CH2M HILL
2485 Natomas Park Drive
Suite 600
Sacramento, CA 95833
Tel 916.920.0300
Fax 916.920.8463

CH2MHILL

December 8, 2006
322752

Mr. Robert Worl
1516 Ninth Street
Sacramento, CA 95814-5512

Subject: AES Highgrove Project (06-AFC-2)
Data Response, Set 1B

Dear Bob:

On behalf of the AES Highgrove LLC, please find attached one original and 12 copies of Data Response, Set 1B, in response to Staff's Data Requests dated October 5, 2006. This data response is being filed both electronically and in hard copy.

In addition, I have enclosed five sets of the following items:

- Size D drawings of the Preliminary Grading and Drainage Plan (Figures S&W66-1A and 1B)
- 5 sets of CD-ROMs containing the following files:
  - Revised Air Quality modeling files
  - Revised HARP modeling files
  - Revised meteorological data files

Please call me if you have any questions.

Sincerely,

CH2M HILL

John L. Carrier, J.D.
Program Manager

c: Project File
Proof of Service List

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA

APPLICATION FOR CERTIFICATION FOR THE AES HIGHGROVE POWER PLANT PROJECT	**Docket No. 04-AFC-1** **PROOF OF SERVICE** *(Established 8/2/06)*

INSTRUCTIONS: All parties shall 1) send an original signed document plus 12 copies OR 2) mail one original signed copy AND e-mail the document to the web address below, AND 3) all parties shall also send a printed OR electronic copy of the documents that shall include a proof of service declaration to each of the individuals on the proof of service:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 04-AFC-01
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
docket@energy.state.ca.us

APPLICANT

Julie Way
Project Director
AES Highgrove
690 N. Studebaker Rd.
Long Beach, CA 90803
Julie.Way@aes.com

APPLICANT'S CONSULTANTS

John Carrier
CH2M HILL Project Manager
2485 Natomas Park Drive, Suite 600
Sacramento, CA 95833
jcarrier@ch2m.com

COUNSEL FOR APPLICANT

Scott Galati, Project Attorney
GALATI & BLEK, LLP
555 Capitol Mall, Suite 600
Sacramento, CA 95814
sgalati@gb-llp.com

INTERESTED AGENCIES

Electricity Oversight Board
770 L Street, Suite 1250
Sacramento, CA 95814
esaltmarsh@eob.ca.gov

INTERVENORS

*** CURE**
Suma Peesapati
Marc D. Joseph
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080
mdjoseph@adamsbroadwell.com
speesapati@adamsbroadwell.com

ENERGY COMMISSION

JACKALYNE PFANNENSTIEL
Presiding Committee Member
jpfannen@energy.state.ca.us

JEFFREY D. BYRON
Associate Committee Member
jbyron@energy.state.ca.us

Paul Kramer
Hearing Officer
pkramer@energy.state.ca.us

Robert Worl
Project Manager

Lisa DeCarlo
Staff Counsel
ldecarlo@energy.state.ca.us

Margret J. Kim
Public Adviser
pao@energy.state.ca.us

DECLARATION OF SERVICE

I, Sarah Madams, declare that on December 12, 2006, I deposited copies of the attached Data Response, 1B in the United States mail at Sacramento, California with first class postage thereon fully prepaid and addressed to those identified on the Proof of Service list above. Transmission via electronic mail occurred on December 12, 2006 and was consistent with the requirements of California Code of Regulations, title 20, sections 1209, 1209.5, and 1210. I declare under penalty of perjury that the foregoing is true and correct.

____

Sarah Madams

CH2M HILL
2485 Natomas Park Drive
Suite 600
Sacramento, CA 95833
Tel 916.920.0300
Fax 916.920.8463

December 8, 2006
322752

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  - Revised HARP modeling files
  - Revised meteorological data files

Please call me if you have any questions.

Sincerely,

CH2M HILL

John L. Carrier, J.D.
Program Manager

c: Project File
Proof of Service List

AES HIGHGROVE PROJECT
(06-AFC-2)

DATA RESPONSE, SET 1B

(Responses to Data Requests: 6, 9, 18, 23, 28, 31, 32, 64-67, and 73)

Submitted by

AES Highgrove, LLC.

December 8, 2006

CH2MHILL

2485 Natomas Park Drive, Suite 600
Sacramento, California 95833-2937

AES HIGHGROVE PROJECT
(06-AFC-2)
DATA RESPONSES, SET 1B

Technical Area: Air Quality
CEC Authors: Joe Loyer

BACKGROUND: NITROGEN OXIDES

The applicant proposes to rely on the District's nitrogen oxides (NOx) RECLAIM program to acquire emission reduction credits to mitigate the project NOx emission impacts.

