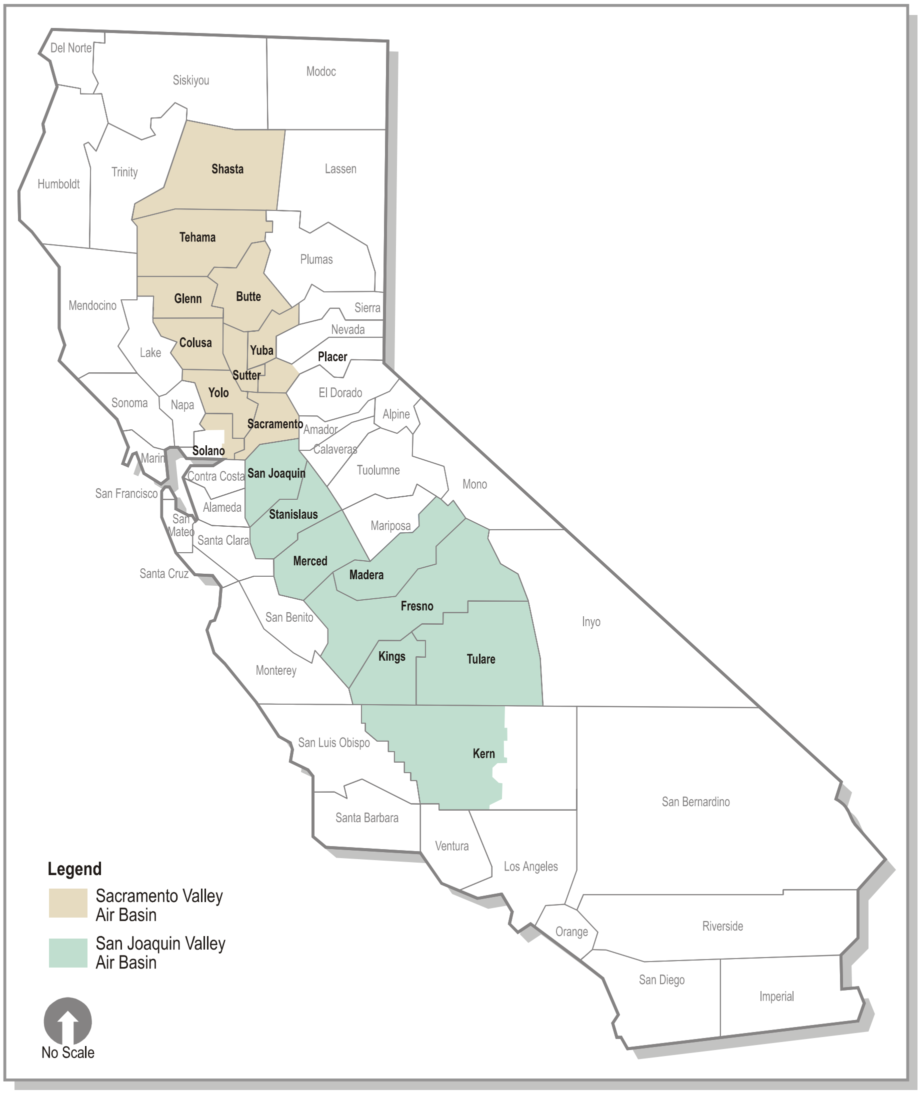
As discussed above, on a local basis, AQMDs or APCDs set regulatory standards for new stationary emission sources. AQMD and APCD boundaries are based on meteorological and geographic conditions and, where possible, jurisdictional boundaries such as a County area.

8.1.3 Upstream from the Delta Region

The Upstream from the Delta Region includes portions of the Sacramento Valley Air Basins (Figure 8-2). During the summer in the Sacramento Valley Air Basin, the Pacific high-pressure system can create low-elevation inversion layers that prevent the vertical dispersion of air.

As a result, air pollutants can become concentrated during summer, lowering air quality. During winter, when the Pacific high-pressure system moves south, stormy, rainy weather dominates the region intermittently. Prevailing winter winds from the southeast disperse pollutants, often resulting in clear, sunny weather and good air quality over most of this portion of the region.

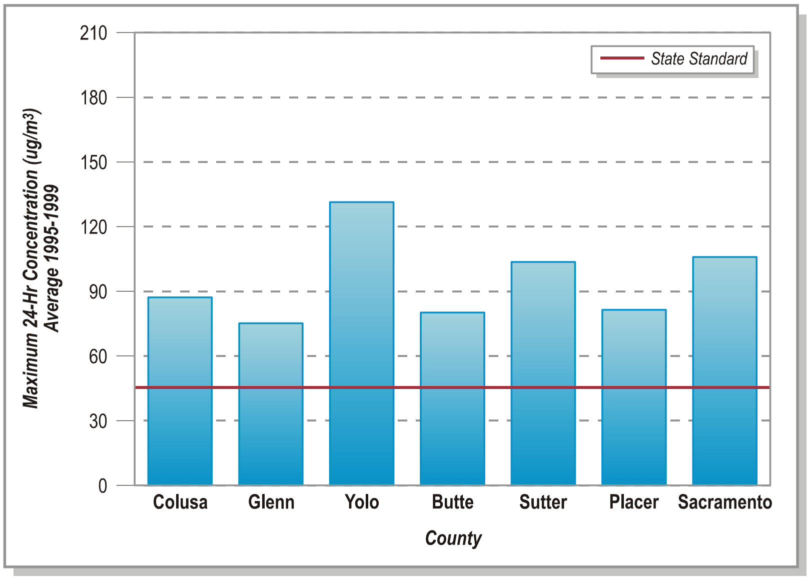
In the Sacramento Valley Air Basin, ozone and PM_{10} are pollutants of concern because concentrations of these pollutants have been found to exceed standards; ozone is a seasonal problem from approximately May through October.



Source: California Air Resources Board 2002

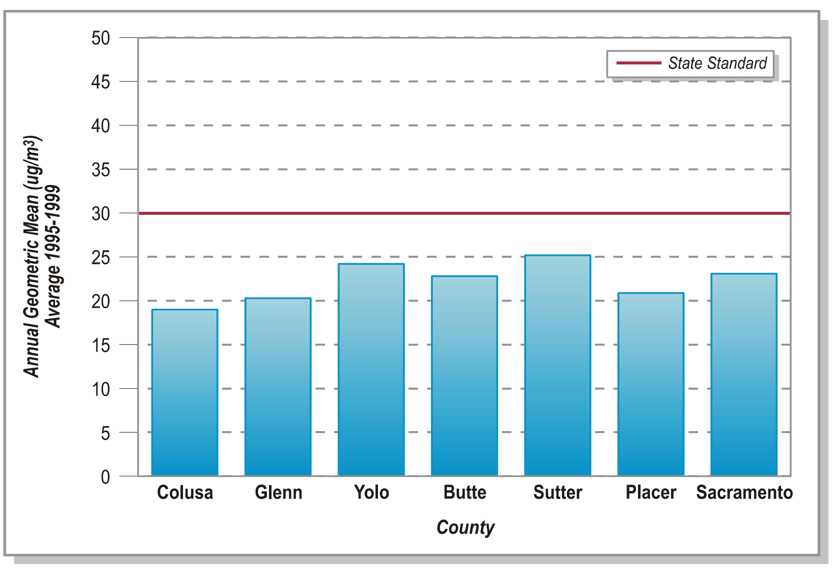
Figure 8-2
California Air Basins and Counties

The following discussion presents information on Butte, Colusa, Glenn, Placer, Sacramento, Shasta, Sutter, Yolo, and Yuba Counties. For each county, Figures 8-3 through 8-5 show maximum PM_{10} and ozone concentrations as compared to the State standard. Monitoring data for Shasta, Yuba, and Merced are not represented on Figures 8-3 through 8-5; however, attainment status is discussed under the associated areas. Figure 8-3 displays the maximum 24-hour PM_{10} concentration, the highest levels that occurred in a single day. The Annual Geometric Mean, Figure 8-4, is an average concentration over the course of a year. Ozone and PM_{10}, as opposed to other criteria pollutants, are highlighted in this discussion because they are the potential pollutants of concern given the proposed Environmental Water Account (EWA) actions.



