APPENDIX D

Air Quality Technical Report

Air Quality Assessment
for the
Carlsbad Seawater Desalination Plant

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1.0 Introduction

This section presents an assessment of potential air quality impacts associated with the proposed Carlsbad Seawater Desalination Plant (CSDP) and other appurtenant and ancillary water and support facilities. In May 2002, Poseidon Resources Corporation (PRC) submitted an application to the City of Carlsbad to obtain land use approvals to construct and operate an approximately 50 million gallon per day (MGD) desalination plant at the Encina Generating Station (EGS). The CSDP includes pipelines facilities proposed offsite of the EGS to deliver the product water from the desalination plant to existing water distribution networks in Carlsbad and neighboring agencies.

The Proposed Project would be co-located at the existing EGS located immediately south of the Agua Hedionda Lagoon. The CSDP would occupy an approximately 4-acre parcel in the area currently containing Fuel Oil Tank #3, which is the southernmost of three large tanks nearest Carlsbad Boulevard. The fuel oil tank would be demolished to accommodate the desalination facility.

Surrounding features and land uses include the Pacific Ocean and Carlsbad Boulevard to the west, the Carlsbad State Beach and Agua Hedionda Lagoon to the west and north, Interstate 5 and SDG&E properties to the east, and SDG&E electric utility properties to the south. A North County Transit District railway bisects the EGS north to south just east of the proposed desalination facility. Access to the site is provided from Carlsbad Boulevard via the Cannon Road interchange at Interstate 5.

The proposed CSDP would have the capacity to deliver approximately 50 MGD of Reverse Osmosis (RO) permeate (product water). From the desalination plant, the desalinated water would be distributed along several pipeline routes (some proposed, some planned and some existing) to the City of Carlsbad and various local water districts as wholesale water purchasers for ultimate use and consumption by homes and businesses in Northern San Diego County. The onsite and offsite components of the CSDP are discussed in detail in the Project Description.

This section focuses on potential short-term air quality impacts associated with construction activity, in addition to long-term local and regional air quality impacts associated with the proposed desalination project. Mitigation measures are also recommended to reduce the significance of impacts.

2.0 Existing Conditions

2.1 Climate and Meteorology

The climate of San Diego County is dominated by a semi-permanent high pressure cell located over the Pacific Ocean. This cell influences the direction of prevailing winds (westerly to northwesterly) and maintains clear skies for much of the year. Figure 2.1 provides a graphic representation of the prevailing winds in the project vicinity, as measured at the San Diego Air Pollution Control District's Miramar Monitoring Station (the closest meteorological monitoring station to the site). The high pressure cell also creates two types of temperature inversions that may act to degrade local air quality.

Subsidence inversions occur during the warmer months as descending air associated with the Pacific high pressure cell comes into contact with cool marine air. The boundary between the two layers of air creates a temperature inversion that traps pollutants. The other type of inversion, a radiation inversion, develops on winter nights when air near the ground cools by heat radiation and air aloft remains warm. The shallow inversion layer formed between these two air masses also can trap pollutants. As the pollutants become more concentrated in the atmosphere, photochemical reactions occur that produce ozone, commonly known as smog.

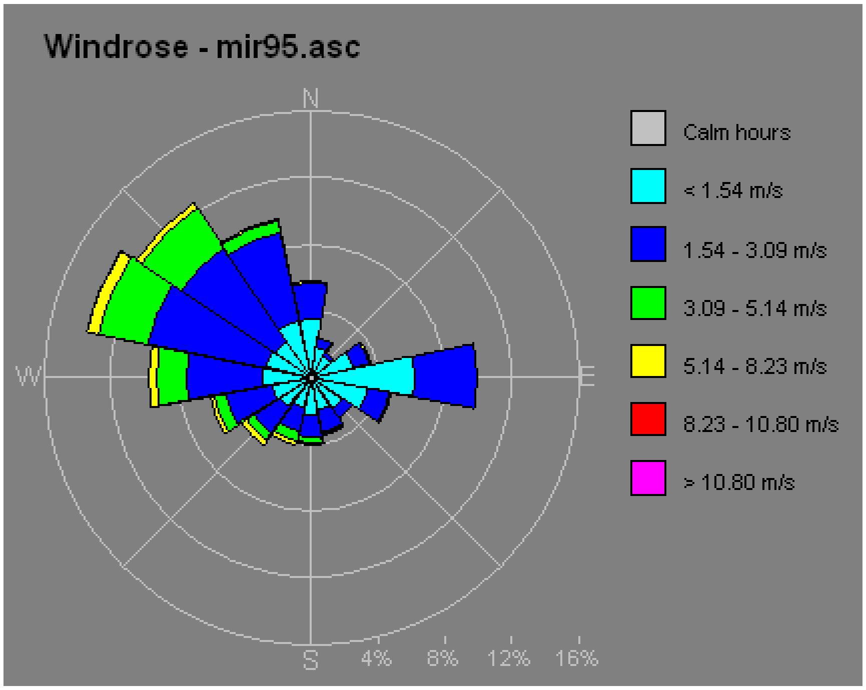

Figure 2.1. Wind Rose – MCAS Miramar Monitoring Station

2.2 Regulatory Setting

Air quality is defined by ambient air concentrations of specific pollutants identified by the United States Environmental Protection Agency (EPA) to be of concern with respect to health and welfare of the general public. The EPA is responsible for enforcing the Federal Clean Air Act (CAA) of 1970 and its 1977 and 1990 Amendments. The CAA required the EPA to establish National Ambient Air Quality Standards (NAAQS), which identify concentrations of pollutants in the ambient air below which no adverse effects on the public health and welfare are anticipated. In response, the EPA established both primary and secondary standards for several pollutants (called "criteria" pollutants). Primary standards are designed to protect human health with an adequate margin of safety. Secondary standards are designed to protect property and the public welfare from air pollutants in the atmosphere. "Primary" NAAQS are set to protect public health with an adequate margin of safety, and "secondary" NAAQS protect against adverse welfare effects (e.g., effects on vegetation, ecosystems, visibility, manmade materials). In September 1997, the EPA promulgated 8-hour ozone (O_3) and 24-hour and annual particulate matter with a diameter less than 2.5 microns ($PM_{2.5}$) national standards. However, due to a lawsuit in May 1999, the United States District Court rescinded these standards and the EPA's authority to enforce them. Subsequent to an appeal of this decision by the EPA, the United States Supreme Court in February 2001 upheld these standards. As a result, this action has initiated a new planning process to monitor and evaluate emission control measures for these pollutants. The EPA is moving forward to develop policies to implement these standards.

The CAA allows states to adopt ambient air quality standards and other regulations provided they are at least as stringent as federal standards. The California Air Resources Board (ARB) has established the more stringent California Ambient Air Quality Standards (CAAQS) for the six criteria pollutants through the California Clean Air Act of 1988, and also has established CAAQS for additional pollutants, including sulfates, hydrogen sulfide, vinyl chloride and visibility-reducing particles. A brief description of each of the criteria pollutants and their potential health effects follows.

Health-based air quality standards have been established by California and the federal government for the following criteria air pollutants: O_3, CO, NO_2, particulate matter with a diameter of 10 microns or less (PM_{10}), $PM_{2.5}$, sulfur dioxide (SO_2), and lead (Pb). These standards were established to protect sensitive receptors from adverse health impacts due to exposure to air pollution. The CAAQS are more stringent than the federal standards. California has also established standards for sulfate, visibility, hydrogen sulfide, and vinyl chloride. Hydrogen sulfide and vinyl chloride are currently not monitored in the Basin because these contaminants are not seen as posing a significant air quality problem. CAAQS and NAAQS for each of these pollutants are shown in Table 1.

Ozone. Ozone is considered a photochemical oxidant, which is a chemical that is formed when reactive organic compounds (ROC) and nitrogen oxides, both byproducts of combustion, react in the presence of ultraviolet light. Ozone is considered a respiratory irritant and prolonged exposure can reduce lung function, aggravate asthma, and increase susceptibility to respiratory infections. Children and those with existing respiratory diseases are at greatest risk from exposure to ozone.

Carbon monoxide. Carbon monoxide is a product of combustion, and the main source of carbon monoxide in the SDAB is from motor vehicle exhaust. CO is an odorless, colorless gas. CO affects red blood cells in the body by binding to hemoglobin and reducing the amount of oxygen that can be carried to the body's organs and tissues. CO can cause health effects to those with cardiovascular disease, and can also affect mental alertness and vision.

Nitrogen dioxide. NO_2 is also a by-product of fuel combustion, and is formed both directly as a product of combustion and in the atmosphere through the reaction of NO with oxygen. NO_2 is a respiratory irritant and may affect those with existing respiratory illness, including asthma. NO_2 can also increase the risk of respiratory illness.

Fine particulate matter. Particulate matter, or PM_{10}, refers to particulate matter with an aerodynamic diameter of 10 microns or less. Fine particulate matter, or $PM_{2.5}$, refers to particulate matter with an aerodynamic diameter of 2.5 microns or less. Particulate matter in this size range has been determined to have the potential to lodge in the lungs and contribute to respiratory problems. PM_{10} and $PM_{2.5}$ arise from a variety of sources, including road dust, diesel exhaust, combustion, tire and break wear, construction operations, and windblown dust. PM_{10} and $PM_{2.5}$ can increase susceptibility to respiratory infections and can aggravate existing respiratory diseases such as asthma and chronic bronchitis. Fine particulate matter ($PM_{2.5}$) is considered to have the potential to lodge deeper in the lungs.

Sulfur dioxide. SO_2 is a colorless, reactive gas that is produced from the burning of sulfur-containing fuels such as coal and oil, and by other industrial processes. Generally, the highest concentrations of SO_2 are found near large industrial sources. SO_2 is a respiratory irritant that can cause narrowing of the airways leading to wheezing and shortness of breath. Long-term exposure to SO_2 can cause respiratory illness and aggravate existing cardiovascular disease.

Lead. Lead in the atmosphere occurs as particulate matter. Lead has historically been emitted from vehicles combusting leaded gasoline, as well as from industrial sources. With the phase-out of leaded gasoline, large manufacturing facilities are the sources of the largest amounts of lead emissions. Lead has the potential to cause gastrointestinal, central nervous system, kidney, and blood diseases upon prolonged exposure. Lead is also classified as a probable human carcinogen.

Sulfates. Sulfates are the fully oxidized ionic form of sulfur. In California, emissions of sulfur compounds occur primarily from the combustion of petroleum-derived fuels (e.g., gasoline and diesel fuel) that contain sulfur. This sulfur is oxidized to sulfur dioxide (SO_2) during the combustion process and subsequently converted to sulfate compounds in the atmosphere. The conversion of SO_2 to sulfates takes place comparatively rapidly and completely in urban areas of California due to regional meteorological features. The ARB's sulfates standard is designed to prevent aggravation of respiratory symptoms. Effects of sulfate exposure at levels above the standard include a decrease in ventilatory function, aggravation of asthmatic symptoms, and an increased risk of cardio-pulmonary disease. Sulfates are particularly effective in degrading visibility, and, due to fact that they are usually acidic, can harm ecosystems and damage materials and property.

