COVER SHEET

DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE UPPER AMERICAN RIVER AND CHILI BAR
HYDROELECTRIC PROJECTS
Docket Nos. P-2101-084 and P-2155-024

Appendix A
Clean Air Act Conformity Analysis

DEIS

APPENDIX A

UPPER AMERICAN RIVER HYDROELECTRIC PROJECT (FERC No. 2101)
AND
CHILI BAR HYDROELECTRIC PROJECT (FERC No. 2155)
CALIFORNIA
CLEAN AIR ACT CONFORMITY ANALYSIS

This page intentionally left blank.

TABLE OF CONTENTS

This page intentionally left blank.

LIST OF TABLES

This page intentionally left blank.

LIST OF ABBREVIATIONS

CAA	Clean Air Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	Carbon monoxide
Commission	Federal Energy Regulatory Commission
EIS	environmental impact statement
ºF	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
GCR	General Conformity Rule
HC	hydrocarbons
kg	kilogram
kV	kilovolt
mmBtu	million British thermal units
mph	miles per hour
MW	megawatt
MWh	megawatt-hours
MWR	Morale, Welfare and Recreation
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NOx	oxides of nitrogen
NSR	non-Attainment New Source Review
O_3	ozone
Pb	airborne lead
PG&E	Pacific Gas and Electric Company
Projects	UARP and Chili Bar Project
PM	particulate matter
$PM_{2.5}$	particulate matter with an equivalent aerodynamic diameter less than 2.5 um
PM_{10}	particulate matter with an equivalent aerodynamic diameter less than 10 um
PSD	prevention of significant deterioration
SIP	State Implementation Plan
SO_2	sulfur dioxide
SMUD	Sacramento Municipal Utility District
TPY	tons per year
UARP	Upper American River Project
USEPA	United States Environmental Protection Agency
VOC	volatile organic compounds

This page intentionally left blank.

1.0 INTRODUCTION

The Federal Energy Regulatory Commission (FERC), Office of Energy Projects has retained the services of The Louis Berger Group, Inc. (Berger), to perform a conformity determination with respect to proposed relicensing to the Upper American River Project (UARP or Project No. 2101) and the Chili Bar Hydroelectric Project (Project No. 2155). In support of the environmental impact statement (EIS) being prepared, Berger is performing a conformity determination for the Projects, pursuant to the provisions of 40 CFR 93.150 for General Conformity, to assess emissions that would result from construction and operation of the Projects

1.1 DESCRIPTION OF PROJECT

The Upper American River Project (UARP or Project No. 2101) is a hydroelectric project located in El Dorado and Sacramento County, California within the Rubicon River, Silver Creek, and the South Fork of the American River (SFAR) drainages and operated by the Sacramento Municipal Utility District (SMUD). The Chili Bar Hydroelectric Project (Project No. 2155), operated by the Pacific Gas and Electric Company (PG&E), is located on the SFAR in El Dorado County, California. The Projects have common stakeholders and issues, as well as operational and hydraulic interrelationships. The UARP can generate up to 688 megawatt (MW) of power, while the Chili Bar Project provides an additional capacity of 7 MW.

PG&E and SMUD entered into two relicensing cooperation agreements that defined the common relicensing issues between the Projects' overlapping issues. These overlapping issues are related to flows into and out of Chili Bar reservoir and operational coordination. Both SMUD's and PG&E's license applications outlined their proposals to continue operating the UARP and the Chili Bar Project in accordance with certain existing and interim operational and environmental measures.

As part of the relicensing process, SMUD proposes to increase electrical capacity of the UARP by constructing the Iowa Hill pumped storage development (Iowa Hill development). The Proposed Action includes the construction of a new upper reservoir atop Iowa Hill and operation of the completed pump-storage facility with capability to generate 400 MW of electricity. The existing Project produces an average of approximately 1,835,000 megawatt-hours (MWh) of power annually. The Iowa Hill development is not expected to significantly change the Project's average annual energy production, but by using off-peak energy to pump water to the storage basin and then releasing water through the powerhouse during peak periods, SMUD would significantly increase the generated energy's value and water use efficiency.

The DEIS concludes that issuing a new license for the Chili Bar Project as proposed by PG&E with staff modifications would best achieve proper use, conservation, and comprehensive development of the Chili Bar Project and the Upper American River.

Furthermore, continuing operations of the Chili Bar Project would not substantially increase air emissions. As such, an air conformity analysis was performed only for alternatives related to the UARP.

1.2 CLEAN AIR CONFORMITY

The 1990 amendments to the Clean Air Act (CAA) and the Conformity Rules require federal agencies to conform to State Implementation Plans (SIPs). Requirements and procedures have been established by the US Environmental Protection Agency (EPA) and federal agencies to ensure that federal sponsored or approved actions will comply with the National Ambient Air Quality Standards (NAAQS), and conform to the appropriate SIPs. The conformity rules apply to designated non-attainment or maintenance areas for criteria pollutants regulated under NAAQS. The SIPs are the approved state air quality regulations that provide policies, requirements, and goals for the implementation, maintenance, and enforcement of the NAAQS. SIPs include emission limitations and control measures to attain and maintain the NAAQS.

The EPA has developed two conformity regulations for transportation and non-transportation projects. Transportation projects are governed by the "transportation conformity" regulations (40 CFR Parts 51 and 93). Non-transportation projects are governed by the "general conformity" regulations (40 CFR Parts 6, 51 and 93) described in the final rule for Determining Conformity of General Federal Actions to State or Federal Implementation Plans. Since the proposed project is a non-transportation project, the general conformity rule applies.

The general conformity determination and applicability analysis have been prepared as supplements to the EIS for the Projects. Air emissions of the proposed actions during construction and operation of the Project Alternatives, including UARP-only (without the Iowa Hill development), UARP with the Iowa Hill development, and No-Action Alternative, were evaluated for air conformity purposes.

2.0 GENERAL CONFORMITY

2.1 ATTAINMENT AND NON-ATTAINMENT AREAS

The General Conformity Rule applies to federal actions occurring in air quality regions designated as being in non-attainment for the NAAQS or attainment areas subject to maintenance plans (maintenance areas). Federal actions occurring in attainment areas are not subject to the conformity rules. A criteria pollutant is a pollutant for which an air quality standard has been established under the CAA. Under the requirements of the 1970 CAA, as amended in 1977 and 1990, the EPA established NAAQS, for six criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), inhalable particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb). Non-attainment designation is based on the exceedances or violations of the air quality standard. A maintenance plan establishes measures to control emissions to ensure that the air quality standard is maintained in areas that have been re-designated as attainment from a previous non-attainment status.

The proposed Projects would take place in Sacramento County and El Dorado County, California. These impact areas are currently designated as serious non-attainment for 8-hour ozone, and as CO maintenance (previously nonattainment) areas. Sacramento County is also designated as moderate non-attainment for PM_{10}. The project areas are designated as attainment for other criteria pollutants. Thus, ozone (O_3), CO, and PM_{10} are the primary pollutants of concern. O_3 is principally formed through chemical reactions of oxides of nitrogen (NO_x) and volatile organic compounds (VOC) in the atmosphere; therefore, emissions of NO_x and VOC need to be included in the conformity analysis.

2.2 *DE MINIMUS* EMISSION LEVELS

Threshold (*de minimis*) rates of emissions for federal actions with the potential to have significant air quality impacts are established in 40 CFR 93.153. Under the general conformity rule, net emissions resulting from proposed federal action must be compared to the applicable *de minimis* levels on an annual basis. A formal conformity determination is required when the annual direct and indirect emissions from a federal action, occurring in a non-attainment or maintenance area, equals or exceeds the *de minimis* level. Table 2-1 lists the established *de minimis* levels for each criteria pollutant; *de minimis* levels for emissions included in the UARP Conformity Analysis are highlighted in gray.

Table 2-1. *De minimus* emission levels for applicable air pollutants

Pollutant	Non-attainment / Maintenance Designation	TPY
Ozone	Serious	50
(Precursors VOCs or NO_x)	Severe	25
	Extreme	10
	Other non-attainment areas outside ozone transport region	100
	Marginal and moderate non-attainment areas inside ozone transport region	50/100
Carbon monoxide	All	100
Sulfur dioxide	All	100
Lead	All	25
Nitrogen dioxide	All	100
Particulate matter	Moderate	100
	Serious	70

2.3 ANALYSIS METHODOLOGY

Per the provisions of 40 CFR 93.150, federal agencies are required to perform a conformity determination when the emissions in non-attainment or maintenance areas would total or exceed thresholds emission levels. "Federal action," as defined in the Conformity Rules, means any activity engaged in by a federal agency, or any activity that a federal agency supports in any way, provides financial assistance for, licenses, permits, or approves, other than activities related to transportation plans, programs, and projects developed, funded, or approved under Title 23 USC or the Federal Transit Act (49 USC §5301 et seq.). Where the federal action is a permit, license, or other approval for some aspect of a nonfederal undertaking, the relevant activity is the part, portion, or phase of the nonfederal undertaking that required the federal permit, license, or approval. Therefore, the proposed action is defined as activities related to the re-licensing of the UARP.

Per the provisions of 40 CFR 93.150, a full conformity determination is required if calculated net emissions are above *de minimis* in non-attainment or maintenance areas. Net emissions are estimated as the difference in annual peak-year emissions between the action being analyzed and baseline condition, which is the no action alternative in this case.