Source: CARB 2002

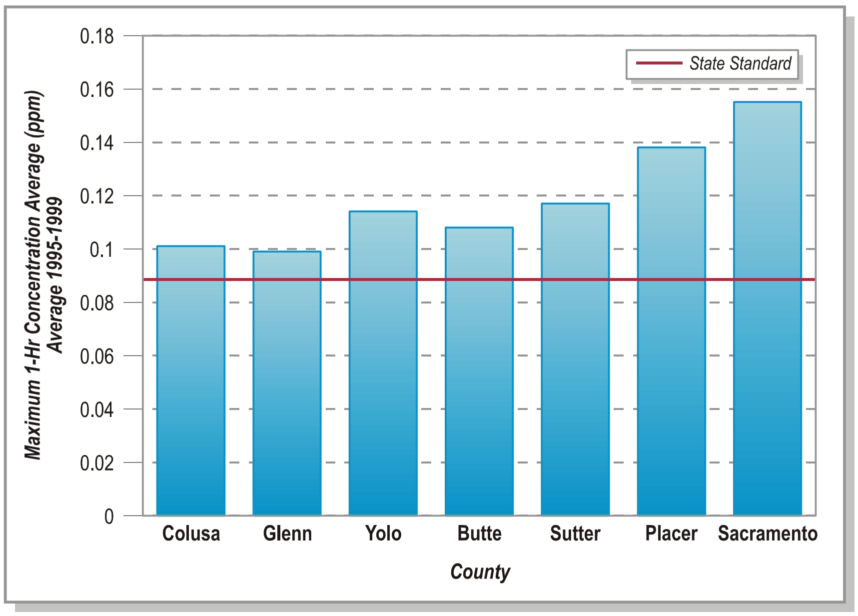
Figure 8-3
PM_{10} Concentrations (Maximum 24-hour) Upstream from the Delta Region



Source: CARB 2002

Figure 8-4
PM_{10} Concentrations (AGM)–Upstream from the Delta Region

Seasonal conditions, such as agricultural harvesting and summer forest fires, affect peak PM_{10} concentrations, which are much higher than the annual average, as the two figures illustrate. Figure 8-5 shows the maximum 1-hour concentration of ozone in relation to the State standard. The region exceeded the national 1-hour standard on 5 days in the year 2000.



Source: CARB 2002

Figure 8-5
Ozone Concentrations – Upstream from the Delta Region

8.1.3.1 Shasta, Glenn, Colusa, Yolo, Butte, Sutter, Yuba, Sacramento, and Placer Counties

Shasta, Glenn, Colusa, Butte, Sutter, Sacramento, Placer, Yuba, and Yolo Counties are nonattainment areas for State PM_{10} standards. All counties are in attainment for Federal standards except Sacramento, which is classified as a moderate nonattainment area for PM_{10}.

On a State level, Yolo County is a serious nonattainment area for ozone; Colusa, Glenn, and Shasta Counties are moderate nonattainment areas for ozone. According to Federal standards, Yolo County is a severe nonattainment area for ozone; Colusa, Glenn, and Shasta Counties are in attainment.

Butte, Sacramento, Placer, and Sutter Counties are nonattainment areas for ozone concentrations. On the Federal level, Butte County is classified as transitional for ozone, Placer, Sacramento, and Sutter Counties are severe nonattainment. Yuba County is a State nonattainment area for ozone, but is in attainment for Federal standards. No monitoring data are available for either PM_{10} or ozone historical concentrations in Yuba County.

8.1.3.2 Merced County

Although Merced County lies upstream from the Delta, the county will be discussed in Section 8.1.5, Export Service Area. Merced County is within the San Joaquin Valley Air Basin, as are all other counties discussed in Section 8.1.5.

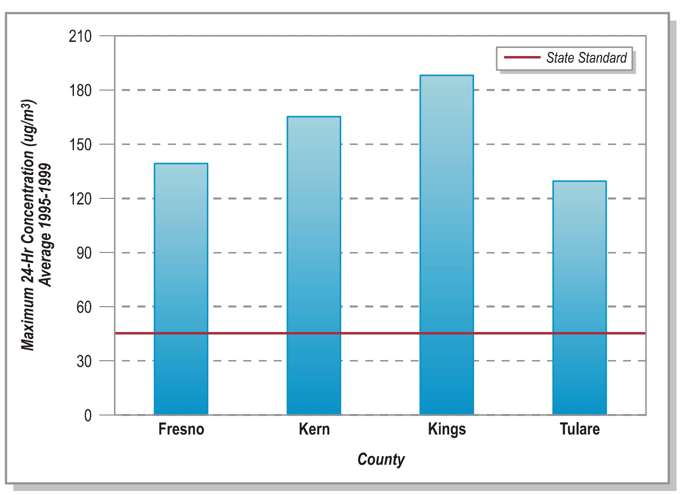
8.1.4 Delta Region

Because no EWA actions that affect air quality would take place in the Delta, a discussion of this region is not included.

8.1.5 Export Service Area

Merced, Fresno, Kern, Kings, and Tulare Counties are within the San Joaquin Valley Air Basin. During the summer, the Pacific high-pressure system moves north, and no precipitation or major storms occur, creating daily inversion layers of cool air over warm air. Surrounding mountains and upper watersheds of the region are at higher elevations than summer inversion layers. As a result, the region is highly susceptible to pollutant accumulation over time. In winter, the Pacific high-pressure system influence moves south and causes alternate periods of unsettled, stormy weather and stable, rainless conditions with winds from the southwest. Most of the San Joaquin Valley is in the rain shadow of the Coast Range and depends on cold, unstable northwesterly flow for its precipitation, consisting of showers following frontal passages.

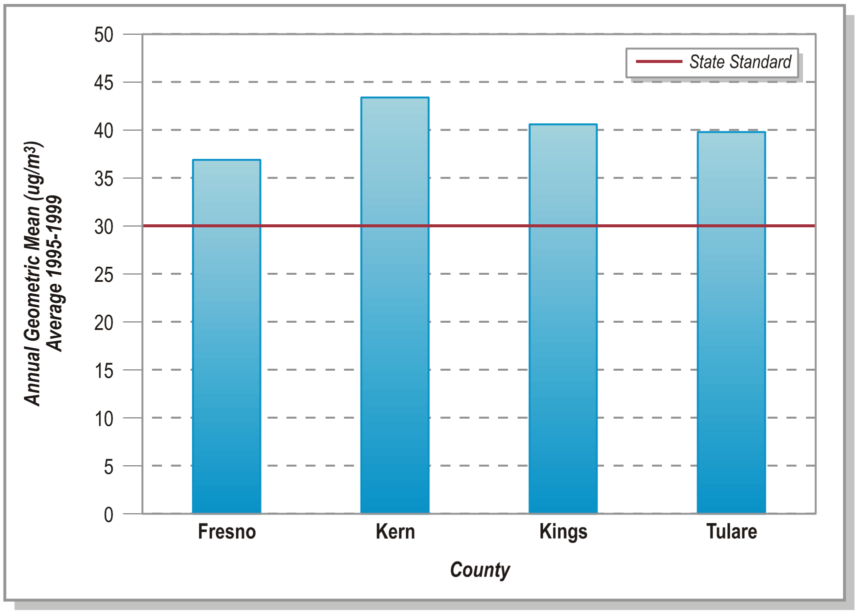
Merced, Fresno, Kern, Kings, and Tulare Counties are classified as nonattainment areas for State and Federal PM_{10} standards. Fresno, Kern, Kings, and Tulare Counties have exceeded the maximum 24-hour PM_{10} concentration and are above State standards (Figure 8-6). (There is no monitoring data available for PM_{10} for Merced County.)