DATA REQUEST

6. Please provide a list of NOx RECLAIM trading credits (RTCs) that the applicant owns or has under option contract, and provide adequate documentation that these cover the NOx liability of the project.

   Response: To confirm the NOx RECLAIM allocations under control by Riverside Canal Power Company, which will be transferred to this project, the District asked AES to submit a public records request. As soon as the data is available, AES will confirm the RTCs in the monthly confidential offset strategy report to the CEC

BACKGROUND: START-UP AND SHUT DOWN EMISSION ESTIMATES

The AFC indicates that the project consists of three General Electric (GE) LMS100 gas turbine generators equipped with water injection and selective catalytic reduction (SCR) systems to minimize NOx emissions. In addition, a carbon monoxide (CO) oxidation catalyst system would also be utilized to minimize the turbines' volatile organic compounds (VOC) and CO emissions.

Appendix 8.1B provides tables summarizing the estimated emissions of the turbines and cooling towers. It is not clear how these estimated emissions were derived. For example, the GE-provided emissions estimates indicate that a LMS100 turbine emits 25 ppm NOx at 15 % oxygen, which is equivalent to 81 lbs/hr if the SCR is not in operation. The start-up duration for each turbine is approximately 35 minutes during which time the SCR is not expected to be fully operational; therefore, staff expects that the turbine start-up emissions will be higher than the 7 lbs/start-up identified (AFC Appendix 8.1B).

DATA REQUEST

9. If the start-up and shut-down emissions rates and characteristics are revised, please provide a revised modeling analysis showing the facility impacts during start-ups and shut-downs.

Response: AES has modified the site layout based upon new detention basin sizing, increased turbine exhaust stack height, modified cooling tower drift rate and improved access for fire protection. The modifications resulted in a relocation of the detention basin from the south side of the Project Site to the north side, optimizing drainage patterns for the site. Additionally, to make room for a continuous fire access road around the perimeter of the site, the layout of the major equipment and exhaust stacks have moved slightly. As a result of these changes, AES is providing this revised air quality emissions estimates and model analysis. The revised site layout was presented as Figure 2.2-1R in AES's Data Response, Set 1A (Docket Number 38329).

The turbine exhaust stack height was also increased to 90 feet from 80 feet to allow for sufficient upstream unobstructed distance to the source testing ports. A 90-foot stack allows for more than 2.5 equivalent diameters of unobstructed flow between the stack breaching and the source testing ports compared to an 80-foot stack that only provided 2.3 equivalent diameters. AES consulted at length with SCAQMD staff, source testing engineers and the SCR vendor regarding potential options to achieve the necessary unobstructed distance before deciding to raise the stack height. Due to the uncertainty in the flow profile inside the exhaust stack and the lack of existing units with similar stacks, it was determined that the most reliable method to assure accurate source test results was to increase the stack height 10 feet.

The cooling drift rate was increased from 0.0005 percent to 0.001 percent based on discussions with vendors of small packaged cooling towers as proposed for Highgrove. The shop-fabricated cooling towers proposed for the Highgrove project are typically used for commercial HVAC and combustion turbine inlet chilling applications. This type of tower was chosen for Highgrove based on its smaller footprint, reduced height and lower cost. Currently, 0.001 percent is the lowest drift rate that can be guaranteed; although the vendors anticipate a lower average drift rate may be achieved. The 0.0005 percent is a typical drift rate achieved by large field-erected cooling towers with multiple layers of drift eliminators. Since large towers have a corresponding large circulating water flow rate, a small reduction in the drift rate percentage produces a large savings in actual drift from the tower. For example, the total circulating water flow for three LMS100 units as proposed for Highgrove is 21,000 gallons per minute (gpm) compared to 72,000 gpm for a similarly sized combined-cycle plant. Therefore, even with a higher drift rate percentage, Highgrove has a lower total drift rate in pounds per hour and pounds per MW than a similarly sized combined-cycle plant.

Because the project changes are not expected to significantly alter the basis for the construction emissions estimates, revised construction emissions and modeling are still valid and have not been revised.

The project modifications altered the basis for the emissions estimates and modeling associated with the commissioning and operational phases, including startup/shutdown. The remainder of this data response presents the revised commission, operational, and startup/shutdown emissions and the air dispersion modeling results. The tables in this section replace tables in the AFC. The letter "R" has been added to the table number to indicate that it has been revised.

