

APPENDIX H

Traffic and Air Quality Analysis Information

H-1 Traffic Analysis Information

Table H-1 summarizes the project construction traffic estimated for each proposed facility and for each of the four alternatives.

**TABLE H-1
LOS VAQUEROS CONSTRUCTION TRAFFIC ASSUMPTIONS**

LV Project Facility	Crew Size	Construction Worker Commute Trips ¹		Equipment and Materials Haul Trucks			Total One-way Trips / Day
		Round Trips / Day	One-way Trips / Day*	Round Trips / Day	One-way Trips / Day	One-way Trips / Hour (10-Hr Day)	
Alternatives 1 and 2²							
1 LV Reservoir Expansion	75	94	188	130	260	26	448
2 Transfer Facility	50	63	125	235	470	47	595
3 New Delta Intake Pipelines	50	63	125	170	340	34	465
		0				0	0
4 Delta-Transfer	50	63	125	180	360	36	485
5 Transfer-LV	50	63	125	165	330	33	455
6 Transfer-Bethany	50	63	125	180	360	36	485
7 Power Option 1 or 2	25	31	63	25	50	5	113
8 LV Recreation Facilities	50	63	125	60	120	12	245
Total (rounded up)	400	500	1000	1150	2300	230	3300
Alternative 3³	263	375	750	619	1,590	159	2,340
Alternative 4⁴	60	75	150	136	272	27	425

¹ Work crew trips include daily commute to / from project site + 25% additional trips, assuming 1/4 of workers leave/return during day (e.g. lunch)

² Alts 1 and 2 - Construction traffic totals include all facilities including Recreation Facilities traffic in peak project total even though these facilities would be built after most everything else and would not likely occur at the same time as other construction activities.

³ Alternative 3 - Project construction traffic estimate totals include facilities shown under alternative 1 with the following adjustments: no construction of the new Delta Intake and Pump Station (3); truck trips for Old River Pump Station Expansion so minor not included; and (6) Transfer-Bethany Pipeline not included.

⁴ Alternative 4 - Project construction traffic estimate totals assume 50% of the traffic level estimated for the reservoir expansion (1) under Alternative 1, 25% of the traffic associated with the Transfer Facility Expansion (2) to reflect an upgrade only; and only 20% of the traffic associated with the Recreation Facilities (8), since the Marina would not be move to the north end of the reservoir and there would be no second Interpretive Center constructed.

H-2 Air Quality Models and Results

Introduction

Several air quality models were used to quantify criteria pollutant emissions during construction activities associated with the Project. The California Air Resources Board (CARB) OFFROAD2007 model calculates emissions of ROG, NO_x, CO, CO₂ and PM₁₀ from off-road construction equipment based on the type, horsepower, activity, load factor, and equipment deterioration. Offroad equipment assumptions and results of OFFROAD2007 modeling are presented in **Section 1** for the project specific equipment provided by the applicant. In **Section 2**, CARB's EMFAC2007 emission factors are presented for on-road vehicles in Contra Costa County for the year 2015 and are used to calculate the emissions generated by worker and haul truck trips during construction. Fugitive dust emissions are also calculated based on the URBEMIS2007 default average of 10 pounds per acre-day and the assumption that 15 acres will all be disturbed at any one time during construction of all Project Alternative components. Finally, in **Section 3**, electricity usage and associated indirect electricity generation greenhouse gas emissions are presented.

Section 1 – Offroad Equipment Emissions

Estimated Construction Schedule - Reservoir Expansion

Description	Duration	Year 1												
		January	February	March	April	May	June	July	August	September	October	November	December	
Notice to Proceed		◆												
Mobilization		◆												
Roads and Temporary Construction	6 wk	■												
Site Preparation	10 wk		◆											
Pump Dead Pool	4 wk		■											
Demo Upper Spillway	7 wk			■										
Groundwater Cutoff and Cofferdam	4 wk			■										
Foundation	19 wk			◆										
Excavate Dam Foundation	19 wk			■										
Grout Upper Left Abutment	8 wk			■										
Grout Upper Right Abutment	5 wk			■										
Embankment	79 wk													
Strip Riprap From Excavated Dam	9 wk					■								
Construct Haul Roads Over Excavated Dam	9 wk						■							
Place Embankment Fill Year 1	13 wk							■						
Place Embankment Fill Year 2	34 wk									■				
Import Filter, Drain, Raprap and Bedding	30 wk									■				
Instrumentation	2 wk													
RCC Abutment	30 wk													
Import and Stockpile RCC Aggregate	30 wk				■									
Construct RCC Buttress	19 wk							■						
Hydraulic Structures	76 wk													
Construct Outlet Retaining Wall	11 wk			■										
Extend Excavation (Outlet) Intake Structure	26 wk						■							
Install Mech/Elec at (Outlet) Intake Structure	26 wk						■							
Install Mech/Elec at (Outlet) Outlet Structure	7 wk							■						
Connect Spillway to Existing Chute	19 wk							■						
Install New Inlet Conduit	13 wk							■						
Install Mech/Elec Inlet Conduit	9 wk							■						
Maintenance Access Roads	81 wk													
Excavate and Stabilize Intake Access Road	13 wk					■								
Pave Access Roads	5 wk							■						
Substantial Completion														