Source: CARB 2002

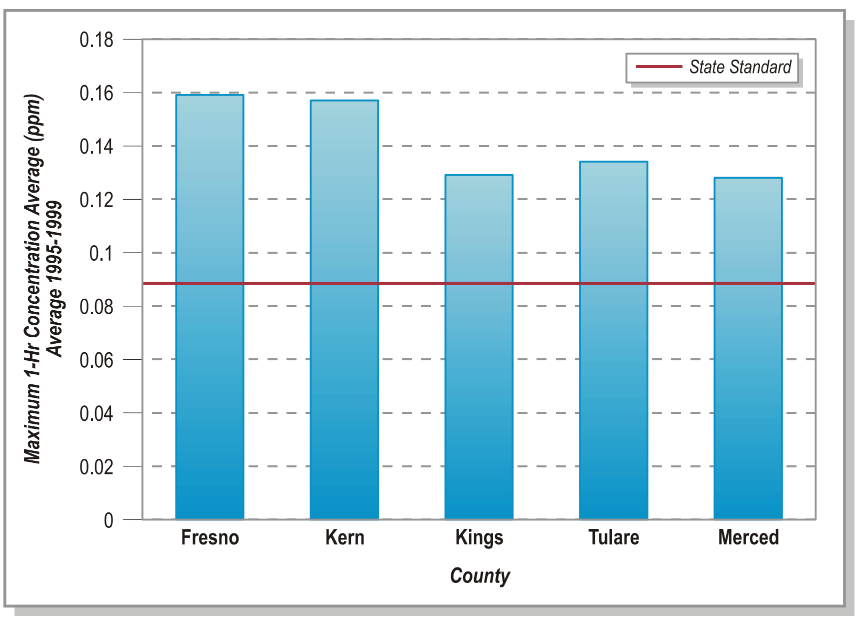
Figure 8-6
PM_{10} Concentrations (Maximum 24-hour) – Export Service Area

Annual PM_{10} concentrations are closer to State standards than the maximum 24-hour concentrations; however, they still exceed the threshold (Figure 8-7). Merced, Fresno, Kern, Kings, and Tulare Counties are severe nonattainment areas for ozone concentrations by State and Federal standards. Figure 8-8 shows ozone concentrations for these counties.



Source: CARB 2002

Figure 8-7
PM_{10} Concentration (AGM) – Export Service Area



Source: CARB 2002

Figure 8-8
Ozone Concentrations– Export Service Area

8.2 Environmental Consequences/Environmental Impacts

8.2.1.1 Assessment Methods

Under each alternative, the EWA Project Agencies would negotiate contracts to purchase water with willing sellers based on a number of factors, including price, water availability, and location. These factors would change from year-to-year; therefore, the EWA Project Agencies may choose to vary their acquisition strategy in each year. To provide maximum flexibility, this analysis includes many potential transfers when the EWA Project Agencies would likely not need all transfers in a given year. Chapter 2 defines the transfers that are included in this analysis.

EWA activities with the potential to contribute to air quality effects include the use of fossil fuel driven pumps to pump groundwater, and crop idling. The exact location of these activities will depend on a number of variables as described in Section 2 of this document. Because of this uncertainty, quantitative dispersion modeling of air pollutants from EWA activities could not be conducted. This analysis focuses on an estimate of the total mass emissions related to EWA actions.

8.2.1.1 Groundwater Substitution

Air quality effects resulting from groundwater substitution activities are limited primarily to generation of criteria pollutants from fossil-fueled pumps. This analysis discusses these effects both qualitatively and quantitatively. The extent of variables that differ across the area of analysis prevents a purely quantitative approach. In developing the projected mass emissions related to groundwater substitution activities, the following assumptions were made:

- Irrigation pumps are powered by 115-horsepower diesel engines;
- Diesel engines are assumed to be 'dirty' operating at 8.75 g NO_x/hp-hr.;
- Irrigation pumps operate for 2,000 hours over the course of the irrigation season;
- Irrigation pumps operate 24 hours/day[3];
- Average depth-to-groundwater ranges from 60 to 100 feet[4];
- A 115-horsepower diesel irrigation pump with a depth to groundwater of 60 to 100 feet can produce 3,000 gallons/minute[5]; and

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[3] Although pumping hours/day varies, it is assumed that pumps run 24 hours/day as a conservative estimate.

[4] Depth to groundwater was approximated based on groundwater maps of the Sacramento Valley.

[5] Irrigation pump engine size and capacity was approximated based on personal communication with pump manufacturer and field verified through discussions with farmers.

- Irrigation efficiency is 70 percent.

The above assumptions provide a conservative, (worst case) estimate of mass emissions.

8.2.1.2 Crop Idling

Air quality effects related to crop idling activities are primarily generation of PM_{10} emissions associated with soil erosion. Some beneficial effects will be generated due to a reduction in emissions associated with general agricultural activities such as the use of diesel-fueled tractors, etc.

The effects of large-scale crop idling on air quality have not been studied in detail or well documented. Although there are equations that can predict soil loss, and thus estimate PM_{10} emissions, these equations are either very specific (for a given field), or very general (based on assumptions that are not accurate for the EWA study area) (Sheldon 2002). The analysis presented in Section 8.2.4.4 assesses the effects of crop idling on air quality using a close approximation based on CARB methods for estimating windblown dust from unpaved roads and compares the results with an estimation of windblown dust from agricultural lands.

Estimates of PM_{10} emissions under existing conditions (agricultural lands under cultivation) have been made based on methodology and data presented in the CARB Emission Inventory, Area Source Categories, Section 7.12, (Windblown Dust – Agricultural Lands) (CARB 1997a). Additionally, emission estimates from mechanical equipment used for cotton land preparation (8.9 lbs/acre/year) and cotton harvest (3.37 lbs/acre/year) (Gaffney 2003) have been applied to the total pounds of PM_{10}/acre/year. The monthly pounds/acre of PM_{10} produced for each of the 12 months was calculated using the normalized monthly emission profiles for land preparation, growth, and harvest presented in the CARB Emission Inventory, Area Source Categories Sections 7.4, 7.5, and 7.12 (CARB 1997a).

The methodology and data presented in the CARB Emission Inventory, Area Source Categories, Section 7.13 (Windblown Dust – Unpaved Roads) (CARB 1997a) have been used to estimate PM_{10} emissions with the EWA (crop idling). In calculating the emissions factors for windblown dust from unpaved roads, the CARB assumed that soil characteristics of the unpaved roads are approximately the same as the soil characteristics in the vicinity of the unpaved roads that are not used for vehicular travel; the CARB states that no additional gravel or amendments have been applied to the soils in the unpaved roads. Therefore, the emissions factors provide good estimates for PM_{10} emissions resulting from idled cropland. The total annual PM_{10} emissions for Fresno, Kern, Kings, and Tulare Counties in pounds/acre/year are taken from the CARB Emission Inventory, Area Source Categories Section 7.13 (CARB 1997a). The monthly pounds/acre of PM_{10} produced for each of the 12 months were calculated using the monthly windblown dust emissions seasonal profile also in Section 7.13.