Hydrogen Sulfide. H_2S is a colorless gas with the odor of rotten eggs. It is formed during bacterial decomposition of sulfur-containing organic substances. Also, it can be present in sewer gas and some natural gas, and can be emitted as the result of geothermal energy exploitation. Breathing H_2S at levels above the standard will result in exposure to a very disagreeable odor. In 1984, an ARB committee concluded that the ambient standard for H_2S is adequate to protect public health and to significantly reduce odor annoyance.

Vinyl Chloride. Vinyl chloride, a chlorinated hydrocarbon, is a colorless gas with a mild, sweet odor. Most vinyl chloride is used to make polyvinyl chloride (PVC) plastic and vinyl products. Vinyl chloride has been detected near landfills, sewage plants, and hazardous waste sites, due to microbial breakdown of chlorinated solvents. Short-term exposure to high levels of vinyl chloride in air causes central nervous system effects, such as dizziness, drowsiness, and headaches. Long-term exposure to vinyl chloride through inhalation and oral exposure causes in liver damage. Cancer is a major concern from exposure to vinyl chloride via inhalation. Vinyl chloride exposure has been shown to increase the risk of angiosarcoma, a rare form of liver cancer in humans.

Table 1 AMBIENT AIR QUALITY STANDARDS						
POLLUTANT	AVERAGE TIME	CALIFORNIA STANDARDS		**NATIONAL STANDARDS**		
		Concentration	Measurement Method	Primary	Secondary	Measurement Method
Ozone (O_3)	1 hour	0.09 ppm (180 µg/m³)	Ultraviolet Photometry	0.12 ppm (235 µg/m³)	0.12 ppm (235 µg/m³)	Ethylene Chemiluminescence
	8 hour	--		0.08 ppm (157 µg/m³)	0.08 ppm (157 µg/m³)	
Carbon Monoxide (CO)	8 hours	9.0 ppm (10 mg/m³)	Non-Dispersive Infrared Spectroscopy (NDIR)	9 ppm (10 mg/m³)	None	Non-Dispersive Infrared Spectroscopy (NDIR)
	1 hour	20 ppm (23 mg/m³)		35 ppm (40 mg/m³)		
Nitrogen Dioxide (NO_2)	Annual Average	--	Gas Phase Chemiluminescence	0.053 ppm (100 µg/m³)	0.053 ppm (100 µg/m³)	Gas Phase Chemiluminescence
	1 hour	0.25 ppm (470 µg/m³)		--	--	
Sulfur Dioxide (SO_2)	Annual Average	--	Ultraviolet Fluorescence	0.03 ppm (80 µg/m³)	--	Pararosaniline
	24 hours	0.04 ppm (105 µg/m³)		0.14 ppm (365 µg/m³)	--	
	3 hours	--		--	0.5 ppm (1300 µg/m³)	
	1 hour	0.25 ppm (655 µg/m³)		--	--	
Respirable Particulate Matter (PM_{10})	24 hours	50 µg/m³	Gravimetric or Beta Attenuation	150 µg/m³	150 µg/m³	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m³		50 µg/m³	50 µg/m³	
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 µg/m³	Gravimetric or Beta Attenuation	15 µg/m³	--	Inertial Separation and Gravimetric Analysis
	24 hours	--		65 µg/m³	--	
Sulfates	24 hours	25 µg/m³	Ion Chromatography	--	--	--
Lead (Pb)	30-day Average	1.5 µg/m³	Atomic Absorption	--	--	Atomic Absorption
	Calendar Quarter	--		1.5 µg/m³	1.5 µg/m³	
Hydrogen Sulfide (H_2S)	1 hour	0.03 ppm (42 µg/m³)	Ultraviolet Fluorescence	--	--	--
Vinyl Chloride	24 hours	0.010 ppm (26 µg/m³)	Gas Chromatography	--	--	--

ppm= parts per million
µg/m³ = micrograms per cubic meter
mg/m³= milligrams per cubic meter
Source: California Air Resources Board July 2003

Areas that do not meet the NAAQS or the CAAQS for a particular pollutant are considered to be "nonattainment areas" for that pollutant. In December 2002, the San Diego Air Pollution Control District submitted a maintenance plan for the 1-hour NAAQS for O_3 and requested redesignation from a serious O_3 nonattainment area to attainment. As of July 28, 2003, the San Diego Air Basin has been reclassified as an attainment area for the 1-hour NAAQS for O_3. On April 15, 2004, the SDAB was classified as a basic nonattainment area for the 8-hour NAAQS for O_3. The SDAPCD has recommended that the SDAB be classified as a nonattainment area for the 24-hour standard for $PM_{2.5}$. It is anticipated that the EPA will release its classifications for $PM_{2.5}$ attainment in December 2004. The SDAB is an attainment area for the NAAQS for all other criteria pollutants. The SDAB is currently classified as a nonattainment area under the CAAQS for O_3 and PM_{10}.

The ARB is the state regulatory agency with authority to enforce regulations to both achieve and maintain the NAAQS and CAAQS. The ARB is responsible for the development, adoption, and enforcement of the state's motor vehicle emissions program, as well as the adoption of the CAAQS. The ARB also reviews operations and programs of the local air districts, and requires each air district with jurisdiction over a nonattainment area to develop its own strategy for achieving the NAAQS and CAAQS. The local air district has the primary responsibility for the development and implementation of rules and regulations designed to attain the NAAQS and CAAQS, as well as the permitting of new or modified sources, development of air quality management plans, and adoption and enforcement of air pollution regulations. The San Diego County Air Pollution Control District (APCD) is the local agency responsible for the administration and enforcement of air quality regulations for San Diego County.

2.3 Background Air Quality

The APCD operates a network of ambient air monitoring stations throughout San Diego County. The purpose of the monitoring stations is to measure ambient concentrations of the pollutants and determine whether the ambient air quality meets the CAAQS and the

NAAQS. The nearest ambient monitoring stations to the project site are the Oceanside Mission Avenue monitoring station, which measured O_3 and NO_2 until 2001; the Camp Pendleton Monitoring Station, which measures O_3 and NO_2; the Escondido Monitoring Station, which measures O_3, NO_2, PM_{10}, $PM_{2.5}$, and CO; and the San Diego 12th Avenue station (which is the closest station that measures SO_2). Because they are located in more developed areas that are likely to experience higher levels of traffic congestion and emission sources than the project site, data from the Escondido and San Diego 12th Avenue monitoring stations are likely to exhibit higher ambient concentrations than the Project area. Ambient concentrations of pollutants over the last three years are presented in Table 2.

Air quality has shown improvement in the San Diego Air Basin such that the 1-hour and 8-hour federal ozone standards have only been exceeded once, in 2001, at the Oceanside monitoring station during the time period from 2001 – 2003. The federal 24-hour $PM_{2.5}$ standard was exceeded once at the Escondido monitoring station in 2003; however, the exceedance occurred during the Cedar Fire event in San Diego County. The annual $PM_{2.5}$ standards were exceeded during all three years. The data from the monitoring stations indicate that air quality is in attainment of all other federal standards. The Escondido monitoring station measured exceedances of the state 24-hour and annual PM_{10} standards during the period from 2001 to 2003.

Concentrations of CO at the Escondido monitoring station tend to be among the highest in the San Diego Air Basin, due to the fact that the monitor is located along East Valley Parkway in a congested area in downtown Escondido. The station sees higher concentrations of CO than have historically been measured elsewhere in San Diego County and the background data are not likely to be representative of background ambient CO concentrations at the Project site, due to the site's location in a less developed area. Since 2000, CO has not been monitored at other stations in northern San Diego County. The state 8-hour CO standard was exceeded once at the Escondido monitoring station during 2003; however, the exceedance occurred during the Cedar Fire event.

Table 2
Ambient Background Concentrations
ppm

Pollutant	Averaging Time	2001	2002	2003	Most Stringent Ambient Air Quality Standard	Monitoring Station
Ozone	8 hour	0.089	0.073	0.084	0.08	Oceanside (2001); Camp Pendleton (2002,2003)
	1 hour	0.104	0.087	0.099	0.09	Oceanside (2001); Camp Pendleton (2002,2003)
PM_{10}	Annual	30.6 $\mu g/m^3$	25.1 $\mu g/m^3$	32.7 $\mu g/m^3$	20 $\mu g/m^3$	Escondido
	24 hour	72 $\mu g/m^3$	50 $\mu g/m^3$	179 $\mu g/m^3$	50 $\mu g/m^3$	Escondido
$PM_{2.5}$	Annual	17.5 $\mu g/m^3$	16.0 $\mu g/m^3$	14.2 $\mu g/m^3$	12 $\mu g/m^3$	Escondido
	24 hour	60.0 $\mu g/m^3$	53.6 $\mu g/m^3$	69.2 $\mu g/m^3$	65 $\mu g/m^3$	Escondido
NO_2	Annual	0.016	0.013	0.012	0.053	Oceanside (2001); Camp Pendleton (2002,2003)
	1 hour	0.096	0.106	0.095	0.25	Oceanside (2001); Camp Pendleton (2002,2003)
CO	8 hour	5.11	3.9	10.64	9.0	Escondido
	1 hour	8.5	8.5	8.9	20	Escondido
SO_2	Annual	0.003	0.003	0.004	0.03	San Diego
	24 hour	0.012	0.007	0.008	0.04	San Diego
	3 hour	0.036	0.015	0.019	0.5	San Diego
	1 hour	0.052	0.028	0.036	0.25	San Diego

[1]Secondary NAAQS

Source: www.arb.ca.gov/aqd/aqd.htm (all pollutants except 1-hour CO and 1-hour and 3-hour SO_2)
www.epa.gov/air/data/monvals.html (1-hour CO, Escondido Station; 1-hour and 3-hour SO_2, 12th Avenue Station)

2.4 Sensitive Receptors

Sensitive populations (sensitive receptors) are more susceptible to the effects of air pollution than the general population. Sensitive populations who are in proximity to localized sources of toxins and CO are of particular concern. Land uses considered sensitive receptors include residences, schools, playgrounds, child care centers, athletic facilities, long-term health care facilities, rehabilitation centers, convalescent centers, and retirement homes.

Residential areas surround the facility to the south, north, and east of Aqua Hedionda Lagoon. The Carlsbad beach area is used for recreation. Cannon Park is located to the south of the facility at the intersection of Cannon Road and Carlsbad Blvd. The closest K-12 school to the facility is the St. Patrick's Catholic School, which is located approximately one mile north of the facility.

2.5 Toxic Air Contaminants (TACs)

TACs, often termed "non-criteria" pollutants, do not have established ambient air standards. The SDAPCD implements TAC controls through Federal, State and local programs. Federally, TACs are regulated by EPA under Title III of the Federal CAA. At the State level, the ARB has designated all 189 federal hazardous air pollutants as TACs, under the authority of AB 1807. The Air Toxics Hot Spots Information and Assessment Act (AB 2588) requires inventories and public notices for facilities that emit TACs. Under SDAPCD Rule 1200, new, relocated, or modified facilities that would emit TACs are required to undergo a health risk assessment to demonstrate that impacts to nearby receptors would not be significant.