Estimated Labor and Equipment

Description	Year 1											
	January	February	March	April	May	June	July	August	September	October	November	December
Project Management												
Administration	176	176	176	346	346	346	346	346	346	346	346	346
Management	433	433	433	433	433	433	433	433	433	433	433	433
Engineering	433	433	433	433	433	433	433	433	433	433	433	433
Safety	217	217	217	217	217	217	217	217	217	217	217	217
Subtotal	1,259	1,259	1,259	1,429	1,429	1,429	1,429	1,429	1,429	1,429	1,429	1,429
Quality Assurance and Control												
Observation	217	217	217	217	217	217	217	217	217	217	217	173
Inspection	651	651	651	651	651	651	651	651	651	651	651	173
Testing	868	868	868	868	868	868	868	868	868	868	868	173
Subtotal	1,736	1,736	1,736	1,736	1,736	1,736	1,736	1,736	1,736	1,736	1,736	519
Construction Labor												
Operator	1085	1085	1085	9382	11467	11467	11467	9382	9382	1085	1,085	217
Driver				5212	5212	5212	5212	5212	2606	2606		
Carpenter				1302	1302	1302	1736	1736	1736	2604	2604	1736
Electrician												
Laborer				1668	1668	2085	2085	2085	2085	2085	2085	2085
Subtotal	1,085	1,085	2,387	17,564	19,649	20,500	20,500	18,415	16,677	8,380	5,774	4,038
Total Labor Hours	4,080	4,080	5,382	20,729	22,814	23,665	23,665	21,580	19,842	11,545	8,939	5,986
Crew#	24	24	31	120	132	137	137	125	115	67	52	35
Equipment Hours												
Wheel and Track Loader			173	692	692	692	692	692				
Hydraulic Excavator			173	1040	1040	1040	1040	1040				
Track Type Tractor w/ Dozer	173	90		692	692	1126	1126	868	868	868		
Scraper	346	173				1038	1038	1038	2076	2076	2076	
Motor Grader	173	90		346	346	346	346	346				
Compactor									692	692	692	
Water Wagon	173	90							434	434	434	
Off Highway Truck				1730	1730	1730	1730	1730				
Highway Truck				1586	1586	1586	1586	1586	1586	1586		
Water Truck				173	173	217	217	217	217	217	217	217
Crane 100 Ton			217	217	217	217	217	217	217	217	217	217
RCC Batch and Placement						434	434	434	434	434		
Service and Support Equipment	173	173	173	346	346	346	346	346	346	346	346	173
Subtotal	1,038	833	2,495	6,822	6,866	8,772	8,772	8,772	6,870	6,870	4,850	390
Total Equipment Hours	1,038	833	2,495	6,822	6,866	8,772	8,772	8,772	6,870	6,870	4,850	390
Year 1 total	63,350			9								