Commissioning Phase

The commissioning schedule was revised based on new data provided by the turbine vendor and best engineering estimates. The changes to the commissioning schedule did not change the actual *hourly* emission rates for commissioning presented in AFC Table 8.1-14. Daily emission estimates were revised, however, based on the new commissioning schedule to determine if daily emissions during commissioning exceeded operational emissions. The results of this analysis show that average daily emissions during commissioning are less than operational daily emissions. This analysis is presented in Attachment AQ-9A (see Table 8.1B-3AR).

Operational Startup/Shutdown Phase

The LMS100 unit is a new technology offering by General Electric (GE) and because there are no units installed in California, there is currently no operating experience with SCRs. AES recently obtained from the vendor an exhaust temperature profile during startup that has allowed us to work with emission control system vendors to obtain better estimates of catalyst performance during a startup event. Based on this new data, AES has revised estimates for startup emissions that will be produced after the turbine reaches full load but before the catalysts reach full effectiveness. The current estimates are shown in Table 8.1-16R. The assumptions and calculated values for NOx and CO, respectively, used to derive the individual turbine startup emissions were presented in Data Response, Set 1A, Data Responses Nos. 7 and 8.

TABLE 8.1-16R)
Facility Startup/Shutdown Emission Rates[a,, b]

	NO_x	CO	VOC	SO_x	PM_{10}
Startup (lb/event)	16.7	15.4	2.1	0.36	3.5
grams per event	7,579	7,000	953	163	1,588
Startup (lb/hr)[c]	27.0	25.2	4.0	0.86	8.5
Grams per second	3.41	3.18	0.5	0.1	1.07
Shutdown (lb/event)	4.3	18.2	1.6	0.11	1.1
grams per event	1,950	8,255	726	50	499
Shutdown (lb/hr)	13.1	27.5	3.4	0.6	6.0
Grams per second	1.7	3.5	0.4	0.08	0.8

[a]Estimated based on vendor data and emissions per startup or shutdown event. See Attachment AQ-9A Table 8.1B-5R.

[b] Start is assumed to take 37 minutes for NOx and 10 minutes for CO, VOC, SO2, and PM10 to achieve compliance with BACT. Shutdown takes 11 minutes.

[c] Maximum hourly start up emissions are estimated as follows.

NO_X = 16.7 lb/start /37 minutes * 60 minutes = 27 lb/hr.
CO = 15.4 lb/start + 11.7 lb/hr/60 minutes * 50 minutes = 25.2 lb/hr.
VOC = 2.1 lb/start + 2.2 lb/hr/60 minutes * 50 minutes = 4.0 lb/hr.
SO2 = 0.36 lb/start + 0.6 lb/hr/60 minutes * 50 minutes = 0.86 lb/hr.
PM10 = 3.5 lb/start + 6 lb/hr/60 minutes * 50 minutes = 8.5 lb/hr.

Emissions from the cooling tower were calculated from the maximum design cooling water total dissolved solids (TDS) level of 280 milligrams per liter, 10 cycles of concentration (a conservative, worst-case basis used in the air quality impact analysis), and a design cooling water recirculation rate of 7,000 gallons per minute. The annual emissions reflect 15 hours per day, 365 days per year of operations per cooling tower. Because the project is expected to operate at a maximum capacity factor of 30 percent, the annual emissions calculations are very conservative.

The maximum annual, daily, and hourly emissions for the project during normal operation are shown in Table 8.1-19R and include startup and shutdown emissions. Detailed emission estimates are provided in Attachment AQ-9A (See Tables 8.1B-2 through 8.1B-8).

TABLE 8.1-19R)
AES Highgrove Project Facility Emissions

	NO_x	SO_2	VOC	CO	PM_{10}
Maximum Hourly Emissions per unit, lb/hr					
Turbines[a]	27.0	0.86	4.0	25.2	8.5
Cooling Tower	-	-	-	-	0.20
Total Project (lb/hr)	**27.0**	**0.86**	**4.0**	**25.2**	**8.7**
Maximum Facility Daily Emissions, lb/day					
Turbines[a]	575.3	29.3	116	703	285
Cooling Tower	-	-	-	-	8.8
Total Project (lb/day)	**575.3**	**29.3**	**116**	**703**	**293.8**
Maximum Annual Emissions, lbs/year[b]					
Turbines	209,978	10,686	42,356	256,585	104,025
Cooling Tower	-	-	-	-	3,222
Total Project (lb/yr)	**209,978**	**10,686**	**42,356**	**256,585**	**107,247**
Total Project (tpy)	**105**	**5.34**	**21.182**	**128.293**	**53.6**

[a] Maximum hourly emissions based on start up emissions, see Table 8.1-16R. Daily emissions include two startups and two shutdowns per day of operation and 15-hour per day of operation for each CTG.