8.2.2 Significance Criteria

The criteria used to evaluate potential air quality effects are based on standardized air emission levels. Potential air quality effects are considered significant if the implementation of the alternative would cause substantial adverse changes to the baseline (ambient) air quality conditions in the affected area. The range of such changes includes producing pollutants that would either on their own, or when combined with baseline emissions:

- Cause a lowering of attainment status;
- Conflict with an adopted air quality management plan, policy, or program;
- Violate any air quality standard or contribute to an existing or projected air quality violation; or
- Exceed visible dust emissions of 20 percent opacity (San Joaquin Valley Air Pollution Control District regulation).

8.2.3 Environmental Consequences/Environmental Impacts of the No Action/No Project Alternative

Baseline trends in air quality can reasonably be expected to continue if no action is taken. Total air emissions are expected to increase, even assuming that emissions allowable from individual and mobile sources would be regulated more strictly. Increased population and associated increases in the need for more vehicles would be a contributor to the rise in pollutant emissions. Given the short-term duration of the EWA program however, increases (or decreases) beyond current trends would likely be unnoticeable. Therefore, there are no air quality effects of the No Action Alternative. Because the description of the Affected Environment and the No Action/No Project Alternative are the same, they are collectively referred to as the Baseline Condition in the following sections.

8.2.4 Environmental Consequences/Environmental Impacts of the Flexible Purchase Alternative

The Flexible Purchase Alternative allows transfers up to 600,000 acre-feet and does not specify transfer limits from the Upstream from the Delta Region or the Export Service Area. Transfers from the Upstream from the Delta Region would range from 50,000 to 600,000 acre-feet, limited by hydrologic year and conveyance capacity through the Delta. Although all potential transfers would probably not be done in 1 year, this section evaluates the effects of a 1-year transfer of 600,000 acre-feet in order to provide a worst case effect analysis of a maximum transfer scenario. Similarly, the evaluation includes an analysis of up to 540,000 acre-feet in the Export Service Area to cover a maximum transfer scenario for that region.

8.2.4.1 Upstream from the Delta Region

8.2.4.1.1 Shasta, Glenn, Colusa, Yolo, Butte, Sutter, Yuba, Sacramento, and Placer Counties

The potential effects on air quality due to groundwater substitution, stored groundwater purchase, and crop idling would not differ by county. Therefore, the effects of the EWA actions are evaluated for the Upstream from the Delta Region as a whole.

Groundwater substitution would require use of groundwater pumps to retrieve groundwater. Groundwater substitution would take place in Glenn, Colusa, Yolo, Butte, Sutter, Sacramento, Shasta, and Yuba Counties. Agricultural users would use groundwater instead of surface water for their water supply. The use of groundwater would require pumps to lift the groundwater to the surface. Groundwater pumps can be driven by many different means. Table 8-4 shows the estimated NO_x and PM_{10} emissions for a 115 hp pump with electric, propane, and diesel motors, operating under the assumptions described in Section 8.2.1.1. NO_x and PM_{10} emissions are presented because several counties are in nonattainment for ozone and PM_{10} and NO_x is considered an ozone precursor. This information is for comparison purposes, but actual pollutants emitted depend on how the pump is powered, the size of the pump, the efficiency of the well, the length of time the pump is running, and the depth to groundwater.

Table 8-4
Groundwater Pump Emissions by Motor Type

Motor Type	***NO_x (lbs/year)***	***PM_{10} (lbs/year)***
"Dirty" Diesel	2,544	236
"Clean" Diesel	2,007	236
Electric	84	5.6
Propane	562	66

Source: California Farm Bureau Federation 1999.
These calculations assume that the pump would operate 2,000 hours in an average year.

Electric pumps do not emit pollutants at the pump; the source of pollutants can be traced to emissions from the powerplant. Powerplants are given permits based on their maximum operating potential. Although the electricity required to power the groundwater pumps would not be needed under the Baseline Condition, the additional electricity would not cause any powerplant to exceed operating capacity. A majority of power is derived from fossil fuel combusted at powerplants to generate electricity required to run the groundwater pumps. CO_2 is the primary pollutant emitted as a result of the oxidation of the carbon in the fuel. NO_x and PM_{10} are also emitted. As mentioned previously, these pollutants are noteworthy because many of the counties in the Upstream from the Delta Region are nonattainment areas for ozone and PM_{10}.

Diesel pump engines emit air pollutants through the exhaust. The primary pollutants from the pumps are NO_x, TOC, CO, and particulates (including visible and nonvisible emissions). Pumps that run on propane burn much cleaner than diesel, but still contribute NO_x, CO_2, VOCs, and trace amounts of SO_2 and particulate matter[6].

The pumps that would be used for groundwater substitution are existing pumps; no new pumps would be installed as a result of this alternative. The pumps have most likely been used in the past and will be used in the future; thus, the pumps are not a new source of emissions. However, groundwater substitution activities would result in use of the pumps at times when they would otherwise not be used. It is therefore necessary to quantify the project-related emissions to determine effects.

Table 8-5 shows the NO_x and PM_{10} emissions generated as a result of pump operation based on the assumptions listed above and in Section 8.2.1.1. The amounts represent pollutant emissions if the maximum transfer in each county was pumped using "dirty diesel" motors. This assumption represents a conservative worst-case estimate.

The values presented in Table 8-5 include the CARB estimated daily emissions from diesel-fueled groundwater pumps. This analysis assumes that the groundwater pumps will be operating from April through September. CARB's estimated emissions over this same time period were calculated using a temporal profile developed by CARB. According to CARB surveys, approximately 74.7 percent of groundwater pump emissions occur between April and September.

The project-related emissions, both NO_x and PM_{10}, in Sacramento, Yolo, Sutter, Glenn, and Colusa Counties have been accounted for within CARB's inventory as is demonstrated by the fact that the annual average EWA project emissions produced from groundwater pumping would fall below the diesel-fueled groundwater pump emission inventory. However, because the project-related emissions would be produced in a nonattainment area, the project would contribute to an existing air quality violation, which is a significant impact. Butte, Shasta, and Yuba Counties exceed CARB's inventory, also producing a significant impact. The mitigation measures listed in Section 8.2.7 would lower emissions to a negligible amount; therefore, these significant impacts would be reduced to a less-than-significant level.

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6 NO_x = Nitrogen oxides, TOC = Total organic carbon, CO = Carbon monoxide, CO_2 = Carbon dioxide, VOCs = Volatile organic compounds, SO_2 = Sulfur dioxide.