	Equipment Type	Representative Equipment Model	Fuel	MaxHP	Total Equip Hours Per Month	Qty of Equip	State Average HP	Equipment Usage Days/Year	Activity from OFFROAD 007 (hr/day)	Emissions from OFFROAD 2007 Model (tons/day)					Emission Factor (lbs/hp-hr)					Equipment Emissions (lbs/month)					Equipment Emissions (tons/month)					
										ROG	CO	NOX	CO2	PM	ROG	CO	NOX	CO2	PM	ROG	CO	NOX	CO2	PM	ROG	CO	NOX	CO2	PM	
JUNE	Wheel and Track Loader	Wheel loader - CAT 966	d	259	692	4	500	22	109.15	0.01	0.04	0.09	18.80	0.00	4E-04	0	0	0.6891	0.0001	74.652	253.9	575.201	123504	20.009	0	0	0	56	0	
	Hydraulic Excavator	Excavator - CAT 320	d	138	1040	6.012	157	22	1335.22	0.07	0.44	0.49	74.85	0.03	7E-04	0	0	0.7141	0.0003	95.977	607.7	676.147	102494	36.929	0	0	0	46	0	
	Track Type Tractor w/ Dozer	Track type tractor - CAT D6N	d	145	1126	6.509	147	22	209.09	0.01	0.06	0.07	10.59	0.00	6E-04	0	0	0.6891	0.0002	94.696	649.4	702.06	112507	37.126	0	0	0	51	0	
	Scraper	Scraper - CAT 631	d	462	1038	6	356	22	136.99	0.02	0.07	0.16	22.00	0.01	8E-04	0	0	0.9021	0.0003	388	1439	3243.4	432597	125.12	1	2	196	0		
	Motor Grader	Grader - CAT 140	d	222	346	2	225	22	242.28	0.02	0.05	0.14	20.83	0.00	6E-04	0	0	0.7643	0.0002	45.215	138	395.22	58704	13.631	0	0	0	27	0	
	Compactor	Compactor - CS 323	d	83	0	0	104	22	12.82	0.00	0.00	0.00	0.52	0.00	8E-04	0	0	0.7768	0.0004	0	0	0	0	0	0	0	0	0	0	0
	Water Wagon	Water Wagon 8,000 Gal - CAT 631	d	417	0	0	381	22	172.98	0.02	0.05	0.12	23.53	0.00	5E-04	0	0	0.7141	0.0001	0	0	0	0	0	0	0	0	0	0	0
	Off Highway Truck	Articulated Truck 18 CY - CAT 735	d	408	1730	10	381	22	172.98	0.02	0.05	0.12	23.53	0.00	5E-04	0	0	0.7141	0.0001	362.68	1101	2620.53	504072	93.444	0	1	1	229	0	
	Water Truck	Water Truck 3000 Gal and Pump	d	417	217	1.254	381	22	172.98	0.02	0.05	0.12	23.53	0.00	5E-04	0	0	0.7141	0.0001	46.495	141.2	335.954	64622	11.98	0	0	0	29	0	
	Crane 100 Ton	Grove Crane GMK4100B	d	390	217	1.254	334	22	43.70	0.00	0.01	0.03	3.93	0.00	4E-04	0	0	0.5387	0.0001	35.256	118.1	298.938	45594	10.793	0	0	0	21	0	
	RCC Batch and Placement	Pumps	d	190	434	2.509	206	22	41.09	0.00	0.01	0.02	5.22	0.00	6E-04	0	0	1.2331	0.0002	52.358	198.5	474.351	101678	15.743	0	0	0	46	0	
	Service and Support Equipment	Generator sets, compressors	d	303	346	2	327	22	41.09	0.00	0.01	0.02	5.22	0.00	4E-04	0	0	0.7768	0.0001	41.935	159	379.922	81437	12.609	0	0	0	37	0	
	JULY	Wheel and Track Loader	Wheel loader - CAT 966	d	259	692	4	500	22	109.15	0.01	0.04	0.09	18.80	0.00	4E-04	0	0	0.6891	0.0001	74.652	253.9	575.201	123504	20.009	0	0	0	56	0
Hydraulic Excavator		Excavator - CAT 320	d	138	1040	6.012	157	22	1335.22	0.07	0.44	0.49	74.85	0.03	7E-04	0	0	0.7141	0.0003	95.977	607.7	676.147	102494	36.929	0	0	0	46	0	
Track Type Tractor w/ Dozer		Track type tractor - CAT D6N	d	145	1126	6.509	147	22	209.09	0.01	0.06	0.07	10.59	0.00	6E-04	0	0	0.6891	0.0002	94.696	649.4	702.06	112507	37.126	0	0	0	51	0	
Scraper		Scraper - CAT 631	d	462	1038	6	356	22	136.99	0.02	0.07	0.16	22.00	0.01	8E-04	0	0	0.9021	0.0003	388	1439	3243.4	432597	125.12	1	2	196	0		
Motor Grader		Grader - CAT 140	d	222	346	2	225	22	242.28	0.02	0.05	0.14	20.83	0.00	6E-04	0	0	0.7643	0.0002	45.215	138	395.22	58704	13.631	0	0	0	27	0	
Compactor		Compactor - CS 323	d	83	0	0	104	22	12.82	0.00	0.00	0.00	0.52	0.00	8E-04	0	0	0.7768	0.0004	0	0	0	0	0	0	0	0	0	0	
Water Wagon		Water Wagon 8,000 Gal - CAT 631	d	417	0	0	381	22	172.98	0.02	0.05	0.12	23.53	0.00	5E-04	0	0	0.7141	0.0001	0	0	0	0	0	0	0	0	0	0	
Off Highway Truck		Articulated Truck 18 CY - CAT 735	d	408	1730	10	381	22	172.98	0.02	0.05	0.12	23.53	0.00	5E-04	0	0	0.7141	0.0001	362.68	1101	2620.53	504072	93.444	0	1	1	229	0	
Water Truck		Water Truck 3000 Gal and Pump	d	417	217	1.254	381	22	172.98	0.02	0.05	0.12	23.53	0.00	5E-04	0	0	0.7141	0.0001	46.495	141.2	335.954	64622	11.98	0	0	0	29	0	
Crane 100 Ton		Grove Crane GMK4100B	d	390	217	1.254	334	22	43.70	0.00	0.01	0.03	3.93	0.00	4E-04	0	0	0.5387	0.0001	35.256	118.1	298.938	45594	10.793	0	0	0	21	0	
RCC Batch and Placement		Pumps	d	190	434	2.509	206	22	41.09	0.00	0.01	0.02	5.22	0.00	6E-04	0	0	1.2331	0.0002	52.358	198.5	474.351	101678	15.743	0	0	0	46	0	
Service and Support Equipment		Generator sets, compressors	d	303	346	2	327	22	41.09	0.00	0.01	0.02	5.22	0.00	4E-04	0	0	0.7768	0.0001	41.935	159	379.922	81437	12.609	0	0	0	37	0	
AUGUST		Wheel and Track Loader	Wheel loader - CAT 966	d	259	692	4	500	22	109.15	0.01	0.04	0.09	18.80	0.00	4E-04	0	0	0.6891	0.0001	74.652	253.9	575.201	123504	20.009	0	0	0	56	0
	Hydraulic Excavator	Excavator - CAT 320	d	138	1040	6.012	157	22	1335.22	0.07	0.44	0.49	74.85	0.03	7E-04	0	0	0.7141	0.0003	95.977	607.7	676.147	102494	36.929	0	0	0	46	0	
	Track Type Tractor w/ Dozer	Track type tractor - CAT D6N	d	145	1126	6.509	147	22	209.09	0.01	0.06	0.07	10.59	0.00	6E-04	0	0	0.6891	0.0002	94.696	649.4	702.06	112507	37.126	0	0	0	51	0	
	Scraper	Scraper - CAT 631	d	462	1038	6	356	22	136.99	0.02	0.07	0.16	22.00	0.01	8E-04	0	0	0.9021	0.0003	388	1439	3243.4	432597	125.12	1	2	196	0		
	Motor Grader	Grader - CAT 140	d	222	346	2	225	22	242.28	0.02	0.05	0.14	20.83	0.00	6E-04	0	0	0.7643	0.0002	45.215	138	395.22	58704	13.631	0	0	0	27	0	
	Compactor	Compactor - CS 323	d	83	0	0	104	22	12.82	0.00	0.00	0.00	0.52	0.00	8E-04	0	0	0.7768	0.0004	0	0	0	0	0	0	0	0	0		
	Water Wagon	Water Wagon 8,000 Gal - CAT 631	d	417	0	0	381	22	172.98	0.02	0.05	0.12	23.53	0.00	5E-04	0	0	0.7141	0.0001	0	0	0	0	0	0	0	0	0		
	Off Highway Truck	Articulated Truck 18 CY - CAT 735	d	408	1730	10	381	22	172.98	0.02	0.05	0.12	23.53	0.00	5E-04	0	0	0.7141	0.0001	362.68	1101	2620.53	504072	93.444	0	1	1	229	0	
	Water Truck	Water Truck 3000 Gal and Pump	d	417	217	1.254	381	22	172.98	0.02	0.05	0.12	23.53	0.00	5E-04	0	0	0.7141	0.0001	46.495	141.2	335.954	64622	11.98	0	0	0	29	0	
	Crane 100 Ton	Grove Crane GMK4100B	d	390	217	1.254	334	22	43.70	0.00	0.01	0.03	3.93	0.00	4E-04	0	0	0.5387	0.0001	35.256	118.1	298.938	45594	10.793	0	0	0	21	0	
	RCC Batch and Placement	Pumps	d	190	434	2.509	206	22	41.09	0.00	0.01	0.02	5.22	0.00	6E-04	0	0	1.2331	0.0002	52.358	198.5	474.351	101678	15.743	0	0	0	46	0	
	Service and Support Equipment	Generator sets, compressors	d	303	346	2	327	22	41.09	0.00	0.01	0.02	5.22	0.00	4E-04	0	0	0.7768	0.0001	41.935	159	379.922	81437	12.609	0	0	0	37	0	
	SEPTEMBER	Wheel and Track Loader	Wheel loader - CAT 966	d	259	0	0	500	22	109.15	0.01	0.04	0.09	18.80	0.00	4E-04	0	0	0.6891	0.0001	74.652	253.9	575.201	123504	20.009	0	0	0	56	0
Hydraulic Excavator		Excavator - CAT 320	d	138	0	0	157	22	1335.22	0.07	0.44	0.49	74.85	0.03	7E-04	0	0	0.7141	0.0003	95.977	607.7	676.147	102494	36.929	0	0	0	46	0	
Track Type Tractor w/ Dozer		Track type tractor - CAT D6N	d	145	868	5.017	147	22	209.09	0.01	0.06	0.07	10.59	0.00	6E-04	0	0	0.6891	0.0002	72.998	500.6	541.197	86729	28.619	0	0	0	39	0	
Scraper		Scraper - CAT 631	d	462	2076	12	356	22	136.99	0.02	0.07	0.16	22.00	0.01	8E-04	0	0	0.9021	0.0003	776.01	2878	6486.81	865194	250.25	1	3	392	0		
Motor Grader		Grader - CAT 140	d	222	0	0	225	22	242.28	0.02	0.05	0.14	20.83	0.00	6E-04	0	0	0.7643	0.0002	0	0	0	0	0	0	0	0	0		
Compactor		Compactor - CS 323	d	83	692	4	104	22	12.82	0.00	0.00	0.00	0.52	0.00	8E-04	0	0	0.7768	0.0004	45.604										