[b] Annual emissions are based on a maximum of 5,475 hours per year of operation for each CTG and cooling tower, which represents a very conservative estimate since hours of operation are expected to be much lower than this value.

Toxic Air Contaminants

Due to the revised emission estimates, revised Toxic Air Contaminant (TAC) emissions were also revised. Table 8.1-20R presents the TAC emissions estimates for the combustion turbines, and includes hexane emission estimates. The TAC emissions were estimated using the same procedures as presented in the AFC.

In addition, TAC emissions were estimated for the cooling tower, based on a sample of well water. Those constituents in the well water analysis reported as below the detection level were assumed to be at the detection level to provide a conservative estimate. Table 8.1-33 presents the TAC emission estimates for the cooling towers. The results of the health risk assessment presented below show the project's TAC emissions will not create a significant public health impact.

TABLE 8.1-20R)
Noncriteria Pollutant Emissions For The Project

Pollutant	Emission Factor (pounds per million standard cubic feet [lb/MMscf])[a]	Emissions	
		lb/hr (each turbine)	tpy (total 3 turbines)
Ammonia[b]	5 ppm	6.0	49.2
Noncriteria			
Acetaldehyde	0.0406	0.035	0.5
Acrolein	0.00369	0.0032	0.04
Benzene	0.00333	0.0029	0.04
1,3-Butadiene	0.000436	0.00038	0.005
Ethylbenzene	0.03248	0.0282	0.4
Formaldehyde	0.3654	0.317	4.2
Hexane	0.259	0.225	3.0
Naphthalene	0.00132	0.0011	0.015
PAHs[c]	0.000014	0.00001	0.0002
Propylene oxide	0.029435	0.0255	0.34
Toluene	0.13195	0.115	1.5
Xylene	0.06496	0.056	0.7
Total HAP emissions			10.6
Highest Individual HAP (formaldehyde)			4.2

Source: Appendix AQ-9A, Tables 8.1B-6AR.

[a] Obtained from AP-42 Table 3.1-3 revised April 2000 for natural-gas-fired combustion turbines. Formaldehyde, benzene, and acrolein emission factors are from the Background Document for AP-42 Section 3.1, Table 3.4-1 for a natural-gas-fired combustion turbine with an oxidation catalyst. Hexane emission factor from California Air Toxic Emission Factor database.

[b] Based on an exhaust ammonia limit of 5 ppmv @ 15 percent O_2, an F-factor of 8710, and 15 operating hours per day, 365 days per year for each turbine. However, to be conservative, the health risk analysis was based on 24 operating hours per day, 365 days per year for each turbine (i.e., 78.9 tpy).

[c] Carcinogenic PAHs only; naphthalene considered separately. Emission Factor based on two separate source tests (2002 and 2004) from the Delta Energy Center located in Pittsburg, California.