3.0 Impacts

The impact analysis was designed to address the potential for adverse impacts to the ambient air quality due to construction and operational emissions. The proposed project would result in air emissions from both construction phase of the project due to use of heavy equipment and fugitive dust emissions. The proposed project would also generate operational emissions due to truck traffic and energy use. The following sections address the criteria by which impacts are evaluated and impacts from both Project phases.

3.1 Significance Criteria

Significance thresholds in this section are based on the CEQA Guidelines (Environmental Checklist Form), and guidelines from the City of Carlsbad as indicated below.

A potentially significant impact to air quality would occur if the project caused one or more of the following:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable Federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors);
- Expose sensitive receptors to substantial pollutant concentrations; and/or
- Create objectionable odors affecting a substantial number of people.

Significance thresholds may be based on the SDAPCD's Rule 20.2 air quality thresholds as screening criteria for potential significance. The thresholds provide quantitative emission limits above which a potential source may have a significant impact on the ambient air quality. In the event that emissions are above the screening criteria presented in Table 3, air dispersion modeling may be used to evaluate whether the emissions have the potential to violate any air quality standard or result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment. The Rule 20.2 thresholds are shown in Table 3.

Table 3
Rule 20.2 Air Quality Significance Thresholds

Pollutant	**Emission Rate**		
	lbs/hr	*lbs/day*	*tons/year*
Carbon Monoxide (CO)	100	550	100
Oxides of Nitrogen (NOx)	25	250	40
Particulate Matter (PM_{10})	-	100	15
Oxides of Sulfur (SOx)	25	250	40
Lead and Lead Compounds (Pb)	-	3.2	0.6
Reactive Organic Compounds (ROC)[1]	-	55	15

[1]Rule 20.2 does not contain emission thresholds for ROC. The SCAQMD CEQA Air Quality Handbook thresholds are presented in Table 3. For construction, the SCAQMD CEQA Air Quality Handbook recommends a significance threshold for ROC of 75 lbs/day.

Because the $PM_{2.5}$ standard is currently being implemented, no rules and regulations have been adopted to address emissions of $PM_{2.5}$. Therefore, no significance criteria have been established for $PM_{2.5}$ emissions. Furthermore, data for $PM_{2.5}$ emission estimates is not readily available at this time. Therefore, $PM_{2.5}$ emissions have not been evaluated with regard to significance of impacts.

3.2 Construction Impacts

Emissions of criteria pollutants associated with construction of the CSDP: emissions associated with demolition of Fuel Oil Tank #3, fugitive dust generation from site grading and preparation, heavy construction equipment exhaust emissions, emissions associated with truck traffic bringing construction materials to the site, and construction worker vehicle travel. Construction emissions are generated from both facility construction and construction of the associated pipelines and ancillary equipment. To estimate emissions associated with construction, emission factors from the SCAQMD CEQA Air Quality Handbook (SCAQMD 1993) were used to estimate emissions from heavy equipment use and fugitive dust generated during construction. The following subsections describe the construction associated with each construction phase.

Facility Construction. Construction of the CSDP would be conducted in several phases. Construction phases involved in the desalination facility construction and their estimated duration are as follows:

- Fuel Oil Tank Demolition
  - Removal of Residual Fuel – 1 month
  - Removal of Tank Insulation – 0.5 month
  - Removal of External Metal Tank Shell – 1 month
  - Removal of Concrete Footings or Piles – 0.5 month
  - Berm Excavation – 1.5 months
- Site Remediation (if necessary) – assume to require 2 months
- Desalination Plant Construction
  - Initial Site Grading/Excavation – 5 months
  - Transportation of Construction Materials and Equipment – 15 months
  - Final Site Grading, Paving, and Landscaping – 4 months
- Intake Pump Station Construction
  - On-Site Excavation – 3 months
  - Transportation of Construction Materials and Equipment – 9 months
  - Paving – 1 month

- Intake and Discharge Pipeline Construction
    - Earthwork – 6 months
    - Pipe Laying – 6 months
    - Pavement – 0.5 month

Equipment requirements, crew sizes, and construction phases were estimated by the project engineers and are listed below in Table 4.

Fugitive dust would be generated during construction as well. The main source of fugitive dust is materials handling during earthwork and disposal. To estimate the amount of fugitive dust that would be generated during construction, the amount of soil/materials handled during each earthwork phase were used to estimate emissions. Fugitive dust emissions were estimated based on the SCAQMD CEQA Air Quality Handbook emission factor (Table A9-9) for PM_{10} emissions from truck filling of 0.02205 lbs PM10/ton material handled. It was assumed that there are approximately 1.6 tons per cubic yard of material, and that excavated/handled material would be generally moist.

Emission estimates associated with each phase of the CSDP facility construction are presented in Table 5. The CSDP facility would be constructed over a total period of 24 months; however, certain phases could not occur simultaneously (for example, demolition of the fuel oil tank could not occur at the same time as paving and landscaping of the facility). To estimate maximum daily emissions, it was assumed that the following phases would occur simultaneously and would represent maximum activity levels during construction:

- Desalination Plant Construction
    - Transportation of Construction Materials and Equipment – 15 months
- Intake Pump Station Construction
    - Transportation of Construction Materials and Equipment – 9 months
- Intake and Discharge Pipeline Construction
    - Earthwork – 6 months
    - Pipe Laying – 6 months

Table 4
Construction Phasing Assumptions
Carlsbad Seawater Desalination Facility Construction

Construction Phase	Duration, months	Equipment Type	Number
Demolition of Fuel Oil Storage Tank	4.5	Crane	1
		Loader	1
		Excavator	1
		Pump	1
		Construction Crew	10
		Construction Truck Trips	1,190 total
		Cubic Yards Soil Handled	8,300
Site Remediation	2	Excavators	2
		Construction Crew	12
		Construction Truck Trips	260 total
		Cubic Yards Soil Handled	1,800
Desalination Plant Construction - Earthwork	5	Excavators	3
		Backhoes	3
		Loaders	3
		Graders	2
		Compactors	2
		Construction Crew	20
		Construction Truck Trips	4,310 total
		Cubic Yards Soil Handled	30,150
Desalination Plant Construction - Structures	15	Cranes	3
		Cement/Mortar Mixers	2
		Forklifts	4
		Aerial Lifts	1
		Generator Set	1
		Welders	4
		Construction Crew	40
		Construction Truck Trips	3,580 total
Desalination Plant Construction – Paving and Landscaping	4	Pavers	2
		Rollers	2
		Grader	1
		Construction Crew	15
		Construction Truck Trips	500 total
Intake Pump Station Construction - Earthwork	3	Excavators	2
		Loaders	2
		Pile Drivers	2
		Pumps	4
		Construction Crew	20
		Construction Truck Trips	1,610 total
		Cubic Yards Soil Handled	11,250
Intake Pump Station Construction - Structures	9	Crane	1
		Forklifts	4
		Welders	2
		Pumps	4
		Construction Crew	25
		Construction Truck Trips	1,600 total

Table 4 (continued)
Construction Phasing Assumptions
Carlsbad Seawater Desalination Facility Construction

Construction Phase	Duration, months	Equipment Type	Number
Intake Pump Station Construction – Paving	1	Paver	1
		Roller	1
		Construction Crew	10
		Construction Truck Trips	300 total
Intake and Discharge Pipelines Construction - Earthwork	6	Excavators	2
		Trenchers	2
		Loaders	2
		Drill Rig	1
		Construction Crew	15
		Construction Truck Trips	1,300 total
		Cubic Yards Soil Handled	10,440
Intake and Discharge Pipelines Construction – Pipe Laying	6	Loaders	2
		Welders	2
		Crane	1
		Construction Crew	15
		Construction Truck Trips	160 total
Intake and Discharge Pipelines Construction – Paving	0.5	Paver	1
		Roller	1
		Construction Crew	5
		Construction Truck Trips	50 total

For estimating truck traffic emissions associated with the earthwork phase of the construction, it was assumed that 10% of the soils excavated from the desalination plant site will be reused at the site rather than disposed off site. The maximum daily emissions anticipated during project construction are also presented in Table 5.

Table 5
Estimated Construction Emissions
Carlsbad Seawater Desalination Plant Construction

Emission Source	**CO**	**ROC**	**NOx**	**SOx**	**PM_{10}**
lbs/day					
Demolition of Fuel Oil Tank					
Fugitive Dust					19.44
Heavy Equipment Exhaust	21.68	4.76	48.30	4.25	3.10
Worker Travel – Vehicle Emissions	5.23	0.25	0.54	0.00	0.03
Construction Trucks	9.78	2.51	36.16	0.51	1.24
TOTAL	**36.69**	**7.52**	**85.00**	**4.76**	**23.81**
	550	75	250	250	100
Significant?	*No*	*No*	*No*	*No*	*No*
Site Remediation					
Fugitive Dust					5.832
Heavy Equipment Exhaust	7.15	0.65	15.59	1.30	0.97
Worker Travel – Vehicle Emissions	6.28	0.31	0.65	0.00	0.03
Construction Trucks	1.63	0.42	6.03	0.09	0.21
TOTAL	**15.06**	**1.37**	**22.27**	**1.39**	**7.05**
Significance Criteria	550	75	250	250	100
Significant?	*No*	*No*	*No*	*No*	*No*
Desalination Plant Construction – Earthwork					
Fugitive Dust					22.68
Heavy Equipment Exhaust	67.91	14.50	140.98	12.60	7.98
Worker Travel – Vehicle Emissions	10.47	0.51	1.09	0.01	0.06
Construction Trucks	10.27	2.63	37.96	0.54	1.30
TOTAL	**88.65**	**17.64**	**180.83**	**13.15**	**32.02**
Significance Criteria	550	75	250	250	100
Significant?	*No*	*No*	*No*	*No*	*No*

Table 5 (continued)
Estimated Construction Emissions
Carlsbad Seawater Desalination Plant Construction