Equipment Type	Representative Equipment Model	Fuel	MaxHP	Total Equip Hours Per Month	Qty of Equip	State Average HP	Equipment Usage Days/Year	Activity from OFFROAD2 007 (hr/day)	Emissions from OFFROAD 2007 Model (tons/day)					Emission Factor (lbs/hp-hr)					Equipment Emissions (lbs/month)					Equipment Emissions (tons/month)														
									ROG	CO	NOX	CO2	PM	ROG	CO	NOX	CO2	PM	ROG	CO	NOX	CO2	PM	ROG	CO	NOX	CO2	PM										
									Dam Construction Emissions:										Totals:										Total (tons per year)									
DECEMBER	Wheel and Track Loader	Wheel loader - CAT 966	d	259	0	0	500	22	109.15	0.01	0.04	0.09	18.80	0.00	4E-04	0.0014	0.003	0.69	0.000112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Hydraulic Excavator	Excavator - CAT 320	d	138	0	0	157	22	1335.22	0.07	0.44	0.49	74.85	0.03	7E-04	0.0042	0.005	0.71	0.000257	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Track Type Tractor w/ Dozer	Track type tractor - CAT D6N	d	145	0	0	147	22	209.09	0.01	0.06	0.07	10.59	0.00	6E-04	0.004	0.004	0.69	0.000227	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Scraper	Scraper - CAT 631	d	462	0	0	356	22	136.99	0.02	0.07	0.16	22.00	0.01	8E-04	0.003	0.007	0.9	0.000261	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Motor Grader	Grader - CAT 140	d	222	0	0	225	22	242.28	0.02	0.05	0.14	20.83	0.00	6E-04	0.0018	0.005	0.76	0.000177	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Compactor	Compactor - CS 323	d	83	0	0	104	22	12.82	0.00	0.00	0.00	0.52	0.00	8E-04	0.005	0.006	0.78	0.000424	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Water Wagon	Water Wagon 8,000 Gal - CAT 631	d	417	0	0	381	22	172.98	0.02	0.05	0.12	23.53	0.00	5E-04	0.0016	0.004	0.71	0.000132	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Off Highway Truck	Articulated Truck 18 CY - CAT 735	d	408	0	0	381	22	172.98	0.02	0.05	0.12	23.53	0.00	5E-04	0.0016	0.004	0.71	0.000132	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Water Truck	Water Truck 3000 Gal and Pump	d	417	0	0	381	22	172.98	0.02	0.05	0.12	23.53	0.00	5E-04	0.0016	0.004	0.71	0.000132	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Crane 100 Ton	Grove Crane GMK4100B	d	390	217	1,254,335	334	22	43.70	0.00	0.01	0.03	3.93	0.00	4E-04	0.0014	0.004	0.54	0.000128	35.3	118	298.9	45594	10.7926	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RCC Batch and Placement	Pumps	d	190	0	0	206	22	41.09	0.00	0.01	0.02	5.22	0.00	6E-04	0.0024	0.006	1.23	0.000191	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Service and Support Equipment	Generator sets, compressors	d	303	173	1	327	22	41.09	0.00	0.01	0.02	5.22	0.00	4E-04	0.0015	0.004	0.78	0.00012	21	79.5	190	40719	6.30437	0	0	0	0	0	0	0	0	0	0	0	0	0	0
										ROG					CO					NOX					CO2					PM								
										56					218					441					73964					17								