TABLE 8.1-33
AES Highgrove Cooling Tower Toxic Emissions Analysis

Toxic Compounds	CAS Number	Design Case Cooling Tower Influent (mg/L)	Max. TDS for Cooling Tower Discharge (mg/L)	Cooling Tower Emissions Per CT (mg/L)	Annual Cooling Tower Toxic Emissions per CT (lb/year)
Arsenic	7440-38-2	0.000637	0.00637	4.46E-07	3.91E-03
Copper	7440-50-8	0.00159	0.0159	1.11E-06	9.76E-03
Nickel	7440-02-0	0.00182	0.0182	1.28E-06	1.12E-02
Silver	7440-22-4	0.0074	0.074	5.18E-06	4.54E-02
Antimony	7440-36-0	0.001	0.01	7.01E-07	6.14E-03
Beryllium	7440-41-7	0.001	0.01	7.01E-07	6.14E-03
Cadmium	7440-43-9	0.0002	0.002	1.40E-07	1.23E-03
Chromium (total)	18540-29-9	0.001	0.01	7.01E-07	6.14E-03
Lead	7439-92-1	0.001	0.01	7.01E-07	6.14E-03
Manganese	7439-96-5	0.005	0.05	3.50E-06	3.07E-02
Mercury	7439-97-6	0.0005	0.005	3.50E-07	3.07E-03
Selenium	7782-49-2	0.001	0.01	7.01E-07	6.14E-03
Zinc	7440-66-6	0.005	0.05	3.50E-06	3.07E-02
Acrylonitrile	107-13-1	2	20	1.40E-03	1.23E+01
Allyl chloride	107-05-1	0.5	5	3.50E-04	3.07E+00
Benzene	71-43-2	0.5	5	3.50E-04	3.07E+00
Bromomethane	74-83-9	0.5	5	3.50E-04	3.07E+00
2-Butanone	78-93-3	2	20	1.40E-03	1.23E+01
Carbon disulfide	75-15-0	0.5	5	3.50E-04	3.07E+00
Carbon tetrachloride	56-23-5	0.5	5	3.50E-04	3.07E+00
Chlorobenzene	108-90-7	0.5	5	3.50E-04	3.07E+00
Chloroethane	75-00-3	0.5	5	3.50E-04	3.07E+00
Chloroform	67-66-3	0.5	5	3.50E-04	3.07E+00
1,2-Dibromo-3-chloropropane	96-12-8	0.5	5	3.50E-04	3.07E+00
1,2-Dibromoethane	106-93-4	0.5	5	3.50E-04	3.07E+00
1,4-Dichlorobenzene	106-46-7	0.5	5	3.50E-04	3.07E+00
1,1-Dichloroethane	75-34-3	0.5	5	3.50E-04	3.07E+00

TABLE 8.1-33
AES Highgrove Cooling Tower Toxic Emissions Analysis

Toxic Compounds	CAS Number	Design Case Cooling Tower Influent (mg/L)	Max. TDS for Cooling Tower Discharge (mg/L)	Cooling Tower Emissions Per CT (mg/L)	Annual Cooling Tower Toxic Emissions per CT (lb/year)
1,2-Dichloroethane	107-06-2	0.5	5	3.50E-04	3.07E+00
1,1-Dichloroethene	75-35-4	0.5	5	3.50E-04	3.07E+00
Ethylbenzene	100-41-4	0.5	5	3.50E-04	3.07E+00
Methylene chloride	75-09-2	2	20	1.40E-03	1.23E+01
Methyl-t-butyl ether	1634-04-4	0.5	5	3.50E-04	3.07E+00
Naphthalene	91-20-3	0.5	5	3.50E-04	3.07E+00
Styrene	100-42-5	0.5	5	3.50E-04	3.07E+00
1,1,2,2-Tetrachloroethane	79-34-5	0.5	5	3.50E-04	3.07E+00
Tetrachloroethene	127-18-4	0.5	5	3.50E-04	3.07E+00
Toluene	108-88-3	0.5	5	3.50E-04	3.07E+00
1,1,1-Trichloroethane	71-55-6	0.5	5	3.50E-04	3.07E+00
1,1,2-Trichloroethane	79-00-5	0.5	5	3.50E-04	3.07E+00
Trichloroethene	79-01-6	0.5	5	3.50E-04	3.07E+00
Vinyl chloride	75-01-4	0.5	5	3.50E-04	3.07E+00
o-Xylene	95-47-6	0.5	5	3.50E-04	3.07E+00
m-Xylene	108-38-3	0.5	5	3.50E-04	3.07E+00
p-Xylene	106-42-3	0.5	5	3.50E-04	3.07E+00

Notes:

1. Influent concentration data were tested on November 18, 2004 (Calscience Environmental Laboratories, Inc).
2. For chemicals that were not detected (ND) during the source test, the reporting limits were used to calculate the emissions.
3. It was assumed that the total chromium is hexavalent chromium.

Air Quality Impact Analysis

Based on the revised site plan and startup emissions rates, a revised air quality impact analysis (AQIA) was prepared to determine the projects consistency with applicable ambient air quality laws, ordinances, regulations, and standards (LORS). The AQIA was performed using the methodology presented in the AFC Section 8.1 (Air Quality). The results of this analysis are presented below. Five compact diskettes containing the air dispersion modeling files for CEC Staff are attached.

A screening analysis was conducted to identify the highest pollutant impacts (by pollutant and averaging period) for each of the following operating conditions: 80˚F at 50 percent load, 30˚F at 50 percent load, and 30˚F at base load. Table 8.1-23R presents the operating conditions that resulted in the highest ambient impacts by pollutant and averaging period.