The proposed action would be subject to conformity requirements if net project VOC or NOx emissions above baseline conditions exceed 50 tons per year, or if CO or PM net emissions exceed 100 tons per year. Other pollutants do not need to be included in the conformity analysis since the area is designated as attainment or unclassifiable for all other criteria pollutants. The conformity determination consists of an emission netting analysis and comparison with applicability thresholds. The detailed methodologies and procedures for air emission calculations and general conformity demonstration are described below.

This page intentionally left blank.

3.0 ANALYSIS

The conformity analysis for a federal action examines the effects of the direct and indirect net air emissions from all sources compared to baseline conditions. Direct emissions are emissions of a criteria pollutant or its precursors that are caused or initiated by a federal action and occur at the same time and place as the action. Indirect emissions, occurring later in time and/or further removed in distance from the action itself, must be included in the determination if both of the followings apply; the federal agency can practicably control the emissions and has continuing program responsibility to maintain control and the emissions caused by the federal action are reasonably foreseeable.

3.1 ACTIVITIES INCLUDED IN ANALYSIS

The three alternatives proposed in the Draft Environmental Impact Statement for Hydropower License (FERC Project Nos. 2101 and 2155) include both construction and operations-related activities that may effect air emissions in the Project Area.

3.1.1 No-Action Alternative

Under the No-Action Alternative, the UARP and Chili Bar Project would continue to operate under the terms and conditions of the existing licenses, and no new environmental protection, mitigation, or enhancement measures would be implemented. This alternative establishes baseline environmental conditions for comparison of net emissions produced under the other alternatives. Under the No-Action Alternative, a Simple-Cycle Turbine (SCT) system will be added for additional on-peak use. These stationary combustion turbines use natural gas to generate shaft power that is converted into electricity.

3.1.2 SMUD's Proposal: Iowa Hill Development

As part of the re-licensing process, SMUD proposes to increase electrical capacity of the UARP by constructing the Iowa Hill development, which would operate as a pumped storage facility. The Iowa Hill development, as proposed, would be an off-stream pumped storage project that makes use of the existing UARP Slab Creek reservoir as a lower reservoir and creates a new upper reservoir atop Iowa Hill. A proposed underground powerhouse would house two or three, equally sized, reversible, variable-speed pump/turbine units with a rated capacity of 400 MW. Under this alternative, SMUD would also seek for additional future off-peak generation with either a preferred Combined-Cycle Turbines (CCT) combustion system or conventional coal-fired units for supplements of energy supply. A Simple-Cycle Turbine (SCT) system will also be added for additional on-peak use.

3.1.3 UARP-Only Alternative

Under this alternative, all components of SMUD's Proposal would be established with the exception of the Iowa Hill development. SMUD would operate the existing UARP facilities. Slab Creek reservoir water level fluctuations under this alternative would be the same as existing conditions, while the release schedule for the project dams would be the same as with the Iowa Hill development. Without the additional 400 MW of capacity from the Iowa Hill development, SMUD would have to meet future peak generation needs with replacement facilities, additional on-peak simple cycle peaking plants, such as a SCT system, or seek an alternative supplemental energy supply. SMUD would also add the additional future off-peak generation with either a preferred CCT combustion system or conventional coal-fired units during for supplements of energy supply.

3.2 EMISSIONS SOURCE DETERMINATION

The General Conformity Rule (GCR) requires that potential emissions generated by any project-related demolition or construction activity and/or increased operational activities be determined on an annual basis and compared to the annual *de minimis* levels for those pollutants (or their precursors) for which the area is classified as non-attainment or maintenance. CO, PM, NO_x and VOC emissions attributable to operational activities and construction were analyzed.

In estimating construction-related air pollutants emissions, the EPA NONROAD model was utilized. The usage of equipment, the likely duration of each activity, and manpower estimates for each activity for the construction were determined by the Engineer. In estimating operational-related emissions, the EPA-developed AP-42 emission factors were used if other emissions information was not provided.

3.3 CONSTRUCTION EMISSIONS

Construction-related air emissions include potential direct and indirect VOC, NO_x, CO, and PM emissions generated by construction equipment and vehicles. Emissions may result from the use of construction equipment, equipment mobilization, site preparation, foundations, exterior masonry work, interior and exterior utilities, structures demolition and construction, and exterior pavement around structures. Construction activities would involve operations of on-site construction equipment and motor vehicles, including construction material delivery trucks and workers' commuting vehicles, and dusts from earth surface handling activities. Since the maximum annual emissions would result from all lots being constructed at the same time, the number and type of equipment necessary for construction activities were determined in aggregate for the project.

In estimating air emissions from construction activities, the usage of equipment and the duration of activities for construction were first determined based on the sizes of structures and lots to be constructed. To be conservative, all equipment was assumed to be diesel-powered unless otherwise noted. Types of equipment to be used include, but are not limited to; bull dozers, rigs, crushers, rock saws, drill, scrapers, concrete batch plants, dumpers, excavators, compressors, water tanks, cranes, graders, pavers, backhoes, dump trucks, front-end loaders, jackhammers, and vibrators. The resulting air emissions were then calculated using the EPA provided guidance and emission factors.

Because there are no construction activities in either the No-Action Alternative or the UARP-Only Alternative, construction-related emissions analysis has been performed only for the Iowa Hill development. Operational-related air emissions have been analyzed for all proposed alternatives.

Construction of the Iowa Hill development may affect short-term air quality due to construction equipment and vehicle emissions, and fugitive dust from earthmoving activities. Both potential effects would be temporary (limited to the construction period) and local (only occurring in the immediate vicinity of the construction activity).

Estimates of construction equipment emissions were based on the estimated hours of usage and emission factors for each motorized source for the project. Emission factors for NOx , VOC, CO, and PM related to heavy-duty diesel equipment were obtained from EPA NONROAD Model (Version 2005c, February 2006) and relevant Vehicle Emission Study Reports (EPA). Emission factors are available for hydrocarbons (HC), which include all VOC as well as other non-VOC constituents; therefore, HC emissions represent a conservative estimate of VOC emissions.

Emission factors in grams of pollutant per hour per horsepower were multiplied by the estimated running time and equipment associated average horsepower provided by the EPA to calculate total grams of pollutant from each piece of equipment. Total grams of pollutant were converted to tons of pollutant.

The EPA NONROAD model recommends the following formula to calculate hourly emissions from nonroad engine sources:

$M_i = N \times HP \times LF \times EF_i$

Where:

M_i = mass of emissions of pollutants.

N = source population (units).

HP = average rated horsepower.

LF = typical load factor.

EF_i = average emissions of pollutant per unit of use (e.g., grams per horsepower-hour).

Estimated emissions from construction activities are presented in Attachment A. Construction of the Iowa Hill Development will occur in two phases. During the first phase, which will last approximately 24 months, material will be excavated from the upper storage reservoir and tunnel sites. The second phase, which will extend from month 25 to month 49, will include the construction of the upper storage reservoir berm, drain structure, and impermeable surface bottom, and the installation of generating equipment in the underground facilities. Emissions will be greatest during Phase I due to the large volume of material excavated; therefore this phase was evaluated for worst-case (peak-year 2009) air emissions. Other years will have lesser emissions from the construction sites.

Heavy construction equipment and truck emissions for the Iowa Hill development would be generated from the engine exhaust pipes of diesel construction equipment and trucks used for 1) the excavation and transport of materials; 2) the boring and lining of underground tunnels and caverns and transport of spoils; 3) surface dust control in upper reservoir and stockpiling areas; and 4) delivery of equipment and materials to the construction site.

Fugitive dust emissions from the excavation of the upper reservoir site and the tunnels would be associated with excavation and transport of topsoil; ripping and transport of weathered rock; blasting, loading, and transport of basin rock; and transport of tunnel spoils. In addition, wind erosion of areas disturbed during construction activities may contribute emissions. Commuting and delivery motor vehicles operations would result in indirect emissions. The activities that are subject to the general conformity determination include vehicles' operations within project areas. Per engineering and construction team estimates, motor vehicles operations are assumed to be as follows:

- On-Road (off-site) delivery vehicles would travel at an average speed of 25 miles per hour, for a total estimated 15 deliveries per working day with 45 minutes on-site idling time per visit.
- Each commuter vehicles would make an average round trip of 60 miles within project areas at an average speed of 25 mph.
- Average number of commuting worker vehicles would be 130 per working days.
- There would be 264 working days per construction year.

Emission factors for motor vehicles were calculated for 2009 for both delivery vehicles (heavy duty diesel vehicles) and commuter vehicles (light duty gasoline vehicles) using the EPA Mobile6.2 mobile source emission factor model associated with regional parameters.

Under the proposal, SMUD would develop and implement an Iowa Hill Development Construction Dust and Exhaust Emissions Abatement Plan in consultation with interested parties. Under the plan proposed measures would potentially minimize exhaust and fugitive dust emissions during construction of the Iowa Hill development, including:

- Operational measures, such as limiting engine idling time and shutting down equipment when not in use;
- Regular preventive maintenance to prevent emission increases resulting from engine problems;
- Use of low sulfur and low aromatic fuel meeting California standards for motor vehicle diesel fuel;
- Regular preventive maintenance to prevent emission increases resulting from engine problems;
- Use of low-emitting diesel engines meeting federal emissions standards for construction equipment, if available;
- Use of either water application or chemical dust suppressant application to control dust emissions from unpaved surface travel and unpaved parking areas;
- Use of vacuum sweeping and/or water flushing of paved road surface to remove buildup of loose material to control dust emissions from travel on the paved access road (including adjacent public streets impacted by construction activities) and paved parking areas;
- Require all onsite haul trucks to maintain at least two feet of freeboard;
- Limit on-site traffic speeds on unpaved surfaces to 20 mph;
- Install sandbags or other erosion control measures to prevent silt runoff to roadways;
- Re-plant vegetation in disturbed areas as quickly as possible; and
- As needed, use gravel pads along with wheel washers or wash tires of all trucks exiting Mitigate fugitive dust emissions from wind erosion of areas disturbed from construction activities (including storage piles) by application of either water or chemical dust suppressant and/or use of windbreaks.