Table 8-5
Groundwater Pump Emissions – Flexible Purchase Alternative – Upstream from the Delta Region

	CARB Average Daily Emissions (Tons/day)		***CARB Annual Emissions (Tons/year)***		***CARB Apr – Sep Daily Emissions (Tons/day)***		***Project Average Daily Emissions (Tons/day)***		***Project Annual Emissions (Tons/year)***		***Project Apr – Sep Daily Emissions (Tons/day)***		***Difference between Project and CARB Apr – Sep Daily Emissions (Tons/day)***	
County	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**
Sacramento	0.38	0.03	138.7	10.95	0.57	0.04	0.05	<0.01	18.25	<3.00	0.07	<0.01	-0.50	0
Yolo	4.29	0.31	1565.9	113.15	6.39	0.46	0.02	<0.01	7.30	<3.00	0.03	<0.01	-6.36	0
Feather River (Sutter)	2.06	0.15	751.9	54.75	3.07	0.22	0.07	<0.01	25.55	<3.00	0.10	<0.01	-2.97	0
Butte County	0.26	0.02	94.90	7.3	0.39	0.03	0.37	0.01	135.05	3.65	0.55	0.01	0.16	-0.02
Shasta County	0.088	0.001	32.12	0.365	0.13	<0.01	0.18	<0.01	65.70	<3.00	0.27	<0.01	0.14	0
Colusa	0.16	0.005	58.40	1.825	0.24	0.01	0.14	<0.01	51.10	<3.00	0.21	<0.01	-0.03	0
Glenn County	0.21	0.01	76.65	3.65	0.31	0.01	0.19	0.01	69.35	3.65	0.28	0.01	-0.03	0
Feather River (Yuba)	0.176	0.01	64.24	3.65	0.26	0.01	0.38	0.02	138.70	7.30	0.57	0.03	0.31	0.02

Notes:
CARB April – September Daily Emissions were calculated by taking 74.7 percent of the total annual emissions and dividing by 183 days (# of days from April through September).
Shasta and Yuba Counties are not included in CARB's estimate. For these Counties, the emissions were estimated using average emission values per pump.
Exceeds Statewide Inventory

EWA acquisition of water via crop idling in the Sacramento Valley would result in temporary conversion of lands from rice crops to bare fields. The overall effects on air quality are based on the effects of the reduction of air emissions due to declining use of farming equipment and pesticide applications and the effects, if any, of leaving rice fields idled.

During a typical calendar year of operation for rice production, farm equipment is required for preparing seedbeds, plowing and discing in March and April, harvesting in late September and October, and disposing of residue and discing in late October through November. Rice farmers apply fertilizers and pesticides during the spring. The equipment required for these activities produces both dust from disturbed soils and combustion emissions, which contribute to poor air quality. Additionally, burning of rice fields contributes to particulate matter and ground-level ozone concentrations. Idling rice fields would reduce the use of farm equipment and associated pollutant emissions, resulting in a beneficial impact on air quality.

The only potential adverse effect on air quality from idled rice fields would be PM_{10} from potential erosion of barren fields (caused by wind or vehicles driving on the fields). The soil texture in the Sacramento Valley reduces the potential for erosion. Highly erodible lands are those with fine soil texture and correspond to increased soil erosion. Increased soil erosion creates a larger amount of soil particulates entrained into the air; a percentage of which are particles small enough to be considered PM_{10}. Soil types in the Sacramento Valley are generally not considered highly erodible.

The rice crop cycle also reduces the potential for erosion. The process of rice cultivation includes incorporating the leftover rice straw into the soil after harvest. Farmers flood the rice fields during the winter to aid in decomposition of the straw. If no additional irrigation water were applied to the fields after this point (because the farmers would sell water to the EWA agencies), the soils would remain moist until approximately mid-May. Once dried, the combination of the decomposed straw and clay soils produces a hard, crust-like surface. This surface type, in contrast to sandy topsoil, would not be conducive to soil loss from wind erosion (Mutters 2002). Therefore, there would be little to no fugitive dust from wind erosion off the idled rice fields. Effects on sensitive receptors, such as nearby residents, would also be minimal. Therefore, effects on air quality from idled rice fields would be less than significant.

8.2.4.2 Delta Region

There are no EWA actions within the Delta; therefore, the EWA would cause no impacts on air quality in this region.

8.2.4.3 Export Service Area

EWA acquisition of water via stored groundwater purchase would require increased pumping. Stored groundwater would be purchased from Kern County Water Agency, Arvin Edison, and Semitropic. Air quality effects from operation of Semitropic's facilities were found to be less than significant in the 1994 Semitropic Banking Project EIR. The majority of the extraction pumps are electrical. The pumps at Semitropic are approximately 75 percent electric and 25 percent diesel/natural gas (Boschman 2002), and the pumps at Arvin Edison and Kern County Water Agency are 100 percent electric (Lewis 2002 and Iger 2002). Electric pumps are not a considerable source of NO_x or PM_{10}. Additional pumping using primarily electric motors would slightly increase NO_x and PM_{10}, but not substantially above the Baseline Condition. Therefore, the effects of stored groundwater purchase on air quality are less than significant.

EWA acquisition of water via groundwater substitution from Merced Irrigation District would require increased pumping. Agricultural users would use groundwater instead of surface water for their water supply. The use of groundwater would require pumps to lift the groundwater to the surface. As stated in Section 8.2.4.1, groundwater pumps can be driven by electric, propane, or diesel motors. Pollutants emitted depend on how the pump is powered, the size of the pump, the efficiency of the well, the length of time the pump is running, and the depth to groundwater. Electric pumps do not emit pollutants at the pump; the source of pollutants can be traced to emissions from the powerplant. Table 8-6 shows the NO_x and PM_{10} emissions related to pump generation based on the assumptions listed in Section 8.2.1.1. The amounts represent pollutant emissions if the maximum transfer in the Export Service Area (Merced County) was pumped using “dirty diesel”.

The project-related NO_x emissions in Merced County have been accounted for in CARB’s inventory as is demonstrated by the fact that the annual EWA project emissions produced from groundwater pumping would fall below the diesel-fueled agricultural pump emission inventory. However, because the project-related emissions would be produced in a nonattainment area, the project would contribute to an existing air quality violation, which is a significant impact. The mitigation measures listed in Section 8.2.7 would lower emissions to a negligible amount; therefore, these significant impacts would be reduced to a less-than-significant level.

Table 8-6 Groundwater Pump Emissions – Flexible Purchase Alternative – Export Service Area														
	CARB Average Daily Emissions (Tons/day)		***CARB Annual Emissions (Tons/year)***		***CARB Apr – Sep Daily Emissions (Tons/day)***		***Project Average Daily Emissions (Tons/day)***		***Project Annual Emissions (Tons/year)***		***Project Apr – Sep Daily Emissions (Tons/day)***		***Difference between Project and CARB Apr – Sep Daily Emissions (Tons/day)***	
County/ Region	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**
San Joaquin Valley														
Merced	0.98	0.07	357.7	25.55	1.46	0.10	0.11	<0.01	40.15	<3.0	0.16	<0.01	-1.30	-<0.09

Notes:

CARB April – September Daily Emissions were calculated by taking 74.7 percent of the total annual emissions and dividing by 183 days (# of days from April through September).

EWA acquisition of water via crop idling in the Export Service Area would result in temporary conversion of lands from cotton crops to bare fields. Under the Baseline Condition, farmers would continue to grow cotton. PM_{10} emissions would result from land preparation, harvesting, and to some extent wind erosion; however, the cotton plants would serve as vegetative cover to control a majority of the erosion.

Using the assessment method discussed in Section 8.2.1.2, Table 8-7shows the PM_{10} emissions for the Baseline Condition (cotton cultivation). As would be expected, PM_{10} emissions for the Baseline Condition are lowest during January and highest during April/May (land preparation) and October/November (harvest).

Table 8-7
Monthly Estimates of PM_{10} Emissions under the Baseline Condition

County	***APR***	***MAY***	***JUN***	***JUL***	***AUG***	***SEP***	***OCT***	***NOV***	***DEC***	***JAN***	***FEB***	***MAR***	***Total***
Fresno	3.88	3.35	1.58	1.66	2.13	1.96	3.76	4.39	1.93	0.24	0.47	0.64	25.99
Kern	2.71	2.11	1.20	1.23	1.34	1.07	3.41	4.46	1.94	0.27	0.52	0.62	20.88
Kings	4.89	2.53	1.14	1.20	1.43	1.53	3.98	4.97	2.00	0.28	0.49	0.67	25.11
Tulare	1.50	1.37	0.80	1.04	1.12	0.78	3.08	4.22	1.85	0.22	0.40	0.55	16.93

All values are in pounds/acre/year
Emission factors from CARB 1997a, Attachment A (nonpasture)

Willing sellers would idle fields that would have grown cotton in the Baseline Condition to use the irrigation water supply as an EWA asset. Beneficial air quality effects of this action include a reduction of air emissions due to less use of farming equipment and reduced pesticide applications. Potential adverse air quality effects result from the production of fugitive dust and PM_{10} through soil erosion on areas with no groundcover.