Emission Source	CO	ROC	NOx	SOx	PM_{10}
lbs/day					
Desalination Plant Construction – Structures					
Heavy Equipment Exhaust	74.17	15.29	113.32	10.81	7.65
Worker Travel – Vehicle Emissions	20.94	1.02	2.18	0.01	0.11
Construction Trucks	2.61	0.67	9.64	0.14	0.33
TOTAL	**97.72**	**16.98**	**125.14**	**10.96**	**8.09**
Significance Criteria	550	75	250	250	100
Significant?	*No*	*No*	*No*	*No*	*No*
Desalination Plant Construction – Paving and Landscaping					
Heavy Equipment Exhaust	25.67	7.08	66.87	6.18	3.09
Worker Travel – Vehicle Emissions	7.85	0.38	0.82	0.01	0.04
Construction Trucks	1.30	0.33	4.82	0.07	0.17
TOTAL	**34.82**	**7.79**	**72.50**	**6.25**	**3.30**
Significance Criteria	550	75	250	250	100
Significant?	*No*	*No*	*No*	*No*	*No*
Intake Pump Station Construction – Earthwork					
Fugitive Dust					12.96
Heavy Equipment Exhaust	72.03	11.18	112.27	9.83	7.03
Worker Travel – Vehicle Emissions	10.47	0.51	1.09	0.01	0.06
Construction Trucks	5.87	1.50	21.69	0.31	0.74
TOTAL	**88.37**	**13.19**	**135.05**	**10.15**	**20.79**
Significance Criteria	550	75	250	250	100
Significant?	*No*	*No*	*No*	*No*	*No*
Intake Pump Station Construction – Structures					
Heavy Equipment Exhaust	59.74	10.24	73.33	7.64	5.12
Worker Travel – Vehicle Emissions	13.08	0.64	1.36	0.01	0.07
Construction Trucks	0.98	0.25	3.62	0.05	0.12
TOTAL	**73.80**	**11.13**	**78.30**	**7.70**	**5.32**
Significance Criteria	550	75	250	250	100
Significant?	*No*	*No*	*No*	*No*	*No*
Intake Pump Station Construction – Paving					
Heavy Equipment Exhaust	9.23	2.19	23.98	2.19	1.09
Worker Travel – Vehicle Emissions	5.23	0.25	0.54	0.00	0.03
Construction Trucks	1.30	0.33	4.82	0.07	0.17
TOTAL	**15.76**	**2.78**	**29.34**	**2.26**	**1.29**
Significance Criteria	550	75	250	250	100
Significant?	*No*	*No*	*No*	*No*	*No*

Table 5 (continued)
Estimated Construction Emissions
Carlsbad Seawater Desalination Plant Construction

Intake and Discharge Pipelines Construction – Earthwork					
Fugitive Dust					6.48
Heavy Equipment Exhaust	72.64	11.03	108.07	9.28	6.96
Worker Travel – Vehicle Emissions	7.85	0.38	0.82	0.01	0.04
Construction Trucks	2.93	0.75	10.85	0.15	0.37
TOTAL	**83.42**	**12.16**	**119.74**	**9.44**	**13.85**
Significance Criteria	550	75	250	250	100
Significant?	*No*	*No*	*No*	*No*	*No*
Intake and Discharge Pipelines Construction – Pipe Laying					
Heavy Equipment Exhaust	28.44	6.31	61.37	5.47	3.95
Worker Travel – Vehicle Emissions	7.85	0.38	0.82	0.01	0.04
Construction Trucks	0.65	0.17	2.41	0.03	0.08
TOTAL	**36.94**	**6.86**	**64.60**	**5.51**	**4.07**
Significance Criteria	550	75	250	250	100
Significant?	*No*	*No*	*No*	*No*	*No*
Intake and Discharge Pipelines Construction – Pavement					
Heavy Equipment Exhaust	9.23	2.19	23.98	2.19	1.09
Worker Travel – Vehicle Emissions	2.62	0.13	0.27	0.00	0.01
Construction Trucks	0.33	0.08	1.21	0.02	0.04
TOTAL	**12.18**	**2.40**	**25.45**	**2.21**	**1.15**
Significance Criteria	550	75	250	250	100
Significant?	*No*	*No*	*No*	*No*	*No*
Maximum Daily Construction Emissions, lbs/day					
Emission Source	*CO*	*ROC*	*NOx*	*SOx*	*PM10*
Desalination Plant Construction - Structures	97.72	16.98	125.14	10.96	8.09
Intake Pump Station Construction - Structures	73.80	11.13	78.30	7.70	5.32
Intake and Discharge Pipelines Construction – Earthwork	83.42	12.16	119.74	9.44	13.85
Intake and Discharge Pipelines Construction – Pipe Laying	36.94	6.86	64.60	5.51	4.07
TOTAL	**291.88**	**47.13**	**387.78**	**33.61**	**31.33**
Significance Criteria	550	75	250	250	100
Significant?	*No*	*No*	*Yes*	*No*	*No*

Based on the estimated maximum daily emissions, emissions of NOx would be above the significance criteria. Construction projects typically result in emissions of NOx due to the use of heavy equipment and trucks. Emissions of NOx, while significant during the maximum project construction phases, would be temporary and would not be expected to have a permanent significant impact on the ambient air quality.

Pipeline Construction. The pipeline from the new CDSP will convey desalinated water to several service points along its alignment, and will be approximately 16 to 19 miles in total length. The pipeline will initially be 48 inches in diameter and will reduce to 42-, 36- and 30-inch diameters at critical hydraulic and turn-out points. Methods of construction will include open trench as well as trenchless installations. Open trench construction will comprise open-cut excavation, direct-bury pipe installation, trench backfill, and pavement replacement. Trenchless installation will involve microtunneling, horizontal directional drilling, boring, and jacking.

The pipeline will follow one of five alignments described in the project description. The construction emissions calculations were based on identifying a maximum construction scenario, assuming the pipeline would follow the Blue Alternative 1 route, as that route involves the highest number of truck trips and the largest amount of earthmoving. Equipment requirements, crew sizes, and construction phases were estimated by the project engineers for each 1000 feet of pipeline, and are listed below in Table 6. Pipeline construction will take a total of approximately 20 months; therefore, it was assumed that seven 1000-foot lengths of pipeline would be constructed at any one time in accordance with the project construction requirements. It was assumed that the maximum number of truck trips could occur throughout the construction of the CSDP pipelines, and that a composite crew of 22.5 workers would be required for each sub-phase for each 1000 feet of pipeline construction. For the purpose of estimating maximum daily emissions associated with the construction of the CDSP pipelines, it was assumed that seven segments of 1000 feet of pipeline could be constructed simultaneously.

Exhaust from heavy-duty equipment is difficult to quantify because of the day-to-day variability in construction activities and equipment used. Under the pipeline construction scenario, it was assumed that all nine pipeline segments being constructed simultaneously would not be constructed on exactly the same schedule, but that some staggering of the schedule would occur. To evaluate the most likely maximum construction emissions, it was assumed that the following activities could occur simultaneously for the seven pipeline segments that would be constructed at the same time:

- One segment – placement of base course
- Three segments – backfilling pipe trench
- Three segments – placing pipe

This scenario was developed based on the schedule of construction for each 1000 feet of pipeline, and identification of those sub-phases of construction that would require the longest time periods (placing pipe, 36.4 days; backfilling pipe trench, 12.2 days) and would have the highest emissions (placement of base course). This scenario is a credible maximum emissions scenario. To estimate emissions from truck travel, it was assumed based on the construction project description (Carollo Engineers 2004) that a maximum of 108 trucks per day would transport material from the site (spoils), and the average round-trip truck trip would be 9.2 miles. The 108 trucks per day would account for all truck traffic for all simultaneous construction operations on the pipeline. Also, based on the assumption that trucks handle 14 cubic yards each, fugitive dust emissions associated with handling and disposal of the spoils were estimated based on the SCAQMD CEQA Air Quality Handbook, Table 9-9-G. It was also estimated that trucks would travel 0.1 miles on unpaved surfaces during construction, and that surfaces would be watered a minimum of twice daily to reduce emissions of fugitive dust. Emission estimates associated with construction of the CSDP pipeline are presented in Table 7.

Based on the estimated maximum daily emissions, emissions of NOx during simultaneous construction of seven pipeline segments would be above the significance criteria. Construction projects typically result in emissions of NOx due to the use of heavy equipment and trucks. Emissions of NOx, while significant during the maximum project construction phase, would be temporary and would not be expected to have a permanent significant impact on the ambient air quality.

In addition, it is likely that the pipeline construction could occur simultaneously with facility construction, in which case emissions from facility construction and pipeline construction would be occurring at the same time. In the event that maximum emissions from both construction projects occur simultaneously, emissions of NOx would be above the significance threshold. Emissions of other criteria pollutants would not exceed the significance thresholds.

Table 6

Construction Requirements
Off-Site Product Water Transmission Pipeline Construction

Operation	Duration (Crew Days)	Labor		Equipment	
Removing Bituminous Pavment, 2" thick	2.1	1	Labor Foreman	1	Backhoe Loader, 48 hp
		2	Laborers	1	Hydraulic Hammer, 1200 lb
		1	Equip Operator, light	1	F.E. Loader, 170 hp
		1	Equip Operator, med	1	Pavement Removal Bucket
Trench Excavation, 1 CY Backhoe	4.0	1	Equip Operator, crane	1	Hydraulic Excavator, 1 cy
		1	Equip Operator Oiler		
Placing Pipe Bedding, 3/4" Rock	1.9	2	Laborers	1	Backhoe Loader, 48 hp
		1	Equip Operator, light		
Compacting Pipe Bedding, 3/4" Rock	3.2	1	Laborer	1	Gas Engine Power Tool
Placing Pipe	36.4	1	Labor Foreman	1	Welder, 300 amp
		2	Laborers	1	Crane, 75 ton
		1	Skilled Worker		
		1	Welder		
		1	Equip Operator, crane		
		1	Equip Operator Oiler		
Backfilling Pipe Trench, 200' haul	12.2	1	Equip Operator, med	1	F.E. Loader, Whl Mntd, 1 cy
		1	Laborer		
Compacting Pipe Trench, Power Tamper	1.6	1	Laborer	1	Gas Engine Power Tool
Compacting Pipe Trench, Vibrating Roller	1.5	1	Equip Operator, med	1	Roller Compactor, 2000 lbs
		1	Laborer		
Placing Base Course, 3/4" Rock	0.9	1	Labor Foreman	1	F.E. Loader, Whl Mntd, 1 cy
		2	Laborers	1	Roller, Vibratory
		1	Equip Operator, med	1	Truck Tractor, 240 hp
		1	Truck Driver, heavy	1	Water Truck, 5000 gal
Placing AC Pavement Over Trench, 2" thk	10.9	1	Labor Foreman	1	Tandem Roller, 5 ton
		4	Laborers		
		1	Equip Operator, light		
Composite Crew for All Operations:		1	Labor Foreman		
		2	Laborers		
		1	Equip Operator, light		
		1	Equip Operator, med		
		1	Equip Operator, crane		
		1	Skilled Worker		
		1	Welder		
		1	Truck Driver, heavy		

Table 7
Estimated Construction Emissions
CSDP Pipeline Construction
(Emissions per 1000 feet of pipeline)