To determine the potential worst-case (peak-year) construction emissions, the engine exhausts and dust emission rates were evaluated for each source of emissions according to construction schedule. Tables 3-1 and 3-2 present the estimated worst-case maximum daily and annual heavy equipment exhaust and fugitive dust emissions with proposed measures discussed above for onsite construction activities during peak-year of construction. Detailed emissions analyses and procedures for various heavy construction equipment, trucks, and fugitive dust emissions are presented in Attachment A.

The emissions resulting from heavy equipment and trucks during construction under the Iowa Hill Alternative, as shown on table 3-2, also represent the net emission increases versus the No-Action Alternative, which has no construction-related emissions. These net increases for NOx, CO, VOC, and PM are all below *de minimus* levels and meet the conformity thresholds. The SOx emissions shown in the tables are for references only, since the Projects are within sulfur dioxide attainment area and are not subject to conformity requirement.

Table 3-1. Maximum daily construction emissions during peak year (pounds per day)

Emission Source	**NO_x**	**CO**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
On-site heavy equipment and trucks	484.5	197.7	41.3	1.1	35.6	33.1
Fugitive dust					234.5	46.1
Vehicles for deliveries (on-road)	11.2	3.3	1.5	0.1	0.4	0.3
Worker travel vehicles (on-road)	12.0	85.9	9.2	0.1	0.7	0.6
Total construction emissions	507.7	286.9	52.0	1.3	271.2	80.1

Table 3-2. Annual construction emissions during peak year (tons per year)

Emission Source	**NO_x**	**CO**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
On-site heavy construction equipment and trucks	44.3	18.3	4.0	0.1	3.4	3.2
Fugitive dust					31.0	6.1
Vehicles for deliveries (on-road)	0.2	0.6	0.3	0.02	0.06	0.05
Worker travel vehicles (on-road)	0.1	9.8	1.1	0.01	0.07	0.05
Total construction Emissions	44.60	28.70	5.40	0.13	34.50	9.40
De minimus emission Levels	50	100	50	100[a]	100	100

[a] Sulfur dioxide *de minimus* level does not apply to the projects

3.4 OPERATIONAL EMISSIONS

The existing UARP produces renewable energy by using available stream flow within the two river basins in which the project is located. Conventional hydroelectric generation is a reliable, efficient, economical, and less polluting source of energy than burning fossil fuels. As water flows downstream, conventional hydro projects store and then release the water to convert the potential energy into electricity through hydraulic turbines that are connected to generators. The water exits the turbines and is returned to a stream. To evaluate air emissions resulting from UARP future operations, the energy generations for all Projects Alternatives were evaluated.

3.4.1 Operational Emissions from No-Action (Baseline) Alternative

Hydropower, defined by EPA as clean energy, has nearly zero air quality impacts during operations (electricity generation). Under the No-Action (baseline) alternative, the UARP generates an average of 1,835,000 MWh of emissions-free energy annually. Hydropower's air emissions are negligible for criteria pollutants because no fuels are burned. In the UARP relicensing proceeding, SMUD proposes to add 400-MW of pumped storage capacity to the existing conventional hydropower generation at the project. Unlike conventional hydropower generation, pumped storage generation uses an upper and lower reservoir and pumps water to the upper reservoir for use in generating power to meet peak loads. So that all the alternatives we evaluate have the same total generation, we've assumed that under the No-Action Alternative SMUD would meet its peak load needs by adding a simple cycle turbine (SCT) system built to generate the same additional on-peak energy of 931,000 MWh as the proposed Iowa Hill Pumped Storage development and this would contribute air emissions. Additionally, we add 43,000 MWh of off-peak energy to the baseline such that the alternative would be directly comparable to an alternative with Iowa Hill. The first column of table 3-3 shows the generation from the No-Action Alternative and table 3-4a and table3-4b summarize emissions from the existing hydroelectric operations and added on-peak SCT generation. The detailed emission analysis is included in attachment B.

3.4.2 Operational Emissions from UARP-Only Alternative

Under the UARP-only alternative, the existing UARP facilities would operate in a manner identical to the Proposed Action, without construction of Iowa Hill development. As column 2 of table 3-3 shows, the UARP-Only Alternative would result in the annual generation of 1,699,000 MWh of conventional hydroelectric energy, resulting in a reduction of about 136,000 MWh from the No-Action Alternative. This reduction in generation compared to the No-Action Alternative is caused by the proposed environmental measures in the relicensing settlement agreement. We've added generation in our analysis to replace this energy.

Similar to the No-Action Alternative, operation of the existing UARP facilities would not result in any atmospheric emission of criteria pollutants, or other hazardous material that can affect air quality. However, without the Iowa Hill Development, SMUD would have to meet future peak generation needs by using other resources, or purchasing power from the energy market. To account for both the reduction in generation from environmental measures and the added peak generation Iowa Hill provides we've added on-peak SCT generation (1,001,000 MWh[47]), and by off-peak CCT or coal-fired units (109,000 MWh[48]) (See table 3-3) to the baseline. The replacement energy generation from all involved gas turbines or fossil fuel facilities would result in regional air emissions associated with operations. Table 3-5a and table 3-5b estimate the near-term (prior to 2015) and future (post 2015) emissions related to the UARP-Only Alternative's use of various systems. These emissions are compared to the No-Action emissions, to obtain the net emission increases or decreases for the conformity test of *de minimus* levels.

Table 3-3. Energy generation and requirement for all project alternatives (post 2014)

UARP Operation	**No Action Plus SCT for Peaking**	**Proposed Action Without Iowa Hill**	**Proposed Action With Iowa Hill**	**Staff Alternative**
Capacity (MW)	688	688	1,088	1,088
Energy generation:				
Super-peak generation (MWh)	0	0	931,000	931,000
On-peak generation (MWh)	1,287,000	1,217,000	1,217,000	1,217,000
Off-peak generation (MWh)	548,000	482,000	525,000	525,000
Total UARP Hydroelectric Generation (MWh)	1,835,000	1,699,000	2,673,000	2,673,000
Pump back energy requirements (MWh)	--	--	1,230,000	1,230,000
Net UARP Energy generation (MWh)	1,835,000	1,699,000	1,443,000	1,443,000
Replacement of delta energy between no action and alternatives				

[47]Computed by adding the 931,000 MWh of on-peak added to the baseline plus 70,000 MWh in replacement on-peak energy due to environmental measures.

[48]Computed by adding the 43,000 MWh of off-peak added to the baseline plus 66,000 MWh in replacement off-peak energy due to environmental measures.

UARP Operation	No Action Plus SCT for Peaking	Proposed Action Without Iowa Hill	Proposed Action With Iowa Hill	Staff Alternative
On-peak replacement (MWh)	--	70,000	(861,000)	(861,000)
Off-peak replacement (MWh)		66,000	23,000	23,000
Replacement subtotal (MWh)	--	136,000	392,000	392,000
Other supply units:				
Additional on-peak from SCT	931,000	1,001,000	70,000	70,000
Additional off-peak from CCT or Coal	43,000	109,000	1,296,000	1,296,000
Other Supply Subtotal	974,000	1,110,000	1,366,000	1,366,000
Total net energy (MWh) under Project Alternative	2,809,000	2,809,000	2,809,000	2,809,000

Table 3-4a. Peak-year annual operational emissions for the no-action alternative (prior to 2015)

	Annual Energy Generation (MWh)	Peak-Year Annual Emissions (tons per year)				
		NO_x	CO	VOC	PM_{10}	SO_2
Hydroelectric	1,835,000	0.0	0.0	0.0	0.0	0.0
No-Action Sub-total		0.0	0.0	0.0	0.0	0.0

Table 3-4b. Peak-year annual operational emissions for the no-action alternative (post 2014).

	Annual Energy Generation (MWh)	Peak-Year Annual Emissions (tons per year)				
		NO_x	CO	VOC	PM_{10}	SO_2
Hydroelectric	1,835,000	0.0	0.0	0.0	0.0	0.0
On-peak generation from SCT	931,000	77.7	38.2	22.3	9.3	11.2
Off-peak generation						

	Annual Energy Generation (MWh)	Peak-Year Annual Emissions (tons per year)				
		NO_x	CO	VOC	PM_{10}	SO_2
Option 1 Combined Cycle	43,000	2.2	0.9	0.8	0.4	0.5
Option 2 Coal-fired unit	43,000	2.4	2.3	0.4	0.8	2.2
Combined cycle sub-total		79.9	39.1	23.2	9.7	11.7
Coal-fired unit sub-total		80.1	40.5	22.8	10.1	13.4

Sources:

[a] USEPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu.

[b] California Energy Commission, November 2001

[c] SMUD, July 2006.

[d] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs. Conventional Coal vs. Combined-Cycle Gas Turbine," 2002, for Power-Gen International

[e] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)

Table 3-5a Peak annual operational emissions for the UARP-only alternative (prior to 2015)

	Annual Energy Generation (MWh)	Peak-Year Annual Emissions (tons per year)				
		NO_x	CO	VOC	PM_{10}	SO_2
Hydroelectric	1,699,000	0.0	0.0	0.0	0.0	0.0
Replacement facilities:	136,000					
On-peak SCT	70,000	5.8	2.9	1.7	0.7	0.8
Off-peak generation						
Option 1 Combined Cycle	66,000	3.3	1.4	1.3	0.7	0.8
Option 2 Coal-fired unit	66,000	3.7	3.6	0.7	1.3	3.4
Combined cycle sub-total		9.1	4.2	2.9	1.4	1.6
Coal-fired unit sub-total		9.5	6.5	2.3	2.0	4.2

Sources:

[a] USEPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu.