TABLE 8.1-23R
"Worst Case" Model Input for Normal Turbine Operation

Averaging Period	Scenario*
Annual (PM_{10})	80˚F 50% Load
Annual (NO_x, SO_2)	30˚F Base Load
24-hour (PM_{10})	80˚F 50% Load
24-hour (SO_2)	30˚F Base Load
8-hour (CO)	30˚F 50% Load
3-hour (SO_2)	30˚F Base Load
1-hour (CO and SO_2)	30˚F 50% Load
1-hour (NO_2)	80˚F 50% Load
Annual (PM_{10})	Cooling Tower (2 cells; Modeled with the maximum annual PM_{10} scenario)
24-hour (PM_{10})	Cooling Tower (2 cells; Modeled with the maximum 24-hour PM_{10} scenario)

* Emissions and exhaust parameters for each unit are located in Attachment AQ-9B, Tables 8.1C-3R and 8.1C-4R.

A summary of the operating conditions examined in this screening analysis, along with their exhaust and emission characteristics are shown in Attachment AQ-9B (see Tables 8.1C-3R).

Commissioning Impacts Analysis

The commissioning NO_2 impacts exceeded the 1-hour State NO_2 standard using the standard ISC modeling methodology. Therefore, the ISC-OLM model, which allows a more accurate assessment of the NO2 impacts. The ISC-OLM modelcalculates the nitrous oxide (NOx) to nitrogen dioxide (NO_2) conversion based on the simultaneous NOx and ozone (O_3) concentrations for each hour. The ISC-OLM model also calculates the in-stack and near-stack thermal conversion from NOx to NO_2.

As required for ISC-OLM, concurrent meteorological and O_3 concentration data were used. The 2003 hourly ozone data collected at the Riverside-Rubidoux monitoring station had the highest average 1-hour O_3 concentration for the 3-year period (2002 - 2004). Therefore, the 2003 hourly O_3 data were used along with the corresponding 2003 meteorological data collected at the Riverside Municipal Airport.

Table 8.1-25R present the maximum predicted commissioning impacts. The exit velocity and exhaust temperatures for all scenarios and the results of the turbine commissioning analysis are presented in Appendix AQ-9B (see Tables 8.1C-3R and 8.1C-5R). It should be noted that based on the new commissioning schedule only one turbine will be commissioned at a time, with the exception of the full load testing and checkout.

The commissioning phase that gave rise to the largest predicted offsite property impact for NO_2 was the controlled break-in operation phase. The results of the commissioning NO_2 impact analysis show a maximum project impact of 211 μg/m³. The background NO_2 concentration of 188 μg/m³ was added to the maximum modeled NO_2 concentration for a total impact of 399 μg/m³. This value is less than the 1-hour state standard of 470 μg/m³, which shows that the project will not cause or contribute to the violation of the state or federal standard.

For CO, the largest predicted offsite impact for the 1-hour and 8-hour averaging periods was due to the complete automatic voltage regulator system (AVR) commissioning phase. The results of the commissioning CO impact analysis are less than the 1-hour and 8-hour standards, which shows that the project will not cause or contribute to the violation of the state or federal standard.

TABLE 8.1-25R)
Turbine Commissioning Impacts Analysis—Maximum Modeled Impacts Compared to the Ambient Air Quality Standards
Individual Turbine Emissions

Pollutant	Averaging Time	Maximum Facility Impact (μg/m³)	Background (μg/m³)[a]	Total Impact (μg/m³)	State Standard (μg/m³)	Federal Standard (μg/m³)
NO_2	1-hour	211[b,c]	188	399	470	-
CO	1-hour	419.0[b]	9,162	9,581	23,000	40,000
	8-hour	167.3[b]	4,237	4,404	10,000	10,000

[a] Background concentrations were the highest concentrations monitored during 2002-2004
[b] 1st highest modeled concentrations were used
[c] A 100 percent conversion of NO_x to NO_2 was assumed

Operation Impacts Analysis (Including Startup/Shutdown Turbine Cycles)

The highest modeled concentrations were used to demonstrate compliance with the AAQS. Table 8.1-26R presents a comparison of the maximum Highgrove Project operational impacts to the ambient air quality standards based on the facility operating at full load for 5,475 hours per year, which represents a conservative estimate based on the plant's expected maximum annual operating profile of 30 percent. For those pollutants and averaging periods where the background concentrations do not exceed the AAQS, the project will not cause or contribute to the violation of a standard. For those pollutants where the background data is already in excess of the standards, the project's impact plus background is above the standard and would further contribute to an existing violation of the standard, absent mitigation. The Highgrove Project will be providing such mitigation in the form of emission reduction credits. The complete list of off-property impacts for the various scenarios and contaminants is presented in Attachment AQ-9B (see Table 8.1C-6R). The results presented in Table 8.1-26R represent the maximum impact from all the scenarios modeled.