Using the assessment method discussed in Section 8.2.1.2, Table 8-8 shows PM_{10} emissions from idling cotton fields. Generally, PM_{10} emissions in May through October are higher than in the rest of the year. Little to no precipitation, low soil moisture, and windy conditions contribute to high PM_{10} emissions during this time of the year. EWA actions would produce 5 to 9 times more PM_{10} emissions/acre/year compared to the emissions under the Baseline Condition. These additional emissions would contribute to an existing air quality violation because Kern, Kings, Fresno, and Tulare Counties are nonattainment for PM_{10}. Implementation of the mitigation measures described in Section 8.2.7 would lessen the soil erosion potential and therefore fugitive dust and PM_{10} emissions. The potentially significant impact would be reduced to less than significant.

Table 8-8 Monthly Estimates of PM_{10} Emissions under Program Conditions													
County	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**Total**
Fresno	19.95	24.38	24.38	24.38	24.38	24.38	20.96	11.69	9.27	6.05	6.65	5.24	201.5
Kern	15.53	15.53	15.53	15.53	15.53	15.53	15.53	12.75	8.35	6.15	6.45	4.25	146.5
Kings	23.00	23.00	23.00	23.00	23.00	23.00	23.00	19.99	12.9	8.39	7.53	6.02	215
Tulare	8.74	9.66	10.16	10.16	10.16	10.16	10.16	4.87	3.28	2.35	2.69	1.76	84

All values are in pounds/acre/year
Emission factors from CARB 1997b, Table 2

The analysis thus far has been based on a 1-year water transfer; however, the EWA agencies and willing sellers may agree to multi-year transfers. No effects as discussed would accumulate from one year to another. Therefore, the effects presented in Sections 8.2.4.1 and 8.2.4.3 would be the same whether agencies sold water for one or multiple years.

8.2.5 Environmental Consequences/Environmental Impacts of the Fixed Purchase Alternative

The Fixed Purchase Alternative specifies purchases of 35,000 acre-feet from the Upstream from the Delta Region and 150,000 acre-feet from the Export Service Area. Although the amounts in each region are fixed, the acquisition types and sources could vary. This section analyzes the effects of each potential transfer to allow the EWA Project Agencies maximum flexibility when negotiating purchases with willing sellers. These transfers are the same actions as those described for the Flexible Purchase Alternative, but the amounts are limited by the total acquisition amount in each region (35,000 acre-feet from the Upstream from the Delta Region and 150,000 acre-feet from the Export Service Area).

8.2.5.1 Upstream from the Delta Region

Groundwater substitution would require use of groundwater pumps to retrieve groundwater. Table 8-9 shows the NO_x and PM_{10} emissions generated as a result of pump operation based on the assumptions listed in Section 8.2.1. The amounts represent pollutant emissions if the maximum transfer in each county was pumped using “dirty diesel” motors. This assumption represents a conservative worst- case estimate. The values presented in Table 8-9 include the CARB estimated daily emissions from diesel-fueled agricultural irrigation pumps. This analysis assumes that the groundwater pumps will be operating from April through September. CARB’s estimated emissions over this same time period were calculated using a temporal profile developed by CARB. According to CARB surveys, approximately 74.7 percent of groundwater pump emissions occur between April and September.

Table 8-9
Groundwater Pump Emissions – Fixed Purchase Alternative – Upstream from the Delta Region

	CARB Average Daily Emissions (Tons/day)		CARB Annual Emissions (Tons/year)		CARB Apr – Sep Daily Emissions (Tons/day)		Project Average Daily Emissions (Tons/day)		Project Annual Emissions (Tons/year)		Project Apr – Sep Daily Emissions (Tons/day)		Difference between Project and CARB Apr – Sep Daily Emissions (Tons/day)	
County	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**	**NO_x**	**PM_{10}**
Sacramento	0.38	0.03	138.7	10.95	0.57	0.04	0.05	<0.01	18.25	<3.00	0.07	<0.01	-0.50	0
Yolo	4.29	0.31	1565.9	113.15	6.39	0.46	0.02	<0.01	7.30	<3.00	0.03	<0.01	-6.36	0
Feather River (Sutter)	2.06	0.15	751.9	54.75	3.07	0.22	0.07	<0.01	25.55	<3.00	0.10	<0.01	-2.97	0
Butte County	0.26	0.02	94.90	7.3	0.39	0.03	0.16	0.01	57.00	3.65	0.23	0.01	-0.08	-0.02
Shasta County	0.088	0.001	32.12	0.365	0.13	<0.01	0.16	<0.01	57.00	<3.00	0.23	<.01	0.10	0
Colusa	0.16	0.005	58.40	1.825	0.24	0.01	0.14	<0.01	50.00	<3.00	0.20	<.01	-0.04	0
Glenn County	0.21	0.01	76.65	3.65	0.31	0.01	0.16	0.01	57.00	3.65	0.23	0.01	0.00	0
Feather River (Yuba)	0.176	0.01	64.24	3.65	0.26	0.01	0.16	0.02	57.00	7.30	0.23	0.03	-0.03	0.02

Notes:
CARB April – September Daily Emissions were calculated by taking 74.7 percent of the total annual emissions and dividing by 183 days (# of days from April through September).
Shasta and Yuba Counties are not included in CARB's estimate. For these Counties, the emissions were estimated using average emission values per pump.
Exceeds Statewide Inventory

The project-related NO_x emissions in all counties except Shasta County have been accounted for within CARB's inventory as is demonstrated by the fact that the annual average EWA project emissions produced from groundwater pumping fall below the diesel-fueled agricultural pump emission inventory. The project-related PM_{10} emissions in all counties except Yuba County have also been accounted for within CARB's inventory. However, because all project-related emissions would be produced in nonattainment areas, the project would contribute to an existing air quality violation, which is a significant impact. Shasta and Yuba Counties exceed CARB's inventory, also producing a significant impact. The mitigation measures listed in Section 8.2.7 would lower emissions to a negligible amount; therefore, these significant impacts would be reduced to a less-than-significant level.

EWA acquisition of water via crop idling in the Sacramento Valley would result in temporary conversion of lands from rice crops to bare fields. Crop idling upstream from the Delta could potentially cause significant impacts on air quality because idling a maximum of 15,100 acres would increase PM_{10} emissions. As stated in Section 8.2.4.2, the only potential adverse effect on air quality from idled rice fields would be PM_{10} from erosion of barren fields (caused by wind or vehicles driving on the fields). The rice crop cycle and soil texture reduces the potential for erosion. If no irrigation water were applied to the rice fields after their being flooded the previous winter, the soils would remain moist until approximately mid-May. Once dried, the combination of the decomposed straw and clay soils produces a hard, crust-like surface, not conducive to soil loss from wind erosion. Therefore, wind would erode little to no fugitive dust off the idled rice fields. Effects on sensitive receptors, such as nearby residents, would also be minimal. Therefore, effects on air quality from idled rice fields would be less than significant.