[b] California Energy Commission, November 2001

[c] SMUD, July 2006.

[d] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs. Conventional Coal vs. Combined-Cycle Gas Turbine," 2002, for Power-Gen International

[e] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)

Table 3-5b. Peak annual operational emissions for the UARP-only alternative (post 2014).

UARP-Only (without Iowa Hill)	**Annual Energy Generation (MWh)**	**Peak-Year Annual Emissions (tons per year)**				
		NO_x	**CO**	**VOC**	**PM_{10}**	**SO_2**
Hydroelectric	1,699,000	0.0	0.0	0.0	0.0	0.0
Replacement facilities:	1,110,000					
On-peak SCT	1,001,000	83.6	41.0	24.0	10.0	12.0
Off-peak generation						
Option 1 Combined Cycle	109,000	5.5	2.2	2.1	1.1	1.3
Option 2 Coal–fired unit	109,000	6.0	5.9	1.1	2.1	5.6
Combined cycle sub-total		89.0	43.3	26.1	11.1	13.3
Coal-fired unit sub-total		89.6	47.0	25.1	12.1	17.6

Sources:

[a] USEPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu.

[b] California Energy Commission, November 2001.

[c] SMUD, July 2006.

[d] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs. Conventional Coal vs. Combined-Cycle Gas Turbine," 2002, for Power-Gen International.

[e] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)

3.4.3 Operational Emissions from Proposed Iowa Hill Development

Pumped storage projects store water during off-peak periods that can be rapidly released to provide energy generation during on-peak periods. Regional power benefits from the new development would include those often referred to as ancillary system benefits, including spinning reserves, non-spinning reserves, peaking capacity, and grid stability. The generation capacity of the Iowa Hill development would reduce the need to produce peak energy using fossil fuel-fired plants. Our analysis shows the Iowa Hill development would generate about 931,000 MWh during the super-peak period and 43,000 MWh off-peak. During Iowa Hill pumping operation, turbines would be reversed and 1,230,000 MWh of energy from a tie-in transmission line connected to the Camino-White Rock Line will pump water into the upper reservoir, thus reducing the net energy generation under this alternative to 1,443,000 MWh. Considering this revision to net energy production and future super-peak energy demand, replacement energy by other forms of electrical generation would be needed as discussed below.

3.4.4 Air Emissions Resulting From SCT for Additional On-Peak Generation

Additional on-peak generation of 70,000 MWh would be included in the Iowa Hill alternative. The additional on-peak generation would be produced from a natural gas SCT and would provide for the replacement on-peak generation due to environmental measures. A SCT would contribute emissions of nitrogen dioxide (NO_2), SO_2, CO, ozone, VOC, and particulate matter. These emissions are listed in table 3-6, which summarizes the post 2014 annual peak-year emissions for all units associated with the Iowa Hill development. The annual emissions prior to 2015 would be the same as UARP-only alternative

Table 3-6. Annual peak-year operational emissions from the SMUD-proposed action with Iowa Hill Development (post 2014).

	Annual Energy Generation (MWh)	Peak-Year Annual Emissions (tons per year)				
		NO_x	CO	VOC	PM_{10}	SO_2
Hydroelectric	2,673,000	0.0	0.0	0.0	0.0	0.0
Electric Water Pumps	-1,230,000	-	-	-	-	-
Replacement facilities include:						
On-peak SCT	70,000	5.8	2.9	1.7	0.7	0.8
Off-peak generation						
Option 1 combined cycle	1,296,000	64.8	26.6	24.6	13.0	15.6
Option 2 coal–fired unit	1,296,000	71.9	70.6	13.0	25.3	66.1

	Annual Energy Generation (MWh)	Peak-Year Annual Emissions (tons per year)				
		NO_X	CO	VOC	PM_{10}	SO_2
Combined Cycle subtotal		70.6	29.4	26.3	13.7	16.4
Coal-fired subtotal		77.8	73.5	14.6	26.0	66.9

Sources:

[a] USEPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu.

[b] California Energy Commission, November 2001

[c] SMUD, July 2006.

[d] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs. Conventional Coal vs. Combined-Cycle Gas Turbine," 2002, for Power-Gen International

[e] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)

3.4.5 Air Emissions Resulting From CCT or Coal-Fired Unit for Additional Off-Peak Generation

Additional off-peak generation of 1,296,000 MWh would be included in the Iowa Hill alternative. The additional off-peak generation would be produced from a natural gas CCT or renewable sources and would provide both pumping energy and replacement of off-peak generation due to environmental measures.

Even, with the best available control technology installed, a CCT would contribute emissions of nitrogen dioxide (NO_2), SO_2, CO, ozone, VOC, and particulate matter. In addition to emission from SCT, table 3-6 summarizes the post 2014 annual peak-year emissions associated with the Iowa Hill development. The analysis includes replacement energy, additional off-peak energy generation, and use of coal-fired units the worst-case scenario for comparison.

Total future emissions resulting from the Iowa Hill development are compared to the No-Action Alternative emissions to obtain the net emission increases or decreases for conformity test of *de minimus* levels.

3.5 CONFORMITY APPLICABILITY TEST FOR *DE MINIMUS* LEVELS—TOTAL PROJECT-INDUCED ANNUAL EMISSIONS FROM CONSTRUCTION AND OPERATION

For conformity test purposes, peak-year net increases or decreases in annual operational and construction emissions are compared among Project Alternatives (table 3-7 and table 3-8).

These net emissions represent the difference in emissions between each analyzed Alternative and the No-Action and are used to compare with the *de minimus* levels for conformity requirement. Both off-peak replacement generation option 1 – combined cycle turbine and option 2 – coal fired unit, are presented in the table for comparing to the options used in No-Action conditions. As shown in these tables, the Projects-induced emissions would not exceed the *de minimis* criteria of 50 TPY of VOC or NOx, and would not exceed the criteria of 100 TPY of CO or PM, for any of the peak-case years; except for a small temporary exceeding of NO_x emissions during the worst construction year prior to 2015 when both operational and construction emissions are counted. This small temporary effect can be mitigated and eliminated by reducing construction activities by approximately 10% for the peak construction year and re-scheduling them to other years. Therefore, the Projects are determined to be compliance with the general conformity rules.

The SO_x emissions shown in the tables are for references only, since the Projects are within sulfur dioxide attainment area and are not subject to conformity requirement for sulfur dioxide.

Table 3-7. Peak-year project-induced annual emissions[a] during Iowa Hill construction period (prior to 2015).

		Additional Supply	Net Peak Annual Emissions (tons/year)					
			NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$
UARP-Only								
Construction			0	0	0	0	0	0
Operational		CCT[b]	9.1	4.2	2.9	1.6	1.4	1.3
		Coal[c]	9.5	6.5	2.3	4.2	2.0	1.8
	Total	CCT	9.1	4.2	2.9	1.6	1.4	1.3
		Coal	9.5	6.5	2.3	4.2	2.0	1.8
Iowa Hill								
Construction			44.6	28.7	5.4	0.1	34.5	9.4
Operational		CCT	9.1	4.2	2.9	1.6	1.4	1.3
		Coal	9.5	6.5	2.3	4.2	2.0	1.8
	Total	CCT	53.7	32.9	8.3	1.7	35.9	10.7
		Coal	54.1	35.2	7.7	4.3	36.5	11.2
	De Minimus		50	100	50	100	100	100

Notes:

a Project induced emission equals net change in emissions between the proposed actions and no-action. A positive value equals an increase and negative value equals a decrease in net emissions for this pollutant.

b CCT represents the use of combined cycle turbine for off-peak generation for both alternatives and simple cycle turbine for on-peak generation in UARP-only Alternative.

c Coal represents the use of coal-fired unit for off-peak generation for both alternatives and simple cycle turbine for on-peak generation in UARP-only Alternative.

Table 3-8. Peak-year project-induced annual emissions[a] following Iowa Hill construction period (Post 2014)

	Additional Supply	Net Peak Annual Emissions (tons/year)					
		NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$
UARP-Only							
Operational	CCT[b]	9.1	4.2	2.9	1.6	1.4	1.3
	Coal[c]	9.5	6.5	2.3	4.2	2.0	1.8
Iowa Hill							
Operational	CCT	-9.2	-9.6	3.1	4.7	3.9	3.5
	Coal	-2.4	33.0	-8.1	53.6	15.8	14.2
De Minimus		50	100	50	100	100	100

Notes:

[a] Project induced emission equals net change in emissions between the proposed actions and no-action. A positive value equals an increase and negative value equals a decrease in net emissions for this pollutant.

[b] CCT represents the use of combined cycle turbine for off-peak generation for both alternatives and simple cycle turbine for on-peak generation in UARP-Only alternative.

[c] Coal represents the use of coal-fired unit for off-peak generation for both alternatives and simple cycle turbine for on-peak generation in UARP-Only alternative.

4.0 CONCLUSION

The cumulative emissions and effects on air quality resulting from all operational and construction activities of UARP Alternatives were evaluated. Construction-related emissions result from development of the UARP Iowa Hill Pump-Storage Facility, while operational emissions are associated with generation of additional power under UARP alternatives.