Emission Source	CO	ROC	NOx	SOx	PM_{10}
lbs/day					
Removal of Bituminous Pavement					
Heavy Equipment Exhaust	15.31	3.52	30.72	2.79	1.98
Worker Travel – Vehicle Emissions	11.78	0.57	1.22	0.01	0.06
TOTAL	**27.09**	**4.09**	**31.94**	**2.80**	**2.04**
Trench Excavation					
Heavy Equipment Exhaust	3.57	0.32	7.80	0.65	0.49
Worker Travel – Vehicle Emissions	11.78	0.57	1.22	0.01	0.06
TOTAL	**15.35**	**0.89**	**9.02**	**0.66**	**0.55**
Placing Pipe Bedding					
Heavy Equipment Exhaust	3.35	0.67	4.91	0.45	0.22
Worker Travel – Vehicle Emissions	11.78	0.57	1.22	0.01	0.06
TOTAL	**15.13**	**1.24**	**6.13**	**0.46**	**0.28**
Compacting Pipe Bedding					
Heavy Equipment Exhaust	22.83	1.18	0.11	0.01	0.01
Worker Travel – Vehicle Emissions	11.78	0.57	1.22	0.01	0.06
TOTAL	**34.61**	**1.75**	**1.33**	**0.02**	**0.07**
Placing Pipe					
Heavy Equipment Exhaust	9.24	2.82	22.02	1.98	1.41
Worker Travel – Vehicle Emissions	11.78	0.57	1.22	0.01	0.06
TOTAL	**21.02**	**3.39**	**23.24**	**1.99**	**1.47**
Backfilling Pipe Trench					
Heavy Equipment Exhaust	10.10	1.84	21.11	1.84	1.38
Worker Travel – Vehicle Emissions	11.78	0.57	1.22	0.01	0.06
TOTAL	**21.88**	**2.41**	**22.33**	**1.85**	**1.44**
Compacting Pipe Trench – Plate Compactor					
Heavy Equipment Exhaust	22.83	1.18	0.11	0.01	0.01
Worker Travel – Vehicle Emissions	11.78	0.57	1.22	0.01	0.06
TOTAL	**34.61**	**1.75**	**1.33**	**0.02**	**0.07**
Compacting Pipe Trench – Roller					
Heavy Equipment Exhaust	3.98	1.14	11.39	1.14	0.57
Worker Travel – Vehicle Emissions	11.78	0.57	1.22	0.01	0.06
TOTAL	**15.76**	**1.71**	**12.61**	**1.15**	**0.63**

Table 7 (continued)
Estimated Construction Emissions
CSDP Pipeline Construction
(Emissions per 1000 feet of pipeline)

Emission Source	**CO**	**ROC**	**NOx**	**SOx**	**PM_{10}**
lbs/day					
Placing Base Course					
Heavy Equipment Exhaust	52.24	6.86	118.02	12.06	7.19
Worker Travel – Vehicle Emissions	11.78	0.57	1.22	0.01	0.06
TOTAL	**64.02**	**7.43**	**119.24**	**12.07**	**7.25**
Placing AC Pavement over Trench					
Heavy Equipment Exhaust	3.98	1.14	11.39	1.14	0.57
Worker Travel – Vehicle Emissions	11.78	0.57	1.22	0.01	0.06
TOTAL	**15.76**	**1.71**	**12.61**	**1.15**	**0.63**
Construction Truck Emissions					
Construction Trucks	**6.78**	**1.74**	**25.06**	**0.35**	**0.86**
Total Maximum Daily Construction Emissions, lbs/day					
Emission Source	*CO*	*ROC*	*NOx*	*SOx*	*PM10*
Fugitive Dust	-	-	-	-	21.21
Truck Traffic – 108 Trucks/day	8.10	2.07	29.94	0.42	1.03
Simultaneous Construction of 7 pipeline segments	192.72	24.83	255.95	23.59	15.98
TOTAL	**200.82**	**26.90**	**285.89**	**24.01**	**38.22**
Significance Criteria	550	75	250	250	100
Significant?	*No*	*No*	*Yes*	*No*	*No*

Because emissions from construction of the project would be temporary, Project construction would not conflict with strategies in the Regional Air Quality Strategy and SIP for attaining and maintaining the air quality standards. The project construction would not conflict or obstruct the implementation of the San Diego Regional Air Quality Strategy (RAQS) or applicable portions of the State Implementation Plan (SIP). Furthermore, due to the fact that the construction phase of the project is short-term in nature, project construction would not result in emissions that would violate any long-term air quality standard or contribute substantially to an existing or projected air quality violation, nor result in a cumulatively considerable net increase of PM_{10} or exceed quantitative thresholds for O_3 precursors, oxides of nitrogen (NO_X) and Reactive Organic Compounds (ROCs).

Diesel exhaust particulate matter is known to the state of California to contain carcinogenic compounds. The risks associated with exposure to substances with carcinogenic effects are typically evaluated based on a lifetime of chronic exposure, which is defined in the California Air Pollution Control Officers' Association (CAPCOA) Air Toxics "Hot Spots" Program Risk Assessment Guidelines (CAPCOA 1993) as 24 hours per day, 7 days per week, 365 days per year, for 70 years. Diesel exhaust particulate matter would be emitted during the approximately 24 months of facility construction and 16 months of pipeline construction assumed for the project from heavy equipment used in the construction process. Because diesel exhaust particulate matter is considered to be carcinogenic, long-term exposure to diesel exhaust emissions could result in adverse health impacts. However, the construction of the project would result in short-term, temporary emissions of diesel exhaust from construction equipment. Furthermore, the emissions would not occur 24 hours per day, 7 days per week, but would be more likely to occur during working hours (8 to 10 hours per day, six days per week), and there are no sensitive receptors as defined in the City of San Diego's CEQA Air Quality Guidelines (City of San Diego 2003) within the immediate project vicinity that would be exposed to construction emissions. Regardless of its exact duration, the construction phase of the project would therefore not result in the chronic lifetime exposure of sensitive receptors to diesel exhaust from construction equipment. Because of the short-term nature of the construction project, adverse long-term impacts associated with diesel exhaust particulate matter are not expected as a result of project construction.

3.3 Long-Term Emissions

Long-term air emissions associated with operation of the CSDP consist of mobile source emissions generated through truck trips and employee vehicle trips associated with desalination plant operation, and area and stationary source emissions generated directly from activities on the subject site and indirectly from electricity and natural gas consumption.

Stationary sources of long-term air emissions include machinery, equipment and vehicles within the project site, as well as indirect emissions from electricity and natural gas consumption. All water pumps associated with the proposed project (including the proposed off-site underground booster pump station) will be powered electrically, and would not directly generate air emissions. However, indirect impacts due to electrical consumption factors of the proposed desalination project are analyzed below under Off-Site Energy-Related Emissions.

On-Site Area Source Emissions. Assumptions within this EIR for on-site area source emissions for the proposed seawater desalination project are based on estimated emissions from landscaping maintenance. Air emissions associated with landscaping are nominal. Emissions are summarized in Table 8.

Off-Site Mobile Emissions. Off-site mobile emission sources mainly consist of trucks (used for delivery of supplies necessary for project operation and the pick-up of municipal solid waste) and employee vehicle trips to and from the subject site. According to the Project Description, the CSDP will operate 24 hours per day and 365 days per week. Heavy truck traffic to and from the plant site will be associated with the following activities:

- Bulk Supply of Water Treatment Chemicals
- Supply of Equipment and Spare Parts
- Waste Solids Disposal
- Solids Residuals Disposal

According to the Project Description, a maximum of 12 trucks per week would be expected to travel to the site. To estimate maximum daily emissions associated with truck traffic, it was assumed that all 12 trucks could travel to the site on the same day. Furthermore, it was assumed that the facility would require three shifts of facility operations and/or maintenance staff (assumed to be 4 persons per shift), for a total of 12 employee vehicle commutes each day. Emissions associated with truck trips and employee vehicles were calculated using the EMFAC2002 model, assuming operation would begin in 2007. Because the EMFAC2002 model takes into account improvements in emission factors and phase-out of older vehicles, 2007 emission factors represent a worst case estimate of maximum daily emissions associated with vehicular emissions. The estimated long-term emissions from mobile sources are summarized in Table 8.

Indirect Emissions from Energy Use. According to an evaluation of the CSDP's energy requirements, the total average and maximum power use of the desalination plant and the main product water pump station will be 29.8 MW and 35.5 MW, respectively. These facilities will be supplied with electricity generated at the Encina Generating Station, located at the same site as the CSDP.

Indirect emissions associated with natural gas combustion to provide power to the CSDP were calculated based on the average heat rate of the Encina Generating Station units (California Energy Commission 2004) of 11,012 BTU/kW-hr, and using EPA's AP-42 emission factors to estimate emissions of criteria pollutants for the 35.5 MW of power required by the CSDP, plus an additional 0.55 MW of power required for the Oceanside booster pump station, which will also be supplied power from the grid. Emissions of NOx were calculated based on an average emission factor derived from the California Energy Commission data of 2.26×10^{-4} lbs/kW-hr, based on actual NOx emissions and power output for 2002.

Total impacts associated with project operation are summarized in Table 8, including landscaping emissions, vehicle emissions, and indirect emissions associated with energy use.

As shown in Table 8, emissions associated with facility operation would be below the significance criteria. Thus emissions associated with project operation would not be anticipated to be significant.

Table 8
Total Operational Emissions

Emission Source	CO	ROC	NOx	SOx	PM_{10}
			lbs/day		
Landscaping*	0.58	0.08	0.01	0.00	0.00
Truck Trips	1.67	0.43	6.17	0.01	0.21
Employee Vehicles	4.96	0.23	0.50	0.00	0.03
Energy Use	285.83	20.01	59.66	32.39	62.88
TOTAL	**293.04**	**20.75**	**66.34**	**32.40**	**63.12**
Significance Criteria	550	55	250	250	100
Significant?	*No*	*No*	*No*	*No*	*No*
			tons/year		
Landscaping*	0.015	0.002	0.0003	0.00	0.00
Truck Trips	0.04	0.01	0.16	0.00	0.01
Employee Vehicles	0.91	0.09	0.04	0.00	0.01
Energy Use	52.16	3.65	10.89	5.91	11.48
TOTAL	**53.13**	**3.75**	**11.09**	**5.91**	**11.49**
Significance Criteria	100	15	40	40	15
Significant?	*No*	*No*	*No*	*No*	*No*

* Emissions calculated using the URBEMIS2002 Computer Model as recommended by the SCAQMD. Landscaping assumed to occur one day per week.

4.0 Conclusions

Project implementation would not conflict with the General Plan or Zoning Ordinance, nor would it propose to change any designations. As such, projects consistent with local General Plans are considered consistent with air quality related regional plans, such as the RAQS and the SIP. Thus the project would not conflict with or obstruct implementation of the applicable air quality plans.

The project's construction emissions are above the significance threshold for NOx; however, construction would be temporary and would not have a long-term impact. Project operational emissions are below the applicable significance thresholds and would therefore not violate any air quality standard or contribute substantially to an existing or projected air quality violation.

The project would not result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment. Emissions from power generation, which are the main source of emissions associated with project operation, would be well below the total emissions generated by the Encina Generating Station, and are considered within the emissions budget and permitted emission levels for the plant. Emissions from other sources associated with CSDP operation are minor.

The CSDP does not involve the direct emission of toxic air contaminants and would therefore not have the potential to expose sensitive receptors to substantial pollutant concentrations. Furthermore, the CSDP does not involve any odor-generating sources and is not classified as an odor-generating process (SCAQMD 1993); therefore, the project would not create objectionable odors affecting a substantial number of people. The project's operational impacts are therefore less than significant.

5.0 References

California Energy Commission. 2004. Generating Unit List for Aging Power Plant Study. http://www.energy.ca.gov/2004_policy_update/documents/2004-03-24_workshop/2004-03-24_UNIT_LIST.PDF.