8.2.5.2 Export Service Area

EWA acquisition of water via stored groundwater purchase would require increased pumping. Stored groundwater would be purchased from Kern County Water Agency, Arvin Edison, and Semitropic. Air quality effects from operation of Semitropic's facilities were found to be less than significant in the 1994 Semitropic Banking Project EIR. The majority of the extraction pumps are electrical. The pumps at Semitropic are approximately 75 percent electric and 25 percent diesel/natural gas (Boschman 2002), and the pumps at Arvin Edison and Kern County Water Agency are 100 percent electric (Lewis 2002 and Iger 2002). Electric pumps are not a considerable source of NO_x or PM_{10}. Additional pumping using primarily electric motors would slightly increase NO_x and PM_{10}, but not substantially above the Baseline Condition. Therefore, the effects of stored groundwater purchase on air quality would be less than significant.

EWA acquisition of water via groundwater substitution from Merced Irrigation District would require increased pumping. Because the same amount of water could be purchased under the Fixed Purchase Alternative as described in the Flexible Purchase Alternative, the effects on air quality as listed in Section 8.2.4.3 would be the same.

Therefore, the significant impacts on air quality from groundwater substitution in Merced County would be less than significant with mitigation.

EWA acquisition of water via crop idling in the Export Service Area would result in temporary conversion of lands from cotton crops to bare fields. As stated in Section 8.2.4.3, program effects produce both beneficial and adverse effects on air quality. Beneficial air quality effects of this action include a reduction of air emissions due to less use of farming equipment and reduced pesticide applications. Potential adverse air quality effects result from the production of fugitive dust and PM_{10} through soil erosion on areas with no groundcover.

The potential production of PM_{10} is discussed in Section 8.2.4.3. The effects described under the Flexible Purchase Alternative are equivalent to the effects under the Fixed Purchase Alternative because the amount of PM_{10} produced is analyzed on a per-acre basis. The estimated quantity of PM_{10} produced ranges from 84 to 215 pounds of PM_{10}/acre/year, as listed in Table 8-8. Given that Fresno, Kern, Kings, and Tulare Counties are nonattainment areas for PM_{10}, increased PM_{10} could contribute to the nonattainment status in these counties, resulting in a potentially significant impact. The implementation of mitigation measures listed in Section 8.2.7 would reduce the impact of crop idling to less than significant.

The analysis thus far has been based on a 1-year water transfer; however, the EWA agencies and willing sellers may agree to multi-year transfers. No effects as discussed would accumulate from one year to another. Therefore, the effects presented in Sections 8.2.5.1 and 8.2.5.3 would be the same whether agencies sold water for one or multiple years.

8.2.6 Comparative Analysis of Alternatives

This chapter has thus far analyzed the effects of many potential transfers, looking at the "worst-case scenario" that would occur if all acquisitions happened in the same year. This approach ensures that all effects of transfers are included and provides the EWA Project Agencies the flexibility to choose transfers that may be preferable in a given year. The EWA, however, would not actually purchase all this water in the same year. This section provides information about how EWA would more likely operate in different year types. A further comparison of the alternatives is listed in Table 8-10.

Table 8-10
Comparison of the Effects of the Flexible Purchase and Fixed Purchase Alternatives on Air Quality

Region	Asset Acquisition or Management	Result	Effects	Flexible Alternative Change from Baseline	Fixed Alternative Change from Baseline	Significance of Flexible Purchase Alternative	Significance of Fixed Purchase Alternative
Upstream from the Delta	Crop Idling	Conversion of rice crops to bare fields.	Reduced rice crop acreage in Glenn, Colusa, Yolo, Butte, Sutter, and Placer Counties.	Idle acres that could contribute to fugitive dust emissions.	Idle acres that could contribute to fugitive dust emissions.	LTS	LTS
	Groundwater Substitution	Groundwater used in place of surface water.	Increased emissions from use of groundwater pumps.	Increased groundwater pumping	Increased groundwater pumping.	PS; LTS with mitigation.	PS; LTS with mitigation.
	Stored groundwater purchase	Extraction of water from groundwater storage.	Increased emissions from extraction pumps.	Slight increase in PM_{10} and NO_x.	Slight increase in PM_{10} and NO_x.	LTS	LTS
Export Service Area	Crop Idling	Conversion of cotton crops to bare fields.	Reduced cotton crop acreage in Fresno, Kern, Kings, and Tulare Counties.	Idle acres that could contribute to fugitive dust emissions.	Idle acres that could contribute to fugitive dust emissions.	PS; LTS with mitigation.	PS; LTS with mitigation.
	Groundwater Substitution	Groundwater used in place of surface water.	Increased emissions from use of groundwater pumps.	Increased groundwater pumping	Increased groundwater pumping.	PS; LTS with mitigation.	PS; LTS with mitigation.
	Stored Groundwater Purchase	Extraction of water from groundwater storage.	Increased emissions from extraction pumps.	Slight increase in PM_{10} and NO_x.	Slight increase in PM_{10} and NO_x.	LTS	LTS

8.2.6.1 Upstream from the Delta Region

In the Upstream from the Delta Region, under the No Project Alternative, crop idling could occur because of unreliable water supplies, economic factors, or as part of a crop rotation. In very dry years, water supplies would be less as compared to wet years. Reduced supplies could cause an increase in crop idling and an increase in PM_{10} emission. Reduced surface water supplies could also lead to increased groundwater pumping and NO_x emissions.

The Fixed Purchase Alternative would be limited to a maximum acquisition of 35,000 acre-feet from all sources of water. This amount could typically be obtained from stored reservoir water purchases in most year types. The Fixed Purchase Alternative would therefore not likely involve acquisition of groundwater or crop idling and thus would have no effect on air quality. In very dry years, stored reservoir water may not be available, and the EWA would acquire water first from groundwater substitution and/or groundwater purchase, followed by crop idling. Therefore, during dry years, effects on air quality could be possible; however, the effects would be less than significant.

The Flexible Purchase Alternative could involve the purchase of up to 600,000 acre-feet of water from all sources upstream from the Delta. EWA agencies would prefer to purchase water from upstream sources because the water is generally less expensive. The amount that could be purchased would be limited by the capacity of the Delta export pumps to move the water to the Export Service Area. During wet years, excess pump capacity may be limited to as little as 50,000 to 60,000 acre-feet of EWA asset water because the pumps primarily would be used to export Project water to Export Service Area users. During dry years, when less Project water would be available for pumping (and therefore the pumps would have greater availability capacity), the EWA Project Agencies could acquire up to 600,000 acre-feet of water from sources in the Upstream from the Delta Region.

The potential for effects on air quality during wet years for the Flexible Purchase Alternative would be very similar to the Fixed Purchase Alternative. That is, during wet years, acquisition would most likely be from stored reservoir water; EWA Project Agencies would not acquire water from groundwater and crop idling. As rainfall amounts for areas upstream from the Delta decrease, reflecting dry-year conditions, the greater capacity of the export pumps to move EWA assets could result in a greater reliance on groundwater substitution and crop idling for additional EWA acquisitions. If the EWA Project Agencies were to acquire 600,000 acre-feet from the Upstream from the Delta Region, they would need to utilize most available sources, including stored reservoir water, groundwater substitution, stored groundwater purchase, and crop idling. Therefore, effects on air quality could be possible; however, the effects would be less than significant with the exception of groundwater substitution in Yuba County, which is a significant impact. Implementation of mitigation measures listed in Section 8.2.7 would reduce the impact to a less-than-significant level.

8.2.6.2 Export Service Area

Under the No Project Alternative, effects in the Export Service Area in dry years compared to wet years would be the same as described under the Upstream from the Delta Region.