As shown in this analysis, the Projects-induced emissions for all Projects Alternatives during both worst-case construction and operational periods would not exceed the applicability test *de minimis* criteria, with an adjusted construction schedule. Therefore, the Projects will meet the General Conformity rules for all evaluated Alternatives.

While air quality emission modeling indicates construction of the Iowa Hill development would contribute to increases in temporary emissions, increases with a mitigated field construction schedule are below *de minimis* criteria and would be limited to worst-case conditions during a short-term period. Overall, total peak-year annual construction emissions related to Iowa Hill facility development meet the General Conformity requirements because they would not exceed *de minimus* thresholds.

Without the Iowa Hill development, viable substitute resources to cover the energy supply shortage in the future would be required. Air emissions resulting from these substitute plants are also estimated to be below the conformity thresholds based on plants' control measures, including selective catalytic reduction (SCR) and thermal efficiency control, to achieve emission reduction to meet the regulations and requirements.

This page intentionally left blank.

GENERAL CONFORMITY ANALYSIS
ATTACHMENT A

Air Emission Analyses
Construction Activities for Iowa Hill Development

This page intentionally left blank.

GENERAL CONFORMITY ANALYSIS
ATTACHMENT 1

Air Emission Analyses

- Construction Activities For Iowa Hill Development

Engine Combustion Emission

Equipment	Power Rating (HP)	Load Factor	NONROAD Model Emission Factor (grams / HP-hour) HC / VOC	NOx	CO	PM10	PM2.5	SO2
Off-Highway Truck	938	0.59	0.27	5.17	1.38	0.21	0.20	0.01
Rail Mounted Shovel Loader	250	0.59	0.96	6.31	3.85	0.63	0.59	0.01
Mobile Crusher	306	0.43	0.31	5.38	1.60	0.24	0.22	0.01
Double/TripleBoom Jumbo	231	0.43	0.28	3.99	1.29	0.25	0.23	0.01
Bolting Rig	156	0.43	0.50	6.41	2.04	0.40	0.37	0.01
Load Haul Dump	120	0.59	1.38	7.09	5.48	0.89	0.83	0.01
Low Profile Rear Dump	400	0.59	1.05	7.06	3.99	0.83	0.77	0.01
Heavy Duty Centrifugal Pump	50	0.59	0.77	5.46	2.87	0.59	0.55	0.01
Mechnical Dragline	250	0.59	0.32	4.51	1.54	0.29	0.27	0.01
Hydraulic Excavator	404	0.59	0.21	4.18	1.72	0.22	0.20	0.01
Heavy Duty Rock Saw	300	0.59	0.33	4.59	1.60	0.29	0.27	0.01
Blast Hole Drill	125	0.43	0.50	6.41	2.04	0.40	0.37	0.01
Bulldozer	600	0.59	0.28	3.86	1.26	0.24	0.22	0.01
Dump Truck (reservoir spoils)	500	0.59	0.24	3.20	1.23	0.23	0.21	0.01
Dump Truck (tunnel spoils)	500	0.59	0.24	3.20	1.23	0.23	0.21	0.01
Wheel Loader (reservoir spoils)	400	0.59	0.33	4.35	1.59	0.33	0.31	0.01
Wheel Loader (tunnel spoils)	400	0.59	0.33	4.35	1.59	0.33	0.31	0.01
Compactor	179	0.59	0.34	4.69	1.69	0.30	0.28	0.01
Scraper	578	0.59	0.23	4.48	1.88	0.24	0.22	0.01
Concrete Batch Plant	600	0.43	0.42	6.36	2.25	0.31	0.29	0.01
Generator Set	4205	0.43	0.44	5.82	2.05	0.37	0.34	0.01
Compressor	900	0.43	0.36	5.49	1.77	0.33	0.31	0.01
Tracked Mobile Screen	93	0.43	0.43	4.62	3.92	0.53	0.49	0.01
Water Tanker	300	0.59	0.24	3.20	1.23	0.23	0.21	0.01
Grove Crane	215	0.43	0.29	4.38	0.91	0.19	0.18	0.01
Truck-Mounted Hydraulic Crane	500	0.43	0.29	5.26	1.45	0.23	0.21	0.01
300 Ton Truck Crane	450	0.43	0.29	5.26	1.45	0.23	0.21	0.01
Motor Grader - Offsite	145	0.59	0.31	4.02	1.47	0.31	0.29	0.01
Asphalt Paver - Offsite	174	0.59	0.32	4.24	1.54	0.32	0.30	0.01

Annual Engine Emission Burden

Equipment	Annual Construction Engine Emission Burden (tons / year)					
	HC / VOC	NOx	CO	PM10	PM2.5	SO2
Off-Highway Truck	0.000	0.000	0.000	0.000	0.000	0.000
Rail Mounted Shovel Loader	0.568	3.735	2.279	0.373	0.347	0.006
Mobile Crusher	0.082	1.420	0.422	0.063	0.059	0.003
Double/TripleBoom Jumbo	0.000	0.000	0.000	0.000	0.000	0.000
Bolting Rig	0.000	0.000	0.000	0.000	0.000	0.000
Load Haul Dump	0.000	0.000	0.000	0.000	0.000	0.000
Low Profile Rear Dump	0.994	6.686	3.779	0.786	0.731	0.009
Heavy Duty Centrifugal Pump	0.000	0.000	0.000	0.000	0.000	0.000
Mechnical Dragline	0.006	0.078	0.027	0.005	0.005	0.000
Hydraulic Excavator	0.000	0.000	0.000	0.000	0.000	0.000
Heavy Duty Rock Saw	0.293	4.075	1.421	0.257	0.239	0.009
Blast Hole Drill	0.063	0.806	0.257	0.050	0.047	0.001
Bulldozer	0.506	6.980	2.278	0.434	0.404	0.018
Dump Truck (reservoir spoils)	0.471	6.282	2.415	0.452	0.420	0.020
Dump Truck (tunnel spoils)	0.027	0.355	0.137	0.026	0.024	0.001
Wheel Loader (reservoir spoils)	0.256	3.379	1.235	0.256	0.238	0.008
Wheel Loader (tunnel spoils)	0.016	0.210	0.077	0.016	0.015	0.000
Compactor	0.000	0.000	0.000	0.000	0.000	0.000
Scraper	0.025	0.479	0.201	0.026	0.024	0.001
Concrete Batch Plant	0.217	3.292	1.165	0.160	0.149	0.005
Generator Set	0.000	0.000	0.000	0.000	0.000	0.000
Compressor	0.000	0.000	0.000	0.000	0.000	0.000
Tracked Mobile Screen	0.035	0.371	0.315	0.043	0.040	0.001
Water Tanker	0.341	4.546	1.747	0.327	0.304	0.014
Grove Crane	0.000	0.000	0.000	0.000	0.000	0.000
Truck-Mounted Hydraulic Crane	0.000	0.000	0.000	0.000	0.000	0.000
300 Ton Truck Crane	0.000	0.000	0.000	0.000	0.000	0.000
Motor Grader - Offsite	0.053	0.690	0.252	0.053	0.049	0.002
Asphalt Paver - Offsite	0.066	0.873	0.317	0.066	0.061	0.002
Totoal Annual Engine Emission From All Equipment (tons/yr):	**4.019**	**44.258**	**18.322**	**3.393**	**3.155**	**0.100**

Maximum Daily Engine Emission

Equipment	HC / VOC	NOx	CO	PM10	PM2.5	SO2
	Maximum Daily Construction Engine Emission (Lbs / day)					
Off-Highway Truck	0.0	0.0	0.0	0.0	0.0	0.0
Rail Mounted Shovel Loader	5.0	32.8	20.0	3.3	3.0	0.1
Mobile Crusher	0.7	12.5	3.7	0.6	0.5	0.0
Double/TripleBoom Jumbo	0.0	0.0	0.0	0.0	0.0	0.0
Bolting Rig	0.0	0.0	0.0	0.0	0.0	0.0
Load Haul Dump	0.0	0.0	0.0	0.0	0.0	0.0
Low Profile Rear Dump	8.7	58.6	33.1	6.9	6.4	0.1
Heavy Duty Centrifugal Pump	0.0	0.0	0.0	0.0	0.0	0.0
Mechnical Dragline	0.6	8.2	2.8	0.5	0.5	0.0
Hydraulic Excavator	0.0	0.0	0.0	0.0	0.0	0.0
Heavy Duty Rock Saw	3.1	42.9	15.0	2.7	2.5	0.1
Blast Hole Drill	0.9	12.1	3.9	0.8	0.7	0.0
Bulldozer	5.3	72.4	23.6	4.5	4.2	0.2
Dump Truck (reservoir spoils)	5.0	66.5	25.5	4.8	4.4	0.2
Dump Truck (tunnel spoils)	0.3	3.9	1.5	0.3	0.3	0.0
Wheel Loader (reservoir spoils)	2.7	36.1	13.2	2.7	2.5	0.1
Wheel Loader (tunnel spoils)	0.2	2.3	0.8	0.2	0.2	0.0
Compactor	0.0	0.0	0.0	0.0	0.0	0.0
Scraper	2.6	50.4	21.2	2.7	2.5	0.1
Concrete Batch Plant	1.9	28.9	10.2	1.4	1.3	0.0
Generator Set	0.0	0.0	0.0	0.0	0.0	0.0
Compressor	0.0	0.0	0.0	0.0	0.0	0.0
Tracked Mobile Screen	0.3	3.3	2.8	0.4	0.3	0.0
Water Tanker	3.0	39.9	15.3	2.9	2.7	0.1
Grove Crane	0.0	0.0	0.0	0.0	0.0	0.0
Truck-Mounted Hydraulic Crane	0.0	0.0	0.0	0.0	0.0	0.0
300 Ton Truck Crane	0.0	0.0	0.0	0.0	0.0	0.0
Motor Grader - Offsite	0.5	6.1	2.2	0.5	0.4	0.0
Asphalt Paver - Offsite	0.6	7.7	2.8	0.6	0.5	0.0
Maximum Daily Engine Emission From All Equipment (Lbs/day):	**41.3**	**484.5**	**197.7**	**35.6**	**33.1**	**1.1**