Equipment Type		Representative Equipment Model or OFFROAD Category		Fuel	MaxHP	Qty of Equip	State Average HP	Hours per Day	Equipment Usage Days/Year	Activity from OFFROAD2 007 (hr/day)	Emissions from OFFROAD 2007 Model (tons/day)					Emission Factor (lbs/hp-hr)					Equipment Emissions (lbs/day)					Equipment Emissions (tons/year)				
											ROG	CO	NOX	CO2	PM	ROG	CO	NOX	CO2	PM	ROG	CO	NOX	CO2	PM	ROG	CO	NOX	CO2	PM
Pipeline and Pump Station Construction Emissions: Year 2015	Wheel loader	Wheel loader - CAT 966	d	259	2	500	8	260	109.15	0.01	0.04	0.09	18.80	0.00	0.00	0.00	0.69	0.00	1.73	5.87	13.3	2855.58	0.463	0.224	0.8	1.729	336.8	0.06		
	Compactor	Compactor - CS 323	d	83	2	104	8	260	12.82	0.00	0.00	0.00	0.52	0.00	0.00	0.01	0.78	0.00	1.05	6.636	7.667	1031.58	0.563	0.137	0.9	0.997	121.7	0.07		
	Pipeline Mass Excavator	Excavator - CAT 325i	d	188	4	222	8	260	543.02	0.03	0.09	0.24	43.04	0.01	0.00	0.00	0.71	0.00	3.02	9.289	24.17	4296.3	0.804	0.393	1.2	3.143	506.7	0.1		
	Grove Crane (30 ton)	RTS30	d	152	2	149	8	260	61.51	0.00	0.01	0.02	2.47	0.00	0.00	0.00	0.54	0.00	1.5	7.817	10.89	1310.22	0.617	0.195	1	1.416	154.5	0.08		
	Water truck	Water Truck 3000 Gal and Pump	d	417	2	381	8	260	172.98	0.02	0.05	0.12	23.53	0.00	0.00	0.00	0.71	0.00	3.43	10.41	24.77	4764.78	0.883	0.446	1.4	3.22	561.9	0.11		
	Pump Station	Wheel loader	Wheel loader - CAT 966	d	259	1	500	8	50	109.15	0.01	0.04	0.09	18.80	0.00	0.00	0.00	0.69	0.00	0.86	2.935	6.65	1427.79	0.231	0.022	0.1	0.166	32.38	0.01	
		Grader	Grader - CAT 140	d	222	1	225	8	50	242.28	0.02	0.05	0.14	20.83	0.00	0.00	0.01	0.76	0.00	1.81	3.191	9.138	1357.33	0.315	0.026	0.1	0.228	30.78	0.01	
		Backhoe	CAT 430	d	98	1	75	8	50	2801.73	0.08	0.49	0.54	72.40	0.04	0.00	0.01	0.69	0.00	0.6	3.634	4.04	540.245	0.306	0.015	0.1	0.101	12.25	0.01	
	Pump Station	Excavator	Excavator - CAT 320	d	138	2	157	8	100	1335.22	0.07	0.44	0.49	74.85	0.03	0.00	0.00	0.71	0.00	1.48	9.348	10.4	1576.83	0.568	0.074	0.5	0.52	71.52	0.03	
		Backhoe	CAT 430	d	98	3	75	8	100	2801.73	0.08	0.49	0.54	72.40	0.04	0.00	0.01	0.69	0.00	1.81	10.9	12.12	1620.73	0.918	0.09	0.5	0.606	73.52	0.05	
		Trencher	Trencher	d	82	1	69	8	100	330.41	0.02	0.08	0.12	10.71	0.01	0.00	0.01	0.94	0.00	1.09	4.368	6.704	616.42	0.56	0.054	0.2	0.335	27.96	0.03	
	Pump Station	Excavator	Excavator - CAT 320	d	138	1	157	8	110	1335.22	0.07	0.44	0.49	74.85	0.03	0.00	0.00	0.71	0.00	0.74	4.674	5.201	788.417	0.284	0.041	0.3	0.286	39.34	0.02	
	Backhoe	CAT 430	d	98	2	75	8	110	2801.73	0.08	0.49	0.54	72.40	0.04	0.00	0.01	0.69	0.00	1.2	7.268	8.08	1080.49	0.612	0.066	0.4	0.444	53.91	0.03		
Phase 3	Concrete pump truck	Offhighway Truck	d	417	1	381	8	110	172.98	0.02	0.05	0.12	23.53	0.00	0.00	0.00	0.71	0.00	1.71	5.205	12.39	2382.39	0.442	0.094	0.3	0.681	118.9	0.02		
	Forklift	Rough Terrain Forklift	d	94	2	83	8	110	774.91	0.03	0.16	0.20	24.17	0.02	0.00	0.01	0.75	0.00	1.45	7.711	9.344	1130.6	0.76	0.08	0.4	0.514	56.41	0.04		