EWA asset acquisitions in the Export Service Area under the Fixed Purchase Alternative would be limited to 150,000 acre-feet from stored groundwater purchase and crop-idling sources. The EWA agencies would purchase stored groundwater initially; however, the amount of water in storage may not be sufficient to supply the EWA with water for multiple years. Crop idling would supplement water needs beyond what could be acquired from stored groundwater. Stored groundwater purchase would not produce a substantial amount of pollutants because electric pumps are used to lift the water. Crop idling could cause a potentially significant impact from the production of PM_{10} off idled fields. Mitigation measures however, would reduce the effects to less than significant.

EWA asset acquisitions in the Export Service Area under the Flexible Purchase Alternative would be dependent on the water year type upstream from the Delta. Export pump capacity during wet years would limit the availability of the EWA Project Agencies to move assets through the Delta, requiring reliance on greater purchase amounts from the Export Service Area. During wet years, acquisitions within the Export Service Area could involve up to 540,000 acre-feet of assets. The EWA agencies would acquire assets from stored groundwater purchase and idled cropland. As under the Fixed Purchase Alternative, stored groundwater purchase would not produce a substantial amount of pollutants because electric pumps are used to lift the water. During wet years, the Flexible Purchase Alternative would potentially have a greater effect on air quality because a larger number of acres could be idled than under the Fixed Purchase Alternative. However, mitigation measures would reduce both the Flexible and Fixed Purchase Alternatives to a less-than-significant level.

8.2.7 Mitigation Measures

8.2.7.1 Groundwater Substitution

If the EWA agencies obtain water from groundwater substitution, increased groundwater pumping would increase NO_x emissions. The EWA agencies and willing sellers would work together to implement one, or a combination, of the following mitigation measures that is appropriate to reduce impacts to a less-than-significant level. The mitigation measures will be implemented within the willing seller's air district.

- EWA agencies will require willing sellers to use only electric pumps.
- EWA agencies will require willing sellers to use electric or propane-fueled pumps. For each propane-fueled pump, a diesel engine within the district that is not a part of the EWA must be replaced with a propane or electric pump to 'offset' the emissions from the project-related pump.
- EWA agencies will require the willing sellers to purchase offsets to compensate for producing project-related emissions.

8.2.7.2 Crop Idling

If the EWA agencies obtain water from idling cotton crops, the San Joaquin Valley APCD must approve a Dust Suppression Plan that results in less-than-significant air quality effects. Willing sellers will work with EWA agencies and the APCD to establish these plans, using mitigation measures described in Table 8-11 that are appropriate for each site.

Table 8-11
Mitigation Measures

Measure	Feasibility
1. Crop shift (for example, shift to winter wheat). Wheat would be harvested between mid-June and mid-July. The stubble and chaff would be left on the fields to maintain a vegetative cover and reduce the surface area exposed to wind. Additionally, the root system would serve to hold the topsoil in place. Less soil erosion corresponds to less particulate matter entrained into the air.	Winter wheat is a common crop alternated with cotton crops. There is no requirement for a plowdown of the stubble as is required for cotton plants. Crop shifting to winter wheat would greatly reduce soil erodibility. This mitigation measure would increase surface roughness, vegetative cover, and soil moisture and would reduce the impact to less than significant.
2. Increase surface roughness, which reduces wind speed at the soil surface so that the wind is less able to move soil particles. Ripping clay soil using spikes will usually bring up non-erodible clods, creating a rough surface. If soils are sandy, listing, instead of ripping, is used because sandy soils do not produce durable clods. Listing ridges the soil and brings up firmer subsoil. Furrowing fields also increases surface roughness. Peaked furrows would control erosion more effectively than flat furrows. Depending on soil texture, the above methods may need to be repeated throughout the summer.	These practices would reduce soil erodibility and associated entrainment of particulate matter. Depending on soil properties, this mitigation measure alone may not reduce effects to less than significant.
3. Establish wind breaks, which consist of trees or bushes that aid in reducing wind velocity across fields. As a general rule, for every 1 foot in height, the wind break will afford protection to 10 feet of field.	Due to the short-term nature of the transfer, 1 year, newly planted wind breaks would not have grown to sufficient height to substantially reduce impacts. However, wind breaks could be planted as mitigation for the future. The effect of this mitigation measure alone would not reduce the impact to less than significant.
4. After harvest the year before the transfer, leave crop residue on the fields to decrease surface area exposed to strong winds.	Due to required pest management activities for cotton crops, farmers must plow crop residue under by mid-December. Therefore, the crop residue would not be available afterward as a cover to prevent fugitive dust due to wind erosion.
5. Restrict motorized vehicles or the times of operation for certain off-road vehicles on idled agricultural land.	Farmers' preference is to disc a few times throughout the summer to prevent weeds from producing seeds that can be a nuisance the following year.
6. Water fields prior to especially windy periods.	Under program alternatives, farmers would have sold their irrigation water to the EWA and could not apply water to the fields.

8.2.8 Potentially Significant Unavoidable Impacts

There are no potentially significant unavoidable impacts.

8.2.9 Cumulative Effects

8.2.9.1 Upstream from the Delta Region

In the Upstream from the Delta Region, five programs (Sacramento Valley Water Management Agreement, Dry Year Purchase Program, Drought Risk Reduction Investment Program, Environmental Water Program, and Central Valley Project Improvement Act Water Acquisition Program) would contribute to NO_x emissions from groundwater pumping (three of the five would only occur during dry years). In the Upstream from the Delta Region, ozone attainment status is an issue of concern; additional emissions of ozone precursors from other programs would contribute to already high ozone concentration areas, creating a potentially significant cumulative impact. However, the EWA is implementing mitigation measures listed in Section 8.2.7, which would also alleviate the cumulative impact. Therefore EWA's contribution is less than cumulatively considerable and thus not significant.

Four programs (Sacramento Valley Water Management Agreement, Dry Year Purchase Program, Environmental Water Program, and Drought Risk Reduction

Investment Program) would include crop idling as a water acquisition method (during dry years only). Due to the lack of highly erodible soils in the Upstream from the Delta Region, the emission of PM_{10} from EWA actions in combination with other programs would not produce a significant effect.

8.2.9.2 Export Service Area

Groundwater substitution would take place as part of two programs, the Drought Risk Reduction Investment Program and the Central Valley Project Improvement Act Water Acquisition Program. As stated above, increased groundwater pumping corresponds to increased NO_x emissions. Merced County is a severe nonattainment area for ozone. The production of ozone precursors by several programs could lead to a potentially significant cumulative impact. However, the EWA is implementing mitigation measures listed in Section 8.2.7, which would also alleviate the cumulative impact. Therefore EWA's contribution would be less than cumulatively considerable and thus not significant.

One program, the Drought Risk Reduction Investment Program, would include crop idling in the Export Service Area. Crop idling causes increased fugitive dust emissions and associated PM_{10} emissions, as discussed above. Both fugitive dust and PM_{10} are currently at high concentrations in this region. The production of PM_{10} by several programs (e.g., water transferred to Metropolitan Water District to replace reduced Colorado River supply) could lead to a potentially significant cumulative impact. However, Fresno, Kern, Kings, and Tulare Counties are within the San Joaquin Valley APCD. The APCD regulates fugitive dust emissions and requires adherence to mitigation measures in the form of a dust suppression plan. It is anticipated that the Drought Risk Reduction Investment Program, or any other crop idling program, would also be required to comply with the APCD regulations so as not to produce a cumulative effect; however, this cannot be stated definitively. Because the EWA is contributing to mitigation measures to lessen impacts, their contribution would be less than cumulatively considerable and thus not significant.

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