Equipment Utilization (Hoursepower-Hours)

Equipment	Month 1 Feb '09	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Year Total	Peak-Month	Maximum Daily (HP-Hrs)
Off-Highway Truck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rail Mounted Shovel Loader	44840	44840	44840	44840	44840	44840	44840	44840	44840	44840	44840	44840	538080	44840	2360
Mobile Crusher	20000	20000	20000	20000	20000	20000	20000	20000	20000	20000	20000	20000	240002	20000	1053
Double/TripleBoom Jumbo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bolting Rig	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Load Haul Dump	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Low Profile Rear Dump	71744	71744	71744	71744	71744	71744	71744	71744	71744	71744	71744	71744	860928	71744	3776
Heavy Duty Centrifugal Pump	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mechnical Dragline	15694	0	0	0	0	0	0	0	0	0	0	0	15694	15694	826
Hydraulic Excavator	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Duty Rock Saw	0	0	80712	80712	80712	80712	80712	80712	80712	80712	80712	80712	807120	80712	4248
Blast Hole Drill	0	0	0	0	0	16340	16340	16340	16340	16340	16340	16340	114380	16340	860
Bulldozer	78694	107616	107616	107616	107616	162097	162097	162097	162097	162097	162097	162097	1643834	162097	8531
Dump Truck (reservoir spoils)	38114	122750	122750	122750	122750	179360	179360	179360	179360	179360	179360	179360	1784632	179360	9440
Dump Truck (tunnel spoils)	0	3924	1121	10650	10650	10650	10650	10650	10650	10650	10650	10650	100890	10650	561
Wheel Loader (reservoir spoils)	10313	48427	48427	48427	48427	71744	71744	71744	71744	71744	71744	71744	706230	71744	3776
Wheel Loader (tunnel spoils)	0	1794	1794	4484	4484	4484	4484	4484	4484	4484	4484	4484	43943	4484	236
Compactor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scraper	97191	0	0	0	0	0	0	0	0	0	0	0	97191	97191	5115
Concrete Batch Plant	39216	39216	39216	39216	39216	39216	39216	39216	39216	39216	39216	39216	470592	39216	2064
Generator Set	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compressor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tracked Mobile Screen	6078	6078	6078	6078	6078	6078	6078	6078	6078	6078	6078	6078	72942	6078	320
Water Tanker	107616	107616	107616	107616	107616	107616	107616	107616	107616	107616	107616	107616	1291392	107616	5664
Grove Crane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Truck-Mounted Hydraulic Crane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
300 Ton Truck Crane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Motor Grader - Offsite	13004	13004	13004	13004	13004	13004	13004	13004	13004	13004	13004	13004	156043	13004	684
Asphalt Paver - Offsite	15604	15604	15604	15604	15604	15604	15604	15604	15604	15604	15604	15604	187252	15604	821

Notes - Fugitive Dust Emission Calculations

Wind erosion of active construction area - 'Source: "Improvement of Specific Emission Factors (BACM Project No. 1), Final Report", prepared for South Coast AQMD by Midwest Research Institute, March 1996

Level 2 Emission Factor =	0.011 ton/acre-month
Construction Schedule =	30 days/month
PM2.5/PM10 Fraction =	15% (C. Cowherd, Fugitive Dust Control Conference, 5/05)
Level 2 Emission Factor =	0.73 PM10 lbs/acre-day
=	0.11 PM2.5 lb/acre-day

Bulldozer Scrapper Pushing - Source: AP-42, Table 11.9.1, 7/98

E = (0.75)(s^1.5)/(M^1.4)

s = silt content =	6.9% (AP-42, Table 11.9.3, 7/98, overburden average)
M = moisture content =	7.9% (AP-42, Table 11.9.3, 7/98, overburden average)
E = emission factor =	0.75 PM10 lb/hr-bulldozer
E = emission factor =	0.41 PM2.5 lb/hr-bulldozer

Bulldozer Ripping - Source: AP-42, Table 11.9.1, 7/98

E = (0.75)(s^1.5)/(M^1.4)

s = silt content =	2.0% (estimated from AP=42, Table 11.9.3, 7/98)
M = moisture content =	4.0% (estimated from AP=42, Table 11.9.3, 7/98)
E = emission factor =	0.30 PM10 lb/hr-bulldozer
E = emission factor =	0.23 PM2.5 lb/hr-bulldozer

Scraper Loading - Source: AP-42, Table 13.2.3-1, 1/95

E = 20.2 lb/VMT

Earth Removal Depth =	17.0 inches (Caterpillar Performance Handbook, 10/04)
=	1.4 feet
Earth Removal Width =	12.7 feet (Caterpillar Performance Handbook, 10/04)
Earth Removal Volume =	0.66 banked yd3/foot of travel
Daily Removal Volume =	7192 banked yd3/day (EarthmovingActivity.xls)
Daily Scraper Travel During Loading =	2.0 miles/day
=	0.3 miles/hr
E = emission factor =	5.2 PM10 lb/hr-scraper
E = emission factor =	2.8 PM2.5 lb/hr - scraper

Scraper Spreading - Source AP-42, Table 11.9-1 (grading), 7/98

E = (0.60)(0.051)(S^2.0) PM10 lb/VMT
E = (0.031)(0.040)(S^2.5) PM2.5 lb/VMT

Earth Spreading Depth =	26 inches (Caterpillar Performance Handbook, 10/04)
=	2.2 feet
Earth Spreading Width =	12.7 feet (Caterpillar Performance Handbook, 10/04)
Earth Spreading Volume =	1.02 loose yd3/foot of travel
Scraper Capacity =	44 loose yd3 (Caterpillar Performance Handbook, 10/04)
Scraper Spreading Distance =	43 ft
Scraper Spreading Time =	0.35 min (Caterpillar Performance Handbook, 10/04)
Scraper Spreading Speed =	124 ft/min
=	1.41 mi/hr

Notes - Fugitive Dust Emission Calculations

E = emission factor =	0.0604	PM10 lb/VMT
E = emission factor = .	0.0029	PM2.5 lb/VMT
Earth Swell Factor =	20%	(estimated from Caterpillar Performance Handbook, 10/04)
Daily Spreading Volume =	8631	loose yd3/day (EarthmovingActivity.xls)
Daily Scraper Travel During Spreading =	8.2	miles/day
=	1.0	miles/hr
E = emission factor =	0.0617	PM10 lb/hr-scraper
E = emission factor =	0.0030	PM2.5 lb/hr-scraper

Excavator Use - Source: AP-42, Table 11.9-1 (dragline operations), 7/98

E = (0.75)(0.0021)(d^0.7)/(M^0.3) PM10 lb/yd3
E = (0.017)(0.0021)(d^1.1)/(M^0.3) PM2.5 lb/yd3

d = drop height =	6	ft (estimated)
M = moisture content =	7.9%	(AP-42, Table 11.9.3, 7/98, overburden average)
E = PM10 emission factor =	0.0030	PM10 lb/yd3
E = PM2.5 emission factor =	0.0001	PM2.5 lb/yd3
Excavator Production Rate =	429	yd3/hr (EarthmovingActivity.xls)
E = PM10 emission factor =	1.27	PM10 lb/hr-excavator
E = PM2.5 emission factor =	0.059	PM2.5 lb/hr-excavator

Drilling - Source: AP-42, Table 11.19.2-1, 8/04

E = PM10 emission factor =	8.00E-05	PM10 lb/ton
E = PM2.5 emission factor =	2.60E-05	PM2.5 lb/ton (estimated from ratio for controlled conveyor transfer
Drilling Production Rate =	5893	ton/hr (EarthmovingActivity.xls)
=	2947	ton/hr-drill
E = PM10 emission factor =	0.24	PM10 lb/hr-drill
E = PM2.5 emission factor =	0.077	PM2.5 lb/hr-drill

Loader Transfer (topsoil) - Source: AP-42, 13.2.4-3, 1/95

E = (0.35)(0.0032)(U/5)^1.3/(M/2)^1.2 PM10 lb/ton
E = (0.11)(0.0032)(U/5)^1.3/(M/2)^1.2 PM2.5 lb/ton

U = average wind speed =	2.83	m/sec (Camino CA CIMIS data, 7am - 4pm)
=	6.33	mi/hr
M = moisture content =	7.90%	(AP-42, Table 11.9.3, 7/98, overburden average)
E = emission factor =	0.0003	PM10 lb/ton
E = emission factor =	0.0001	PM2.5 lb/ton
Loader Transfer Rate =	2397	loose yd3/day (EarthmovingActivity.xls)
=	1029	loose yd3/hr (EarthmovingActivity.xls)
Loose Soil Density =	1600	lb/yd3 loose (Caterpillar Performance Handbook, 10/04)
=	0.80	ton/yd3
Loader Transfer Rate =	823	ton/hr
E = emission factor =	0.241	PM10 lb/hr-loader
E = emission factor =	0.0757	PM2.5 lb/hr-loader