Worse-Case Daily Emissions: Pipeline plus Phase 3 of Pump Station										Total Annual Emissions														
ROG					CO					NOX					CO2					PM				
16					65					116					19640					5				
2					8					14					2199					1				

Section 2 – On-Road Vehicle Emfac2007 Emission Factors for Contra Costa County and On-Road Vehicle Emissions

Air Quality Analysis for Mobile Emissions Los Vaqueros gram s/m ile						Paved Road lbs/VMT Entrained PM 10 0.0014798
LDA - 2015 45 mph	ROG 0.031	CO 1.337	NOx 0.083	CO2 354.656	PM 10 0.028	
LDT - 2015 45 mph	ROG 0.052	CO 2.13	NOx 0.167	CO2 438.669	PM 10 0.036	
MDT - 2015 35 mph	ROG 0.06	CO 1.941	NOx 0.305	CO2 613.458	PM 10 0.042	Unpaved Road lbs/VMT Entrained PM 10 0.0443627
HDT - 2015 35 mph	ROG 0.371	CO 2.863	NOx 4.736	CO2 1496.25	PM 10 0.233	

Assumed average speed to be 35 mph to and from the project site for haul trucks.
Assumed average speed to be 45 mph to and from the project site for workers.

EMISSIONS CALCULATION FOR ON-ROAD VEHICLES DURING CONSTRUCTION

Emissions = Vehicle Type x Emission Factor x Miles/Trip x Trips/Day

Note: Trip length takes into account round trips
Mobile Emissions Associated with Worker and Haul Truck trips in 2015

		Emission Factors				
		ROG	CO	Nox	CO2	PM 10
LDV	2015 emissions (grams/mile)	0.0415	1.7335	0.125	396.6625	0.032
	2015 emissions (pounds/mile)	9.15E-05	3.82E-03	2.76E-04	8.74E-01	1.55E-03
	Miles/Trip					
	Trips/day	60	1	60	Mobile Source Emissions (pounds per roundtrip)	
		0.01	0.23	0.02	52.47	0.09
HDT	2015 emissions (grams/mile)	0.371	2.863	4.736	1496.253	0.233
	2015 emissions (pounds/mile)	8.18E-04	6.31E-03	1.04E-02	3.30E+00	1.99E-03
	Miles/Trip					
	Trips/day	30	1	30	Mobile Source Emissions (pounds per roundtrip)	
		0.02	0.19	0.31	98.96	0.06

DAM CONSTRUCTION:		ALTERNATIVES A THROUGH C and E				
Round Trips per year		Pollutant Emissions (pounds per year)				
Crew#	Haul Trucks	ROG	CO	NOx	CO2	PM 10
250000	183960	5886.23	92158.5	61755.3	31321763	34256.138
		Pollutant Emissions (tons per year)				
		ROG	CO	NOx	CO2	PM 10
		2.94	46.08	30.88	14207.46	17.13
PIPELINE AND PUMPSTATION CONSTRUCTION:		ALTERNATIVES A THROUGH E				
HDT		Pollutant Emissions (pounds per day)				
2015 emissions (grams/mile)		ROG	CO	Nox	CO2	PM 10
2015 emissions (pounds/mile)		0.371	2.863	4.736	1496.253	0.233
Miles/Trip		8.18E-04	6.31E-03	1.04E-02	3.30E+00	1.99E-03
Trips/day		Mobile Source Emissions (pounds per day)				
From LA	700	1	700	0.57	4.42	7.31
From Tracy	60	1	60	0.05	0.38	0.63
		2309.05	1.40	197.92	0.12	
Round Trips per day		Pollutant Emissions (pounds per day)				
Haul Trucks Days		ROG	CO	NOx	CO2	PM 10
Pipeline	4	260	1.11759	8.6244	14.2666	4507.261
		2.7238371				
		Pollutant Emissions (tons per year)				
		ROG	CO	NOx	CO2	PM 10
		0.15	1.12	1.85	531.56	0.35

Section 3 – Electricity Usage and Indirect GHG Emissions from Electricity Generation

Estimated Electrical Demand Loads with the Proposed Project:

Location	Future Without Project (MWh/yr)	Alternative 1 (MWh/yr)	Alternative 2 (MWh)	Alternative 3 (MWh)	Alternative 4 (MWh)
AIP	0	34,269	70,581	72,163	35,119
Delta Intake and Pump Station	0	0	28,715	0	0
Old River Intake and Pump Station	0	21,629	40,680	42,795	26,960
Rock Slough Pumping Plant	10,452	19,658	20,680	11,807	10,676
Transfer Pump Station	0	9,026	33,230	32,949	24,326
Export Pumping for SBA and SCVWD CVI	0	68,171	11,754	13,223	68,171
Additional Export Pumping for Level 4 Ref	0	0	0	68,171	0
Total	10,452	152,753	205,640	241,107	165,253

SOURCE: URS, 2008. Dan Drew, P.E., Pumping and Emission Data. August 19, 2008.

Notes:

1. Demands assume a conservative level of pumping based on the operations modeling for the 2030 Level of Demand and Severe Fishery Restrictions. For more information on the operations modeling see Appendix C.
2. "Export pumping for SBA and SCVWD CVP" refers to the pumping at Banks or Jones Pumping Plants required to deliver water to these agencies.
3. "Additional export pumping for Level 4 Refuge" refers to increased exports at Banks or Jones Pumping Plants that only occurs in Alternative 3.
4. Power usage associated with pumping at Banks Pumping Plant is assumed for the export pumping described in notes 2 and 3 above.