California Air Resources Board. 2002. EMFAC2002 On-Road Emissions Model.

Carollo Engineers. 2004. *Truck Trips and Traffic Control*, Memorandum to Peter MacLaggan – Poseidon Resources, from Donnell Wilcox. July 12

City of San Diego. 2003. CEQA Air Quality Guidelines, June.

South Coast Air Quality Management District. 1993. CEQA Air Quality Handbook.

U.S. EPA. 2000. Compilation of Air Pollutant Emission Factors, Section 3.1, Stationary Gas Turbines.

APPENDIX A

EMISSION CALCULATIONS

Table A-1
Carlsbad Desalination Facility
Facility Construction

Phase (P1) Demolition of on-site fuel oil storage tank

Equipment	Fuel	HP	Load Factor	CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	CO	VOC	NOX	SOX	PM10
				Emission Factors (lb/bhp-hr)								Emissions, lbs/day				
Cranes	Diesel	194	43	0.009	0.003	0.023	0.002	0.0015	1	10	135	7.51	2.50	19.19	1.67	1.25
Rubber Tired Loaders	Diesel	147	54	0.011	0.002	0.023	0.002	0.0015	1	10	135	8.73	1.59	18.26	1.59	1.19
Excavators	Diesel	56	58	0.011	0.001	0.024	0.002	0.0015	1	10	135	3.57	0.32	7.80	0.65	0.49
Pumps	Diesel	23	74	0.011	0.002	0.018	0.002	0.001	1	10	135	1.87	0.34	3.06	0.34	0.17
												21.68	**4.76**	**48.30**	**4.25**	**3.10**

Phase (P2) Site remediation (if require Fuel

Equipment	Fuel	HP	Load Factor	CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	CO	VOC	NOX	SOX	PM10
				Emission Factors (lb/bhp-hr)								Emissions, lbs/day				
Excavators	Diesel	56	58	0.011	0.001	0.024	0.002	0.0015	2	10	60	7.15	0.65	15.59	1.30	0.97
												7.15	**0.65**	**15.59**	**1.30**	**0.97**

Phase (P3) Desalination Plant Construction - Earthwork

Equipment	Fuel	HP	Load Factor	CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	CO	VOC	NOX	SOX	PM10
				Emission Factors (lb/bhp-hr)								Emissions, lbs/day				
Rubber Tired Loaders	Diesel	147	54	0.011	0.002	0.023	0.002	0.0015	3	10	150	26.20	4.76	54.77	4.76	3.57
Excavators	Diesel	56	58	0.011	0.001	0.024	0.002	0.0015	3	10	150	10.72	0.97	23.39	1.95	1.46
Backhoe	Diesel	77	46.5	0.015	0.003	0.022	0.002	0.001	3	10	150	16.11	3.22	23.63	2.15	1.07
Grader	Diesel	156.6	57.5	0.008	0.003	0.021	0.002	0.001	2	10	150	14.41	5.40	37.82	3.60	1.80
Plate Compctr (4-strk)	Diesel	8	43	0.007	0.002	0.02	0.002	0.001	2	10	150	0.48	0.14	1.38	0.14	0.07
												67.91	**14.50**	**140.98**	**12.60**	**7.98**

Phase (P4) Desalination Plant Construction - Structures

Equipment	Fuel	HP	Load Factor	CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	CO	VOC	NOX	SOX	PM10
				Emission Factors (lb/bhp-hr)								Emissions, lbs/day				
Cranes	Diesel	194	43	0.009	0.003	0.023	0.002	0.0015	3	10	450	22.52	7.51	57.56	5.01	3.75
Cement/Mortar Mix	Diesel	11	56	0.01	0.002	0.024	0.002	0.001	2	10	450	1.23	0.25	2.96	0.25	0.12
Rough Terrain Fork Lifts	Diesel	93	47.5	0.022	0.003	0.018	0.002	0.0015	4	10	450	38.87	5.30	31.81	3.53	2.65
Aerial Lifts	Diesel	43	50.5	0.013	0.003	0.031	0.002	0.0015	1	10	450	2.82	0.65	6.73	0.43	0.33
Generator sets	Diesel	22	74	0.011	0.002	0.018	0.002	0.001	1	10	450	1.79	0.33	2.93	0.33	0.16
Welders	Diesel	35	45	0.011	0.002	0.018	0.002	0.001	4	10	450	6.93	1.26	11.34	1.26	0.63
												74.17	**15.29**	**113.32**	**10.81**	**7.65**

Phase (P5) Desalination Plant Construction - Paving and Landscaping

Equipment	Fuel	HP	Load Factor	CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	CO	VOC	NOX	SOX	PM10
				Emission Factors (lb/bhp-hr)								Emissions, lbs/day				
Grader	Diesel	156.6	57.5	0.008	0.003	0.021	0.002	0.001	1	10	120	7.20	2.70	18.91	1.80	0.90
Paving Equp (4-strk)	Diesel	99	53	0.01	0.002	0.024	0.002	0.001	2	10	120	10.49	2.10	25.19	2.10	1.05
Rollers	Diesel	99	57.5	0.007	0.002	0.02	0.002	0.001	2	10	120	7.97	2.28	22.77	2.28	1.14
												25.67	**7.08**	**66.87**	**6.18**	**3.09**

Phase (P6) Intake Pump Station Construction - Earthwork and site preparation

Equipment	Fuel	HP	Load Factor	CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	CO	VOC	NOX	SOX	PM10
				Emission Factors (lb/bhp-hr)								Emissions, lbs/day				
Rubber Tired Loaders	Diesel	147	54	0.011	0.002	0.023	0.002	0.0015	2	10	90	17.46	3.18	36.51	3.18	2.38
Excavators	Diesel	56	58	0.011	0.001	0.024	0.002	0.0015	2	10	90	7.15	0.65	15.59	1.30	0.97
Pumps	Diesel	23	74	0.011	0.002	0.018	0.002	0.001	4	10	90	7.49	1.36	12.25	1.36	0.68
Pile Driver (Other Construction Equip)	Diesel	161	62	0.02	0.003	0.024	0.002	0.0015	2	10	90	39.93	5.99	47.91	3.99	2.99
												72.03	**11.18**	**112.27**	**9.83**	**7.03**

Phase (P7) Intake Pump Station Construction - Structure

Equipment	Fuel	HP	Load Factor	CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	CO	VOC	NOX	SOX	PM10
				Emission Factors (lb/bhp-hr)								Emissions, lbs/day				
Cranes	Diesel	194	43	0.009	0.003	0.023	0.002	0.0015	1	10	270	7.51	2.50	19.19	1.67	1.25
Pumps	Diesel	23	74	0.011	0.002	0.018	0.002	0.001	4	10	270	7.49	1.36	12.25	1.36	0.68
Cement/Mortar Mix	Diesel	11	56	0.01	0.002	0.024	0.002	0.001	1	10	270	0.62	0.12	1.48	0.12	0.06
Rough Terrain Fork Lifts	Diesel	93	47.5	0.022	0.003	0.018	0.002	0.0015	4	10	270	38.87	5.30	31.81	3.53	2.65
Generator sets	Diesel	22	74	0.011	0.002	0.018	0.002	0.001	1	10	270	1.79	0.33	2.93	0.33	0.16
Welders	Diesel	35	45	0.011	0.002	0.018	0.002	0.001	2	10	270	3.47	0.63	5.67	0.63	0.32
												59.74	**10.24**	**73.33**	**7.64**	**5.12**

Phase (P8) Intake Pump Station Construction - Paving

Equipment	Fuel	HP	Load Factor	CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	CO	VOC	NOX	SOX	PM10
				Emission Factors (lb/bhp-hr)								Emissions, lbs/day				
Paving Equp (4-strk)	Diesel	99	53	0.01	0.002	0.024	0.002	0.001	1	10	30	5.25	1.05	12.59	1.05	0.52
Rollers	Diesel	99	57.5	0.007	0.002	0.02	0.002	0.001	1	10	30	3.98	1.14	11.39	1.14	0.57
												9.23	**2.19**	**23.98**	**2.19**	**1.09**

Phase (P9) Construction of intake and discharge pipelines - Earthwork

Equipment	Fuel	HP	Load Factor	CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	CO	VOC	NOX	SOX	PM10
				Emission Factors (lb/bhp-hr)								Emissions, lbs/day				
Rubber Tired Loaders	Diesel	147	54	0.011	0.002	0.023	0.002	0.0015	2	10	180	17.46	3.18	36.51	3.18	2.38
Excavators	Diesel	56	58	0.011	0.001	0.024	0.002	0.0015	2	10	180	7.15	0.65	15.59	1.30	0.97
Trenchers	Diesel	60	69.5	0.02	0.003	0.022	0.002	0.0015	2	10	180	16.68	2.50	18.35	1.67	1.25
Bore/Drill Rig (4-strk)	Diesel	209	75	0.02	0.003	0.024	0.002	0.0015	1	10	180	31.35	4.70	37.62	3.14	2.35
												72.64	**11.03**	**108.07**	**9.28**	**6.96**

Phase (P10) Construction of intake and discharge pipelines - Pipe Laying

Equipment	Fuel	HP	Load Factor	CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	CO	VOC	NOX	SOX	PM10
				Emission Factors (lb/bhp-hr)								Emissions, lbs/day				
Cranes	Diesel	194	43	0.009	0.003	0.023	0.002	0.0015	1	10	180	7.51	2.50	19.19	1.67	1.25
Rubber Tired Loaders	Diesel	147	54	0.011	0.002	0.023	0.002	0.0015	2	10	180	17.46	3.18	36.51	3.18	2.38
Welders	Diesel	35	45	0.011	0.002	0.018	0.002	0.001	2	10	180	3.47	0.63	5.67	0.63	0.32
												28.44	**6.31**	**61.37**	**5.47**	**3.95**

Phase (P11) Construction of intake and discharge pipelines - Paving

Equipment	Fuel	HP	Load Factor	CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	CO	VOC	NOX	SOX	PM10
				Emission Factors (lb/bhp-hr)								Emissions, lbs/day				
Paving Equp (4-strk)	Diesel	99	53	0.01	0.002	0.024	0.002	0.001	1	10	15	5.25	1.05	12.59	1.05	0.52
Rollers	Diesel	99	57.5	0.007	0.002	0.02	0.002	0.001	1	10	15	3.98	1.14	11.39	1.14	0.57
												9.23	**2.19**	**23.98**	**2.19**	**1.09**

Table A-2
Construction Worker Commute Emissions
Carlsbad Seawater Desalination Plant