Loader Transfer (rock) - Source: AP-42, 13.2.4-3, 1/95

E = (0.35)(0.0032)(U/5)^1.3/(M/2)^1.2 PM10 lb/ton
E = (0.11)(0.0032)(U/5)^1.3/(M/2)^1.2 PM2.5 lb/ton

U = average wind speed =	2.83	m/sec (Camino CA CIMIS data, 7am - 4pm)
=	6.33	mi/hr

Notes - Fugitive Dust Emission Calculations

M = moisture content =	7.90%	(AP-42, Table 11.9.3, 7/98, overburden average)
E = emission factor =	0.0003	PM10 lb/ton
E = emission factor =	0.0001	PM2.5 lb/ton
Loader Transfer Rate =	926	loose yd3/hr (EarthmovingActivity.xls)
Loose Soil Density =	2800	lb/yd3 loose (Caterpillar Performance Handbook, 10/04)
=	1.40	ton/yd3
Loader Transfer Rate =	1296	ton/hr
E = emission factor =	0.379	PM10 lb/hr-loader
E = emission factor =	0.119	PM2.5 lb/hr-loader

Loader Unpaved Road Travel (topsoil) - Source: AP-42, Section 13.2.2, 12/03

E = (1.5)[(s/12)^0.9][(W/3)^0.45] PM10 lb/VMT
E = (0.23)[(s/12)^0.9][(W/3)^0.45] PM2.5 lb/VMT

s = surface silt content =	8.5%	(AP-42, Table 13.2.2-1, 12/03, construction haul route)
W = avg. vehicle weight =	113.63	tons (avg. of loaded and unloaded weights, 992G loader, Caterpillar Performance Handbook, 10/04)
E = PM10 emission factor =	5.64	lb PM10/VMT
E = PM2.5 emission factor =	0.87	lb PM2.5/VMT
Loader Transfer Rate =	2397	loose yd3/day (EarthmovingActivity.xls)
=	1029	loose yd3/hr (EarthmovingActivity.xls)
Loader Capacity =	15	loose yd3 (Caterpillar Performance Handbook, 10/04)
Loading Rate =	68.6	loading cycles/hr
Loading Travel Distance =	100	ft/load (estimated)
Daily Loader Travel Distance =	6,857	ft/hr
=	1.3	mi/hr
E = PM10 emission factor =	7.33	lb PM10/hr-loader
E = PM2.5 emission factor =	1.12	lb PM2.5/hr-loader

Loader Unpaved Road Travel (rock) - Source: AP-42, Section 13.2.2, 12/03

E = (1.5)[(s/12)^0.9][(W/3)^0.45] PM10 lb/VMT
E = (0.23)[(s/12)^0.9][(W/3)^0.45] PM2.5 lb/VMT

s = surface silt content =	8.3%	(AP-42, Table 13.2.2-1, 12/03, mine pit haul route)
W = avg. vehicle weight =	113.63	tons (avg. of loaded and unloaded weights, 992G loader, Caterpillar Performance Handbook, 10/04)
E = PM10 emission factor =	5.52	lb PM10/VMT
E = PM2.5 emission factor =	0.85	lb PM2.5/VMT
Loader Transfer Rate =	926	loose yd3/hr (EarthmovingActivity.xls)
Loader Capacity =	15	loose yd3 (Caterpillar Performance Handbook, 10/04)
Loading Rate =	61.7	loading cycles/hr
Loading Travel Distance =	100	ft/load (estimated)
Daily Loader Travel Distance =	6,171	ft/hr
=	1.2	mi/hr
E = PM10 emission factor =	6.46	lb PM10/hr-loader
E = PM2.5 emission factor =	0.99	lb PM2.5/hr-loader

Dump Truck Unloading (topsoil) - Source: AP-42, 13.2.4-3, 1/95

E = (0.35)(0.0032)(U/5)^1.3/(M/2)^1.2
E = (0.11)(0.0032)(U/5)^1.3/(M/2)^1.2

E = emission factor =	0.120	PM10 lb/hr-truck
E = emission factor =	0.0379	PM2.5 lb/hr-truck

(unloading emissions are equal to loader transfer emissions as emission factors and transfer rates are the same).

Dump Truck Unloading (rock) - Source: AP-42, 13.2.4-3, 1/95

E = (0.35)(0.0032)(U/5)^1.3/(M/2)^1.2
E = (0.11)(0.0032)(U/5)^1.3/(M/2)^1.2

E = emission factor =	0.190	PM10 lb/hr-truck
E = emission factor =	0.060	PM2.5 lb/hr-truck

(unloading emissions are equal to loader transfer emissions as emission factors and transfer rates are the same).

Excavator Transfer - Source: AP-42, 13.2.4-3, 1/95

E = (0.35)(0.0032)(U/5)^1.3/(M/2)^1 PM10 lb/ton
E = (0.11)(0.0032)(U/5)^1.3/(M/2)^1 PM2.5 lb/ton

U = average wind speed =	2.83	m/sec (Camino CA CIMIS data, 7am - 4pm)
=	6.33	mi/hr
M = moisture content =	7.90%	(AP-42, Table 11.9.3, 7/98, overburden average)
E = emission factor =	0.0003	PM10 lb/ton
E = emission factor =	0.0001	PM2.5 lb/ton
Excavator Transfer Rate =	429	loose yd3/hr (EarthmovingActivity.xls)
Loose Soil Density =	1600	lb/yd3 loose (Caterpillar Performance Handbook, 10/04)
=	0.80	ton/yd3
Excavator Transfer Rate =	343	ton/hr
E = emission factor =	0.100	PM10 lb/hr-excavator
E = emission factor =	0.0315	PM2.5 lb/hr-excavator

Unpaved Road Travel - Source: AP-42, Section 13.2.2, 12/03.

E = (1.5)[(s/12)^0.9][(W/3)^0.45] PM10 lb/VMT
E = (0.23)[(s/12)^0.9][(W/3)^0.45] PM2.5 lb/VMT

s = silt fraction (topsoil hauling) =	8.50%	(AP-42, Table 13.2.2-1, 12/03, construction haul route)
s = silt fraction (rock hauling) =	8.30%	(AP-42, Table 13.2.2-1, 12/03, mine pit haul route)
W = scraper avg. veh. wt. =	101	tons (Caterpillar Performance Handbook, 10/04)
W = dump truck avg. veh. weight =	211	tons (Caterpillar Performance Handbook, 10/04)
W = water truck avg. veh. weight =	69.8	tons empty (estimated)
E = scraper emission factor =	5.36	lb PM10/VMT
E = dump truck emission factor =	7.31	lb PM10/VMT
E = water truck emission factor =	4.44	lb PM10/VMT
E = scraper emission factor =	0.82	lb PM2.5/VMT
E = dump truck emission factor =	1.14	lb PM2.5/VMT
E = water truck emission factor =	0.70	lb PM2.5/VMT
Scraper Hourly Travel Distance =	6.55	mi/hr-scraper (EarthmovingActivity.xls)
Dump Truck Travel Distance =	2.70	mi/hr-truck topsoil
Dump Truck Travel Distance =	3.48	mi/hr-truck weathered rock
Dump Truck Travel Distance =	3.32	mi/hr-truck basin rock
Dump Truck Travel Distance =	3.66	mi/hr-truck tunnel spoils
Water Truck Travel Distance =	5.00	mi/hr (estimated)
E = scraper emission factor =	35.07	lb PM10/hr-scraper
E = dump truck emission factor =	19.72	lb PM10/hr-truck topsoil

Notes - Fugitive Dust Emission Calculations

E = dump truck emission factor =	25.42 lb PM10/hr-truck weathered rock
E = dump truck emission factor =	24.25 lb PM10/hr-truck basin rock
E = dump truck emission factor =	26.71 lb PM10/hr-truck tunnel spoils
E = water truck emission factor =	22.19 lb PM10/hr-water truck
E = scraper emission factor =	5.38 lb PM2.5/hr-scraper
E = dump truck emission factor =	3.09 lb PM2.5/hr-truck topsoil
E = dump truck emission factor =	3.98 lb PM2.5/hr-truck weathered rock
E = dump truck emission factor =	3.80 lb PM2.5/hr-truck basin rock
E = dump truck emission factor =	4.18 lb PM2.5/hr-truck tunnel spoils
E = water truck emission factor =	3.48 lb PM2.5/hr-water truck

Unpaved Road Travel and Active Excavation Area Control - Source: Control of Open Fugitive Dust Sources, U.S EPA, 9/88

C = 100 - (0.8)(p)(d)(t)/(i)

p = potential average hourly daytime evaporation rate =	0.32 mm/hr (Control of Open Fugitive Dust Sources, EPA , Figure 3-
d = average hourly daytime traffic rate =	44 vehicles/hr - scrapers
d = average hourly daytime traffic rate =	286 vehicles/hr - loader
d = average hourly daytime traffic rate =	10 vehicles/hr - trucks/topsoil
d = average hourly daytime traffic rate =	36 vehicles/hr - trucks/weathered rock
d = average hourly daytime traffic rate =	120 vehicles/hr - trucks/basin rock
d = average hourly daytime traffic rate =	14 vehicles/hr - trucks/tunnel rock
d = average hourly daytime traffic rate =	99 vehicles/hr - water truck - material-weighted average
d = average hourly daytime traffic rate =	0.13 vehicles/hr - undisturbed areas
t = time between watering applications =	1.00 hr/application - haul roads
t = time between watering applications =	0.50 hr/application - loader maneuver areas
t = time between watering applications =	8.00 hr/application - undisturbed areas
i = application intensity =	1.36 L/m2 (estimated from Control of Open Fugitive Dust Sources, p. 3-23)
C = average annual watering control efficiency	91.8% - scrapers
C = average annual watering control efficiency	73.2% - loader
C = average annual watering control efficiency	98.1% - trucks/topsoil
C = average annual watering control efficiency	93.3% - trucks/weathered rock
C = average annual watering control efficiency	77.5% - trucks/basin rock
C = average annual watering control efficiency	97.4% - trucks/tunnel rock
C = average annual watering control efficiency	81.5% - water truck
C = average annual watering control efficiency	99.8% - undisturbed areas