The PM_{10} and $PM_{2.5}$ impacts were also evaluated at each of the sensitive receptors. The concentration for each sensitive receptor is located in Attachment AQ-9B (see Table 8.1C-7BR).

TABLE 8.1-26R
Normal Operation Impacts Analysis—Maximum Modeled Impacts Compared to the Ambient Air Quality Standards
Facility-Wide Emissions

Pollutant	Averaging Time	Maximum Facility Impact ($\mu g/m^3$)	Background ($\mu g/m^3$)[c]	Total Impact ($\mu g/m^3$)	State Standard ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
NO_2	1-hour [a]	128.2	188	316.2	470	-
	annual[a]	0.75	44.6	45.4	-	100
SO_2	1-hour	3.1	52.4	55.5	655	-
	3-hour	1.9	41.9	43.8	-	1,300
	24-hour	0.36	39.3	39.7	105	365
	annual	0.036	10.5	10.5	-	80
CO	1-hour	218.2	9,162	9,380	23,000	40,000
	8-hour	28.2	4,237	4,265	10,000	10,000
PM_{10}	24-hour	4.5	164	168.5	50	150
	annual[b]	0.42	58.5	58.9	20	50
$PM_{2.5}$	24-hour	4.5	104.3	108.8	-	65
	annual[b]	0.42	27.5	27.9	12	15

[a] 1-Hour and annual NO_2 predictions are conservatively based on 100 percent conversion to NO_2. In reality, NO to NO_2 conversion is limited by the amount of ambient ozone that is available to complete the conversion.

[b] Background concentrations were the highest concentrations monitored during 2002-2004.
Note: Based on the plant operating 5,475 hours per year with two startups and shutdowns per day per unit.

Rule 1303 Compliance. Table 8.1-28R presents the maximum ambient air quality impacts for the Highgrove Project compared to the SCAQMD's significance thresholds for PM_{10}. As shown, the maximum Highgrove Project modeled impacts for PM_{10} from any individual CTGs will not exceed the SCAQMD significance thresholds. Therefore, the project's PM_{10} impacts are not considered significant as defined by the SCAQMD.

TABLE 8.1-28R
Normal Operation Impacts Analysis for AES—SCAQMD Rule 1303 (Maximum Modeled Impacts)
Individual CTG Analysis

Pollutant	Averaging Time	Maximum CTG Impact ($\mu g/m^3$)	SCAQMD Rule 1303 Significance Threshold ($\mu g/m^3$)	Significant?
PM_{10}	24-hour	1.65	2.5	No
	Annual*	0.14	1.0	No

* Annual Arithmetic Mean

Rule 2005 Compliance. To determine compliance with the SCAQMD's Rule 2005 (NSR for RECLAIM) ambient air quality impacts, the project impacts are compared to the NO_2 AAQS of 470 $\mu g/m^3$ on a 1-hour basis and 100 $\mu g/m^3$ on an annual basis. As shown in Table 8.1-

29R, the total NO_2 impacts from any individual CTG do not exceed the SCAQMD's Rule 2005 significance threshold. Therefore, the project's NO_2 impacts are not considered significant as defined by the SCAQMD.

TABLE 8.1-29R
Normal Operation Impacts Analysis for AES —SCAQMD Rule 2005 (Maximum Modeled Impacts)
Individual CTG Analysis

Pollutant	Averaging Time	Maximum CTG Impact ($\mu g/m^3$)	SCAQMD Rule 2005 Significance Threshold ($\mu g/m^3$)	Significant?
NO_2	1-hour	44.6	470	No
	Annual	0.25	100	No

Health Risk Assessment

Based on the revised general arrangement plan and emissions rates, a revised health risk assessment (HRA) for the turbines is required to determine the project's impact on public health. The HRA was performed using the methodology presented in AFC Section 8.6 (Public Health). The TAC emissions for the cooling towers were also estimated since the AFC submittal. Therefore, the results of the cooling tower HRA are also presented.

The revised modeling showed that the MEIR excess lifetime cancer risk was 0.52 in one million, and the MEIW excess lifetime cancer risk was 0.10 in one million. Excess lifetime cancer risks less than 10 in one million are unlikely to represent public health impacts that require additional controls of facility emissions. Five compact diskettes containing the health risk assessment modeling files are attached.