Construction Worker Estimates and Emission Calculations

Construction Phase	Vehicle Class	No. of Workers Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	CO		NO_X		VOCs						SOx		PM10				Emissions, lbs/day				
					Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Hot-Soak (g/trip)	Resting Loss (g/hr)	Running Evaporative (g/mi)	Diurnal Evaporative (g/hr)	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Tire Wear (g/mi)	Brake Wear (g/mi)	CO	VOCs	NOx	SOx	PM10
Demolition of On-site Fuel Storage Tank	Light-duty truck, catalyst	10	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***5.23***	***0.25***	***0.54***	***0.00***	***0.03***
Remediation (if required)	Light-duty truck, catalyst	12	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***6.28***	***0.31***	***0.65***	***0.00***	***0.03***
Desalination Plant Construction - Earthwork	Light-duty truck, catalyst	20	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***10.47***	***0.51***	***1.09***	***0.01***	***0.06***
Desalination Plant Construction - Structures	Light-duty truck, catalyst	40	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***20.94***	***1.02***	***2.18***	***0.01***	***0.11***
Desalination Plant Construction - Paving and Landscaping	Light-duty truck, catalyst	15	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***7.85***	***0.38***	***0.82***	***0.01***	***0.04***
Intake Pump Station Construction - Earthwork	Light-duty truck, catalyst	20	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***10.47***	***0.51***	***1.09***	***0.01***	***0.06***
Intake Pump Station Construction - Structure	Light-duty truck, catalyst	25	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***13.08***	***0.64***	***1.36***	***0.01***	***0.07***
Intake Pump Station Construction - Paving	Light-duty truck, catalyst	10	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***5.23***	***0.25***	***0.54***	***0.00***	***0.03***
Construction of Intake and Discharge Pipelines - Earthwork	Light-duty truck, catalyst	15	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***7.85***	***0.38***	***0.82***	***0.01***	***0.04***
Construction of Intake and Discharge Pipelines - Pipe Laying	Light-duty truck, catalyst	15	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***7.85***	***0.38***	***0.82***	***0.01***	***0.04***
Construction of Intake and Discharge Pipelines - Paving	Light-duty truck, catalyst	5	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***2.62***	***0.13***	***0.27***	***0.00***	***0.01***

Maximum emissions from infrastructure assumed to be sum
of utilities and curb/gutter/paving, simultaneous
Assume startup after 8 hours
Assume 45 minutes run time total
2005 Emission Factors from EMFAC2002, average temp 60F

CO	NOx	VOCs	SOx	PM10
45.54	2.22	4.73	0.03	0.24

Table A-3
Construction Truck Emissions
Carlsbad Seawater Desalination Plant

								VOCs		PM10			Emissions, lbs/day				
Construction Phase	**Vehicle Class**	**No. of Trucks Per Day**	**Total No. of Trucks**	**Speed (mph)**	**VMT (mi/vehicle-day)**	**CO Running Exhaust (g/mi)**	**NO_X Running Exhaust (g/mi)**	**Running Exhaust (g/mi)**	**SOx Running Exhaust (g/mi)**	**Running Exhaust (g/mi)**	**Tire Wear (g/mi)**	**Brake Wear (g/mi)**	CO	VOCs	NOx	SOx	PM10
Demolition of On-site Fuel Storage Tank	Heavy Heavy-duty truck Diesel	60	1090	25	20	3.698	13.667	0.947	0.193	0.42	0.036	0.013	***9.78***	***2.51***	***36.16***	***0.51***	***1.24***
Remediation (if required)	Heavy Heavy-duty truck Diesel	10	100	25	20	3.698	13.667	0.947	0.193	0.42	0.036	0.013	***1.63***	***0.42***	***6.03***	***0.09***	***0.21***
Desalination Plant Construction - Earthwork	Heavy Heavy-duty truck Diesel	63	3350	25	20	3.698	13.667	0.947	0.193	0.42	0.036	0.013	***10.27***	***2.63***	***37.96***	***0.54***	***1.30***
Desalination Plant Construction - Structures	Heavy Heavy-duty truck Diesel	16	2500	25	20	3.698	13.667	0.947	0.193	0.42	0.036	0.013	***2.61***	***0.67***	***9.64***	***0.14***	***0.33***
Desalination Plant Construction - Paving and	Heavy Heavy-duty truck Diesel	8	250	25	20	3.698	13.667	0.947	0.193	0.42	0.036	0.013	***1.30***	***0.33***	***4.82***	***0.07***	***0.17***
Intake Pump Station Construction - Earthwork	Heavy Heavy-duty truck Diesel	36	1250	25	20	3.698	13.667	0.947	0.193	0.42	0.036	0.013	***5.87***	***1.50***	***21.69***	***0.31***	***0.74***
Intake Pump Station Construction - Structure	Heavy Heavy-duty truck Diesel	6	800	25	20	3.698	13.667	0.947	0.193	0.42	0.036	0.013	***0.98***	***0.25***	***3.62***	***0.05***	***0.12***
Intake Pump Station Construction - Paving	Heavy Heavy-duty truck Diesel	8	150	25	20	3.698	13.667	0.947	0.193	0.42	0.036	0.013	***1.30***	***0.33***	***4.82***	***0.07***	***0.17***
Construction of Intake and Discharge Pipelines -	Heavy Heavy-duty truck Diesel	18	1160	25	20	3.698	13.667	0.947	0.193	0.42	0.036	0.013	***2.93***	***0.75***	***10.85***	***0.15***	***0.37***
Construction of Intake and Discharge Pipelines -	Heavy Heavy-duty truck Diesel	4	80	25	20	3.698	13.667	0.947	0.193	0.42	0.036	0.013	***0.65***	***0.17***	***2.41***	***0.03***	***0.08***
Construction of Intake and Discharge Pipelines -	Heavy Heavy-duty truck Diesel	2	10	25	20	3.698	13.667	0.947	0.193	0.42	0.036	0.013	***0.33***	***0.08***	***1.21***	***0.02***	***0.04***

Distances calculated assuming distance to San Marcos for material products, 10 miles one way
Emission factors from 2005 EMFAC2002, 25 mph, Heavy Heavy Duty Diesel truck (HHD)

Table A-4
Materials Handling Emissions
Carlsbad Seawater Desalination Plant

Construction Phase	Cubic Yards Material Handled	Tons Material Handled	Maximum Truck Trips per day	PM10 Emissions, lbs/day
Demolition of On-site Fuel Storage Tank	9,200	14720	60	19.44
Remediation (if required)	1,800	2880	18	5.832
Desalination Plant Construction - Earthwork	33,500	53600	70	22.68
Intake Pump Station Construction - Earthwork	12,500	20000	40	12.96
Construction of Intake and Discharge Pipelines - Earthwork	11,600	18560	20	6.48

Table A-5
Heavy Construction Equipment Emissions
Carlsbad Seawater Desalination Pipeline Construction

Phase (P1) Remove Bituminous Pavement

Equipment	Fuel	HP	Load Factor	Emission Factors (lb/bhp-hr) CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	Emissions, lbs/day CO	VOC	NOX	SOX	PM10
Backhoe Loader	Diesel	48	46.5	0.015	0.003	0.022	0.002	0.001	1	10	2.1	3.35	0.67	4.91	0.45	0.22
Hydraulic Hammer	Diesel	35	48	0.008	0.005	0.017	0.002	0.0015	1	10	2.1	1.34	0.84	2.86	0.34	0.25
Rubber Tired Loaders	Diesel	170	54	0.011	0.002	0.023	0.002	0.0015	1	10	2.1	10.10	1.84	21.11	1.84	1.38
Pavement Removal Bucket (Dumpers/Tendors)	Diesel	23	38	0.006	0.002	0.021	0.002	0.0015	1	10	2.1	0.52	0.17	1.84	0.17	0.13
												15.31	**3.52**	**30.72**	**2.79**	**1.98**

Phase (P2) Trench Excavation

Equipment	Fuel	HP	Load Factor	Emission Factors (lb/bhp-hr) CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	Emissions, lbs/day CO	VOC	NOX	SOX	PM10
Hydraulic Excavator	Diesel	56	58	0.011	0.001	0.024	0.002	0.0015	1	10	4	3.57	0.32	7.80	0.65	0.49
												3.57	**0.32**	**7.80**	**0.65**	**0.49**

Phase (P3) Placing Pipe Bedding

Equipment	Fuel	HP	Load Factor	Emission Factors (lb/bhp-hr) CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	Emissions, lbs/day CO	VOC	NOX	SOX	PM10
Backhoe Loader	Diesel	48	46.5	0.015	0.003	0.022	0.002	0.001	1	10	1.9	3.35	0.67	4.91	0.45	0.22
												3.35	**0.67**	**4.91**	**0.45**	**0.22**

Phase (P4) Compact Pipe Bedding

Equipment	Fuel	HP	Load Factor	Emission Factors (lb/bhp-hr) CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	Emissions, lbs/day CO	VOC	NOX	SOX	PM10
Gas Engine Power Tool (Plate Compctr (4-strk))	Gasoline	5	55	0.83	0.043	0.004	0.0005	0.00025	1	10	3.2	22.83	1.18	0.11	0.01	0.01
												22.83	**1.18**	**0.11**	**0.01**	**0.01**

Phase (P5) Placing Pipe

Equipment	Fuel	HP	Load Factor	Emission Factors (lb/bhp-hr) CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	Emissions, lbs/day CO	VOC	NOX	SOX	PM10
75-T Crane	Diesel	194	43	0.009	0.003	0.023	0.002	0.0015	1	10	36.4	7.51	2.50	19.19	1.67	1.25
300a Welder	Diesel	35	45	0.011	0.002	0.018	0.002	0.001	1	10	36.4	1.73	0.32	2.84	0.32	0.16
												9.24	**2.82**	**22.02**	**1.98**	**1.41**

Phase (P6) Backfilling Pipe Trench

Equipment	Fuel	HP	Load Factor	Emission Factors (lb/bhp-hr) CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	Emissions, lbs/day CO	VOC	NOX	SOX	PM10
Rubber Tired Loaders	Diesel	170	54	0.011	0.002	0.023	0.002	0.0015	1	10	12.2	10.10	1.84	21.11	1.84	1.38
												10.10	**1.84**	**21.11**	**1.84**	**1.38**

Phase (P7) Compacting Pipe Trench, Power Tamper

Equipment	Fuel	HP	Load Factor	Emission Factors (lb/bhp-hr) CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	Emissions, lbs/day CO	VOC	NOX	SOX	PM10
Gas Engine Power Tool (Plate Compctr (4-strk))	Gasoline	5	55	0.83	0.043	0.004	0.0005	0.00025	1	10	1.6	22.83	1.18	0.11	0.01	0.01
												22.83	**1.18**	**0.11**	**0.01**	**0.01**

Phase (P8) Compacting Pipe Trench, Vibrating Roller

Equipment	Fuel	HP	Load Factor	Emission Factors (lb/bhp-hr) CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	Emissions, lbs/day CO	VOC	NOX	SOX	PM10
2000 lbs Roller Compactor	Diesel	99	57.5	0.007	0.002	0.02	0.002	0.001	1	10	1.5	3.98	1.14	11.39	1.14	0.57
												3.98	**1.14**	**11.39**	**1.14**	**0.57**

Phase (P9) Placing Base Course

Equipment	Fuel	HP	Load Factor	Emission Factors (lb/bhp-hr) CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	Emissions, lbs/day CO	VOC	NOX	SOX	PM10
Rubber Tired Loaders	Diesel	170	54	0.011	0.002	0.023	0.002	0.0015	1	10	0.9	10.10	1.84	21.11	1.84	1.38
Roller, Vibratory (Concrete Pavers)	Diesel	99	62	0.01	0.002	0.022	0.002	0.001	1	10	0.9	6.14	1.23	13.50	1.23	0.61
Truck Tractor (Off Highway Trucks)	Diesel			1.8	0.19	4.17	0.45	0.26	1	10	0.9	18.00	1.90	41.70	4.50	2.60
Water Truck (Off Highway Trucks)	Diesel			1.8	0.19	4.17	0.45	0.26	1	10	0.9	18.00	1.90	41.70	4.50	2.60
												52.24	**6.86**	**118.02**	**12.06**	**7.19**

Phase (P10) Placing AC Pavement Over Trench

Equipment	Fuel	HP	Load Factor	Emission Factors (lb/bhp-hr) CO	VOC	NOX	SOX	PM10	No of Equip	Hrs Per Day	Days in Service	Emissions, lbs/day CO	VOC	NOX	SOX	PM10
Tandem Roller (Roller Compactor)	Diesel	99	57.5	0.007	0.002	0.02	0.002	0.001	1	10	1.5	3.98	1.14	11.39	1.14	0.57
												3.98	**1.14**	**11.39**	**1.14**	**0.57**

NOTE: This analysis is based on manpower requirements provided by project engineers; assumes manpower requirements provided per 1000 feet of pipeline.