Daily Fugitive Dust Emissions (month 7)

Equipment	Daily Use Rate (unit hr/day)	PM2.5 Emission Factor(1) (lbs/hr-unit)	PM10 Emission Factor(1) (lbs/hr-unit)	Control Factor(1) (%)	PM2.5 Emissions (lbs/day)	PM10 Emissions (lbs/day)
Windblown Dust	250	0.11	0.73	100%	0.05	0.34
Bulldozer - Topsoil		0.41	0.75	0%		
Bulldozer - Weathered Rock		0.23	0.30	0%		
Bulldozer - Basin Rock	24.1	0.23	0.30	0%	5.46	7.33
Scraper - Excavation		2.84	5.18	0%		
Scraper - Unpaved Road Travel		5.38	35.07	92%		
Scraper - Spreading		0.00	0.06	0%		
Excavator Transfer		0.06	1.27	0%		
Drilling	16.0	0.08	0.24	0%	1.23	3.77
Loader Transfer - Topsoil		0.08	0.24	0%		
Loader Transfer - Weathered Rock		0.12	0.38	0%		
Loader Transfer - Basin Rock	36.4	0.12	0.38	0%	4.34	13.80
Loader Transfer - Tunnel Rock	1.0	0.12	0.38	0%	0.12	0.37
Loader Travel - Topsoil		1.12	7.33	73%		
Loader Travel - Weathered Rock		0.99	6.46	73%		
Loader Travel - Basin Rock	36.4	0.99	6.46	73%	9.64	62.87
Loader Travel - Tunnel Rock	1.0	0.99	6.46	73%	0.26	1.70
Dump Truck Transfer - Topsoil		0.04	0.12	0%		
Dump Truck Transfer - Weathered Rock		0.06	0.19	0%		
Dump Truck Transfer - Basin Rock	77.4	0.06	0.19	0%	4.62	14.69
Dump Truck Transfer - Tunnel Rock	1.9	0.06	0.19	0%	0.11	0.36
Dump Truck Travel - Topsoil		3.09	19.72	98%		
Dump Truck Travel - Weathered Rock		3.98	25.42	93%		
Dump Truck Travel - Basin Rock	77.4	3.80	24.25	95%	14.71	93.90
Dump Truck Travel - Tunnel Rock	1.9	4.18	26.71	95%	0.40	2.54
Water Truck Travel	8.0	3.48	22.19	82%	5.14	32.80
Total =					46.06	234.47

Month 7

GENERAL CONFORMITY ANALYSIS
ATTACHMENT B

Air Emission Analyses
For Operational Activities

This page intentionally left blank.

Table B-1. UARP/Chili Bar air emissions summary, prior to 2015.

Alternative	Action	Description	Annual Energy Generation (MWh)	Emission Factors (Lb/MWh[a]					Peak-Year Annual Emissions (tons/year)				
				NO_x	CO	VOC	PM	SO2	NO_x	CO	VOC	PM	SO2
No Action (Baseline)	Operational emissions	a) Hydroelectric	1,835,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
UARP only (without Iowa Hill)	Operational emissions	a) Hydroelectric	1,699,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
		b) Additional on-peak simple cycle combustion turbine	70,000	0.167	0.082	0.048	0.020	0.024	5.8	2.9	1.7	0.7	0.8
		c) Additional off-peak for energy generation using											
		- Option 1 Combined cycle combustion turbine	66,000	0.100	0.041	0.038	0.020	0.024	3.3	1.4	1.3	0.7	0.8
		- Option 2 Coal-fired unit	66,000	0.111	0.109	0.020	0.039	0.102	3.7	3.6	0.7	1.3	3.4
		Generation sub-total	1,835,000					Sub-total – Option 1	9.1	4.2	2.9	1.4	1.6
								Sub-total – Option 2	9.5	6.5	2.3	2.0	4.2
									Peak-Year Iowa Hill Construction Emissions (tons/year)				
									NO_x	**CO**	**VOC**	**PM**	**SO2**
UARP with Iowa Hill	Construction Emissions (Prior to 2015)	a) Heavy equipment and trucks.							44.3	18.3	4.0	3.4	0.10
		b) Dust from earth & surface handling.										31.0	
		c) Deliveries and workers' commuting vehicles.							0.3	10.4	1.4	0.1	0.03
								Sub-total	44.6	28.7	5.4	34.5	0.1
				General Conformity Test – Increased Emission Level (tons/year) Proposed Build Alternative versus No-Action									
									NO_x	**CO**	**VOC**	**PM**	**SO2**
				UARP only (without Iowa Hill)									
				- Option 1 (CCCT for off-peak)					9.1	4.2	2.9	1.4	1.6
				- Option 2 (Coal unit for off-peak)					9.5	6.5	2.3	2.0	4.2
				UARP with Iowa Hill									
				- During Construction					44.6	28.7	5.4	34.5	0.1

Staff alternative will have the same air emissions as those for Proposed UARP action with Iowa Hill

References:
[a] USEPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu
[b] California Energy Commission, November 2001
[c] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs Conventional Cost vs Combined-Cycle Gas Turbine," 2002 for Power-Gen International
[d] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)
[e] SMUD, July 2006

This page intentionally left blank.

Table B-2. UARP/Chili Bar Project air emissions summary, post 2014.

Alternative	Action	Description	Annual Energy Generation (MWh)	Emission Factors (Lb/MWh) NO$_x$	CO	VOC	PM	SO2	Peak-Year Annual Emissions (tons/year) NO$_x$	CO	VOC	PM	SO2
No Action (Baseline)	Operational emissions	a) Hydroelectric	1,835,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
		b) Additional on-peak simple cycle combustion turbine	931,000	0.167	0.082	0.048	0.020	0.024	77.7	38.2	22.3	9.3	11.2
		c) Additional off-peak for energy generation using											
		- Option 1 Combined cycle combustion turbine	43,000	0.100	0.041	0.038	0.020	0.024	2.2	0.9	0.8	0.4	0.5
		- Option 2 Coal-fired unit	43,000	0.111	0.109	0.020	0.039	0.102	2.4	2.3	0.4	0.8	2.2
		Generation sub-total	2,809,000					Sub-total – Option 1	79.9	39.1	23.2	9.7	11.7
								Sub-total – Option 2	80.1	40.5	22.8	10.1	13.4
UARP only (without Iowa Hill)	Operational emissions	a) Hydroelectric	1,699,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
		b) Additional on-peak simple cycle combustion turbine	1,001,000	0.167	0.082	0.048	0.020	0.024	83.6	41.0	24.0	10.0	12.0
		c) Additional off-peak for energy generation using											
		- Option 1 Combined cycle combustion turbine	109,000	0.100	0.041	0.038	0.020	0.024	5.5	2.2	2.1	1.1	1.3
		- Option 2 Coal-fired unit	109,000	0.111	0.109	0.020	0.039	0.102	6.0	5.9	1.1	2.1	5.6
		Generation sub-total	2,809,000					Sub-total – Option 1	89.0	43.3	26.1	11.1	13.3
								Sub-total – Option 2	89.6	47.0	25.1	12.1	17.6
UARP with Iowa Hill	Operational Emissions (Post 2015)	a) Hydroelectric	2,673,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
		b) Electric energy requirements for pump-back operation.	-1,230,000						0.0	0.0	0.0	0.0	0.0
		c) Additional on-peak simple cycle combustion turbine	70,000	0.167	0.082	0.048	0.020	0.024	5.8	2.9	1.7	0.7	0.8
		d) Additional off-peak for energy generation using											
		- Option 1 Combined cycle combustion turbine	1,26,000	0.100	0.041	0.038	0.020	0.024	64.8	26.6	24.6	13.0	15.6
		- Option 2 Coal-fired unit	1,296,000	0.111	0.109	0.020	0.039	0.102	71.9	70.6	13.0	25.3	66.1
		Generation sub-total	2,809,000					Sub-total – Option 1	70.6	29.4	26.3	13.7	16.4
								Sub-total – Option 2	77.8	73.5	14.6	26.0	66.9

	General Conformity Test – Increased Emission Level (tons/year) Proposed Build Alternative versus No-Action					
		NO_x	CO	VOC	PM	SO2
	UARP only (without Iowa Hill)					
	- Option 1 (CCCT for off-peak)	9.1	4.2	2.9	1.4	1.6
	- Option 2 (Coal unit for off-peak)	9.5	6.5	2.3	2.0	4.2
	UARP with Iowa Hill (Operation)					
	- Option 1 (CCCT for off-peak)	-9.2	-9.6	3.1	3.9	4.7
	- Option 2 (Coal unit for off-peak)	-2.4	33.0	-8.1	15.8	53.6
Staff Alternative will have the same energy generation and air emissions as those for Proposed UARP action with Iowa Hill.						

References:

[a] USEPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu

[b] California Energy Commission, November 2001

[c] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs Conventional Cost vs Combined-Cycle Gas Turbine," 2002 for Power-Gen International

[d] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)

[e] SMUD, July 2006