Rounded Values for report:

Location	Future Without Project (MWh/yr)	Alternative 1 (MWh/yr)	Alternative 2 (MWh)	Alternative 3 (MWh)	Alternative 4 (MWh)
AIP	34,300	70,600	72,200	35,200	32,800
Delta Intake and Pump Station	0	28,700	30,200	0	0
Old River Intake and Pump Station	21,600	40,700	42,800	27,000	22,100
Rock Slough Pumping Plant	4,700	7,100	7,600	3,500	5,000
Transfer Pump Station	9,000	33,200	33,000	24,300	12,100
Export Pumping for SBA and SCVWD CVI	68,200	11,800	13,200	68,200	68,200
Additional Export Pumping for Level 4 Ref	0	0	0	2,500	0
Total	137,800	192,100	199,000	160,700	140,200

SOURCE: URS, 2008. Dan Drew, P.E., Pumping and Emission Data. August 19, 2008.

Pumping Rates:

Location	Future Without Project TAF/yr	Alternative 1 TAF/yr	Alternative 2 TAF/yr	Alternative 3 TAF/yr	Alternative 4 TAF/yr
AIP	71	147	150	73	68
Delta Intake and Pump Station	0	80	84	0	0
Old River Intake and Pump Station	63	119	125	72	65
Rock Slough Pumping Plant	28	43	46	21	30
Transfer Pump Station	28	71	77	55	32
Export Pumping for SBA and SCVWD CVP	232	40	45	232	232
Additional Export Pumping for Level 4 Refuge	0	0	0	8	0

SOURCE: URS, 2008. Dan Drew, P.E., Pumping and Emission Data. August 19, 2008.

Notes:

1. All values are long-term average (1922-2003) annual pumping, from CalSim II model studies performed for each project alternative.

Estimated Carbon Emissions with Proposed Project:

Scenario	Diversion Data				Pump Data								Estimated Electrical Demand			Estimated Carbon Emissions				
	Volume	Pumping Time		Avg. Flow	No.	Motor Size			Flow per Pump	Head	Efficien	Brake Horsepower		(K-W-HR/YR)	(MW-HR/YR)	(K-W-HR /AF)	Source	Emission Factor	Carbon Emission	
	(AF/YR)	(DAY/YR)	(HR/YR)	(CFS)	(#)	(HP)	(KW)	(CFS)	(GPM)	(FT)	(%)	(HP)	(KW)						(LB CO2/ MW-HR)	(LB/YR)
AIP Pump Station																				
Future Without Project	71,178	143,542	3,445	250.0	5	3,000	2,238	50.0	22,442	400	85%	2,667	1,989	34,268,708	34,269	481.5	CVP/MID	406.00	13,913,096	6,310
Alternative 1	146,601	295,845	7,095	250.0	5	3,000	2,238	50.0	22,442	400	85%	2,667	1,989	70,581,176	70,581	481.5	CVP/MID	406.00	28,655,957	12,996
Alternative 2	149,987	302,272	7,255	250.0	5	3,000	2,238	50.0	22,442	400	85%	2,667	1,989	72,163,223	72,163	481.5	CVP/MID	406.00	29,298,269	13,297
Alternative 3	72,944	147,104	3,530	250.0	5	3,000	2,238	50.0	22,441	400	85%	2,667	1,989	35,118,951	35,119	481.5	CVP/MID	406.00	14,258,294	6,466
Alternative 4	68,162	137,460	3,299	250.0	5	3,000	2,238	50.0	22,442	400	85%	2,667	1,989	32,816,653	32,817	481.5	CVP/MID	406.00	13,323,561	6,042
Delta Pump Station																				
Future Without Project	0	0.000	0	0.0	0	0	0	0.0	0	0	0%	0	0	0	0	0.0	PG&E	455.81	0	0
Alternative 1	79,524	235,843	5,660	170.0	4	2,000	1,492	42.5	19,075	300	85%	1,700	1,268	28,715,173	28,715	361.1	PG&E	455.81	13,088,663	5,936
Alternative 2	83,658	248,103	5,954	170.0	4	2,000	1,492	42.5	19,075	300	85%	1,700	1,268	30,207,911	30,208	361.1	PG&E	455.81	13,769,068	6,244
Alternative 3	0	0.000	0	0.0	0	0	0	0.0	0	0	0%	0	0	0	0	0.0	PG&E	455.81	0	0
Alternative 4	0	0.000	0	0.0	0	0	0	0.0	0	0	0%	0	0	0	0	0.0	PG&E	455.81	0	0
Old River Pump Station																				
Future Without Project	63,424	127,900	3,070	250.0	5	2,100	1,567	50.0	22,442	290	87%	1,889	1,409	21,629,340	21,629	341.0	CVP/MID	267.96	5,795,798	2,628
Alternative 1	119,286	240,560	5,773	250.0	5	2,100	1,567	50.0	22,442	290	87%	1,889	1,409	40,679,828	40,680	341.0	CVP/MID	267.96	10,900,567	4,944
Alternative 2	125,487	253,065	6,074	250.0	5	2,100	1,567	50.0	22,442	290	87%	1,889	1,409	42,794,541	42,795	341.0	CVP/MID	267.96	11,467,225	5,201
Alternative 3	71,645	112,878	2,709	320.0	5	3,000	2,238	64.0	28,725	320	87%	2,668	1,990	26,960,473	26,960	376.3	CVP/MID	267.96	7,224,328	3,276
Alternative 4	64,783	130,648	3,135	250.0	5	2,100	1,567	50.0	22,442	290	87%	1,889	1,409	22,092,796	22,093	341.0	CVP/MID	267.96	5,919,986	2,665
Rock Slough Pump Station																				
Future Without Project	28,281				4									4,660,709	4,661	164.8	CVP/MID	162.00	755,035	342
Alternative 1	43,174				4									7,115,075	7,115	164.8	CVP/MID	162.00	1,152,642	523
Alternative 2	46,010				4									7,582,448	7,582	164.8	CVP/MID	162.00	1,228,357	557
Alternative 3	21,216				4									3,496,397	3,496	164.8	CVP/MID	162.00	566,416	257
Alternative 4	30,084				4									4,957,843	4,958	164.8	CVP/MID	162.00	803,171	364
Transfer Station Pumping Plant																				
Future Without Project	27,708	77,600	1,862	180.0	4	2,100	1,567	45.0	20,199	277	87%	1,624	1,212	9,025,610	9,026	325.7	PG&E	455.81	4,113,963	1,866
Alternative 1	70,999	53,425	1,282	670.0	8	4,500	3,357	83.8	37,590	398	87%	4,343	3,240	33,229,740	33,230	468.0	PG&E	455.81	15,146,448	6,869
Alternative 2	76,763	57,760	1,386	670.0	8	4,500	3,357	83.8	37,592	365	87%	3,983	2,971	32,948,560	32,949	429.2	PG&E	455.81	15,018,283	6,811
Alternative 3	54,726	48,405	1,162	570.0	8	4,500	3,357	71.3	31,979	378	87%	3,509	2,617	24,326,361	24,326	444.5	PG&E	455.81	11,068,198	5,029
Alternative 4	32,334	81,500	1,956	200.0	4	2,500	1,865	50.0	22,444	312	85%	2,080	1,552	12,142,441	12,142	375.5	PG&E	455.81	5,534,646	2,510
Totals - CCWD Pumping Plants																				
Future Without Project	190,591														69,584					11,146
Alternative 1	459,584														180,321					31,267
Alternative 2	481,805														185,697					32,100
Alternative 3	220,531														89,902					15,028
Alternative 4	195,363														72,010					11,602
Harvey O. Banks Pumping Plant																				
Future Without Project	232,000	113,248	2,718	1,032.8	?	?	?	1,032.8	463,569	247	86%	33,622	25,082	68,170,641	68,171	293.8	SWP	478.90	32,646,920	14,806
Alternative 1	40,000	19,025	457	1,060.0	?	?	?	1,060.0	475,760	247	86%	34,506	25,741	11,753,559	11,754	293.8	SWP	478.90	5,628,779	2,553
Alternative 2	45,000	21,403	514	1,060.0	?	?	?	1,060.0	475,760	247	86%	34,506	25,741	13,222,754	13,223	293.8	SWP	478.90	6,332,377	2,872
Alternative 3	232,000	110,346	2,648	1,060.0	?	?	?	1,060.0	475,760	247	86%	34,506	25,741	68,170,641	68,171	293.8	SWP	478.90	32,646,920	14,806
Alternative 4	232,000	110,346	2,648	1,060.0	?	?	?	1,060.0	475,760	247	86%	34,506	25,741	68,170,641	68,171	293.8	SWP	478.90	32,646,920	14,806
Level 4 Refuge (Alt 3 on	8,458	4,023	97	1,060.0	?	?	?	1,060.0	475,760	247	86%	34,506	25,741	2,465,290	2,465	293.8	SWP	478.90	1,190,205	540
Total																				
Future Without Project																				25,952
Alternative 1																				33,820
Alternative 2																				34,972
Alternative 3																				30,374
Alternative 4																				26,407
Transfer Facility Pumping Plant - Total Dynamic Head																				
	Avg. Flow (CFS)	Transfer Res. (FT)	LV Reservoir Storage (TAF)	WSEL (FT)	Static Lift (FT)	Head Losses (FT)	TDH (FT)													
Future Without Project	180	213.00	78,000	453	240	37	277													
Alternative 1	670	213.00	207,000	560	347	51	398													
Alternative 2	670	213.00	199,000	527	314	51	365													
Alternative 3	570	213.00	222,000	536	323	55	378													
Alternative 4	200	213.00	115,000	480	267	45	312													

Alternative 1, 2, 3, or 4 Indirect GHG Emissions from Project Electricity Use (Metric Tons/Year):

Operational Emissions	Total Metric Tons/Year CO2E	Increase in Metric Tons/Year CO2E
Future Without Project	25,952	n/a
Alternative 1	33,820	7,868
Alternative 2	34,972	9,020
Alternative 3	30,374	4,422
Alternative 4	26,407	455
<p>SOURCE: URS, 2008. Dan Drew, P.E., Pumping and Emission Data. August 19, 2008.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. Metric tons/year of CO2E were calculated using the California Climate Action Registry General Reporting Protocol emission factors and methodology. See Appendix G for more details. 2. "Future Without Project" includes power required for pumping at Banks and Jones Pumping Plants needed to deliver water to the SBA, SCVWD's CVP supplies, and power required at CCWD pumping facilities. 3. "Increase in Metric Tons/Year" shows the increase in the total emissions for each alternative compared to the emissions for "Future Without Project". <p>Rounded Values for report:</p>		
Operational Emissions	Total Metric Tons/Year CO2E	Increase in Metric Tons/Year CO2E
Future Without Project	26,000	n/a
Alternative 1	33,800	7,900
Alternative 2	34,900	9,000
Alternative 3	30,400	4,400
Alternative 4	26,400	500