Table A-6
Construction Worker Commute Emissions
Carlsbad Seawater Desalination Pipeline Construction

Construction Worker Estimates and Emission Calculations
Construction work crew for all operations: 9 workers total

Construction Phase	Vehicle Class	No. of Workers Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	CO Running Exhaust (g/mi)	CO Start-Up (g/start)[a]	NO_x Running Exhaust (g/mi)	NO_x Start-Up (g/start)[a]	VOCs Running Exhaust (g/mi)	VOCs Start-Up (g/start)[a]	VOCs Hot-Soak (g/trip)	VOCs Resting Loss (g/hr)	VOCs Running Evaporative (g/mi)	VOCs Diurnal Evaporative (g/hr)	SOx Running Exhaust (g/mi)	SOx Start-Up (g/start)[a]	PM10 Running Exhaust (g/mi)	PM10 Start-Up (g/start)[a]	PM10 Tire Wear (g/mi)	PM10 Brake Wear (g/mi)	Emissions, lbs/day CO	Emissions, lbs/day VOCs	Emissions, lbs/day NOx	Emissions, lbs/day SOx	Emissions, lbs/day PM10
Removing Bituminouos Pavement	Light-duty truck, catalyst	22.5	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***11.78***	***0.57***	***1.22***	***0.01***	***0.06***
Trench Excavation	Light-duty truck, catalyst	22.5	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***11.78***	***0.57***	***1.22***	***0.01***	***0.06***
Placing Pipe Bedding	Light-duty truck, catalyst	22.5	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***11.78***	***0.57***	***1.22***	***0.01***	***0.06***
Compacting Pipe Bedding	Light-duty truck, catalyst	22.5	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***11.78***	***0.57***	***1.22***	***0.01***	***0.06***
Placing Pipe Bedding	Light-duty truck, catalyst	22.5	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***11.78***	***0.57***	***1.22***	***0.01***	***0.06***
Backfilling Pipe Trench	Light-duty truck, catalyst	22.5	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***11.78***	***0.57***	***1.22***	***0.01***	***0.06***
Compacting Pipe Trench - Plate	Light-duty truck, catalyst	22.5	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***11.78***	***0.57***	***1.22***	***0.01***	***0.06***
Compacting Pipe Trench - Roller	Light-duty truck, catalyst	22.5	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***11.78***	***0.57***	***1.22***	***0.01***	***0.06***
Placing Base Course	Light-duty truck, catalyst	22.5	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***11.78***	***0.57***	***1.22***	***0.01***	***0.06***
Placing AC Pavement over Trench	Light-duty truck, catalyst	22.5	35	40	5.012	18.463	0.573	0.875	0.119	1.461	0.111	0.016	0.081	0	0.004	0.002	0.01	0.015	0.008	0.013	***11.78***	***0.57***	***1.22***	***0.01***	***0.06***

Maximum emissions from

Assume startup after 8 hours

Assume 45 minutes run time total

2005 Emission Factors from EMFAC2002, average temp 60F

Table A-7
Construction Truck Emissions
Carlsbad Seawater Desalination Pipeline Construction

								VOCs		PM10			Emissions, lbs/day					Emissions, tons/yr				
Construction Phase	**Vehicle Class**	**No. of Trucks Per Day**	**Total No. of Trucks**	**Speed (mph)**	**VMT (mi/vehicle-day)**	**CO Running Exhaust (g/mi)**	**NO_X Running Exhaust (g/mi)**	**Running Exhaust (g/mi)**	**SOx Running Exhaust (g/mi)**	**Running Exhaust (g/mi)**	**Tire Wear (g/mi)**	**Brake Wear (g/mi)**	CO	VOCs	NOx	SOx	PM10	CO	VOCs	NOx	SOx	PM10
Blue Alignment, Alternative 1	Heavy Heavy-duty truck Diesel	108	23750	25	9.2	3.698	13.667	0.947	0.193	0.42	0.036	0.013	***8.10***	***2.07***	***29.94***	***0.42***	***1.03***	***0.89***	***0.23***	***3.29***	***0.05***	***0.11***

Distances calculated assuming distance to San
Emission factors from 2005 EMFAC2002, 25 mph, Heavy Heavy Duty Diesel truck (HHD)

Assumes pipeline construction requires 16 months total.

Table A-8
Fugitive Dust Emissions
Materials Handling
Carlsbad Seawater Desalination Plant

Earth Moving	Total cy Material	Total Tons Material	PM10 Emission factor	Units
Material handling - trench excavation	1512	2419.2	0.000208	lbs/ton

Unpaved Road Emissions

Emission Factor		**Silt content**	**Mean vehicle weight**	**Surface moisture content**
Emission Factor, lb PM10/VMT	k, lb/VMT	s, %	W, tons	Mdry
3.91	2.6	8.5	24	0.2

Total Fugitive Dust: 21.21

Table A-8
Fugitive Dust Emissions
Materials Handling
Carlsbad Seawater Desalination Plant

Emissions, lbs/day	Emissions, tons/year	Source
0.50	0.06	SCAQMD CEQA Air Quality Handbook, Table 9-9-G (moist material)

Days with at least 0.254 mm precipitation	**Exponents for pm-10**		
p	a	b	c
50	0.8	0.4	0.3

Truck Type	**Vehicle Class**	**No. of Trucks Per Construction Phase**	**Estimated Travel Distance per vehicle, miles**
Concrete Trucks	Heavy Duty Trucks	108	0.1

Table A-8
Fugitive Dust Emissions
Materials Handling
Carlsbad Seawater Desalination Plant

Control Efficiency (assume watering 2x per day)	PM10 Emissions lbs/day	PM10 Emissions tons/qtr
0.51	20.70	0.81

Table A-9
Employee Commute Emissions
Carlsbad Seawater Desalination Project

Vehicle Class	Number of Daily Trips	Speed (mph)	VMT (mi/vehicle-day)	CO Running Exhaust (g/mi)	CO Start-Up (g/start)[a]	NO_X Running Exhaust (g/mi)	NO_X Start-Up (g/start)[a]	VOCs Running Exhaust (g/mi)	VOCs Start-Up (g/start)[a]	VOCs Hot-Soak (g/trip)	VOCs Resting Loss (g/hr)	VOCs Running Evaporative (g/mi)	VOCs Diurnal Evaporative (g/hr)	SO_X Running Exhaust (g/mi)	SO_X Start-Up (g/start)[a]	PM10 Running Exhaust (g/mi)	PM10 Start-Up (g/start)[a]	PM10 Tire Wear (g/mi)	PM10 Brake Wear (g/mi)
Light-duty auto	9	35	40	3.638	14.148	0.399	0.747	0.119	1.329	0.12	0.015	0.058	0	0.003	0.002	0.011	0.015	0.008	0.013
Light-duty truck	3	35	40	5.058	17.224	0.547	0.791	0.163	1.367	0.145	0.018	0.084	0	0.004	0.002	0.012	0.016	0.008	0.013
	12																		

Vehicle Class	Emissions, lbs/day CO	NOx	VOCs	SOx	PM10	Emissions, tons/year CO	NOx	VOCs	SOx	PM10
Light-duty auto	*3.59*	*0.36*	*0.17*	*0.0026*	*0.03*	*0.65*	*0.07*	*0.03*	*0.0005*	*0.0049*
Light-duty truck	*1.38*	*0.14*	*0.06*	*0.0010*	*0.01*	*0.25*	*0.02*	*0.01*	*0.0002*	*0.0014*
Totals	**4.96**	**0.50**	**0.23**	**0.00**	**0.03**	**0.91**	**0.09**	**0.04**	**0.00**	**0.01**

Assumed to consist of 78%
light-duty autos and 22%
light-duty trucks.
Assume startup after 8 hours

Assume 45 minutes run time
total
2007 Emission Factors from EMFAC2002, average temp 55F

Table A-10
Truck Emissions
Carlsbad Seawater Desalination Plant

								VOCs		PM10			Emissions, lbs/day					Emissions, tons/yr				
Construction Phase	**Vehicle Class**	**No. of Trucks Per Day**	**Total No. of Trucks**	**Speed (mph)**	**VMT (mi/vehicle-day)**	**CO Running Exhaust (g/mi)**	**NO_x Running Exhaust (g/mi)**	**Running Exhaust (g/mi)**	**SOx Running Exhaust (g/mi)**	**Running Exhaust (g/mi)**	**Tire Wear (g/mi)**	**Brake Wear (g/mi)**	CO	VOCs	NOx	SOx	PM10	CO	VOCs	NOx	SOx	PM10
Demolition of On-site Fuel Storage Tank	Heavy Heavy-duty truck Diesel	12	624	25	20	3.16	11.655	0.817	0.021	0.341	0.036	0.013	***1.67***	***0.43***	***6.17***	***0.01***	***0.21***	***0.04***	***0.01***	***0.16***	***0.00***	***0.01***

Distances calculated assuming distance to San Marcos for material products, 10 miles one way

Emission factors from 2007 EMFAC2002, 25 mph, Heavy Heavy Duty Diesel truck (HHD)

Table A-11
Energy Use
Emissions Calculations
Carlsbad Seawater Desalination Plant

Energy Use Emissions

Based on Section 3.1, Stationary Gas Turbines
Assuming NOx controlled by water/steam injection and 90% SCR
Heat Rate 11012 BTU/kW-hr
Annual Power Requirements =
35.5 MW + 0.55 MW

	Emission Factors, lbs/MMBTU					Emissions, lbs/day					Emissions, tons/year				
kW	CO	ROG	NOX (lbs/k	SOx	PM10	CO	ROG	NOX	SOx	PM10	CO	ROG	NOX	SOx	PM10
36,050	3.00E-02	2.10E-03	0.000226	3.40E-03	6.60E-03	285.83	20.01	59.66	32.39	62.88	52.16	3.65	10.89	5.91	11.48