For residential receptors, formaldehyde, 1,2-Dibromo-3-chloropropane (DBCP), and PAH emissions have the highest potential to contribute to the cancer impact; however, the contribution is less than 0.2 in one million for formaldehyde and DBCP, and less than 0.1 in one million for PAHs. It should also be noted DBCP was not detected in the water sample; so the reporting limits were used to conservatively estimate the emission rates, which subsequently results in a conservative HRA value. Inhalation is the dominant exposure pathway for formaldehyde and DBCP. The dominant exposure pathway for PAHs is ingestion. Other substances each contribute less than 0.01 in one million at the MEIR.

The hazard index for acute non-carcinogenic substances was 0.08. The hazard indices for chronic non-carcinogenic substances were 0.02, for both the MEIR and MEIW.

Because the maximum cancer risk estimated in this evaluation was far less than one for both the MEIR and MEIW, and because the hazard indices for chronic and acute exposure to non-carcinogenic substances was also far below one-half, there is no zone of impact and OEHHA risk assessment guidelines (OEHHA, 2003) do not require an analysis of the potential risk levels at sensitive receptor locations. For the sake of completeness, however, this evaluation includes the modeled potential maximum health impacts at the proposed school under consideration across Taylor Street approximately 1,100 feet to the east of the project site.

Modeling showed that the MEIR excess lifetime (70-year) cancer risk within the proposed school property boundary was 0.36 in one million. The HI for chronic non-carcinogenic substances was 0.004 calculated over a 70-year exposure period. The hazard index for acute non-carcinogenic substances was 0.006. The following table presents the HRA results for the revised site configuration. It should be noted that the HRA assumed that the turbines and cooling towers are operating at the maximum rated capacity for 8,760 hours per year in order to take an extremely conservative approach to estimates of public health impacts (since it is anticipated that the facility will only operate between 1,314 and 2,628 hours per year). Therefore, the HRA results presented below are significantly higher than the expected facility operation. As shown by Table 8.1-34, even with this conservative approach, the public health impacts are significantly below levels expected to result in public health concerns.

The results of the health risk assessment show that the project's TAC emissions do not result in public health impacts. The risks for the individual cooling towers are below 1 in a million, allowing these sources to be exempt from permitting (SCAQMD Rule 219(e)(3) and 219(s)(2)) and mitigation requirements (SCAQMD Rule 1304(d)(3)).

TABLE 8.1-34
Revised Site Configuration HRA Results

	Excess Cancer Risks (result in a million)				Non-Cancer Risks		
	PMI	**MEIR**	**MEIW**	**Significant [c]?**	**HIC**	**HIA**	**Significant [c]?**
All Sources	0.52	0.52	0.10	No	0.018	0.081	No
Turbine 1	0.10	0.10	0.020	No	0.0061	0.028	No
Turbine 2	0.10	0.10	0.020	No	0.0060	0.027	No
Turbine 3	0.10	0.10	0.019	No	0.0059	0.026	No
Cooling Tower 1	0.11	0.11	0.021	No	0.00018	9.9E-06	No
Cooling Tower 2	0.11	0.11	0.022	No	0.00018	9.9E-06	No
Cooling Tower 3	0.11	0.11	0.022	No	0.00018	9.2E-06	No

[a] The health risk analysis was conducted assuming that the combustion turbines would be operated 8,760 hours per year, at the maximum heat input rating, which is based on a 30 °F ambient air temperature, which represents extremely conservative conditions as described above.

[b] It was assumed that each modeled receptor location could potentially be either a residential location, or a worker location.

[c] Compared to the Significance Threshold of 1.0

Mitigation Requirements

The revisions to the startup and shutdown emissions require a reassessment of the mitigation required for the project. Table 8.1-32R presents the revised mitigation required by the SCAQMD. This mitigation is based on a total of 15 hours per day of emissions at an ambient air temperature of 30 °F and 2 starts and shutdowns per unit per day.

TABLE 8.1-32R
SCAQMD Offset Requirements and Project Emissions[a] (ref: Rule 1304(d)(1)(B), Rule 1303(b)(2), Rule 1304, Table A, Regulation 2005)

Pollutant	Offset Threshold	Offsets Required
VOC	4 tons/yr	143.9 lbs/day ERCs
CO	29 tons/yr	871.7 lbs/day[c]
NO_x	4 tons/yr[b]	255,989 lbs NO_x RTCs (first year [d]) 209,978 lbs NO_x RTCs (normal operation)
PM_{10}	4 tons/yr	353.4 lbs/day
SO_2	4 tons/yr	36.3 lbs/day

[a] Because the cooling towers will be exempted from SCAQMD permitting requirements by Rule 219(e)(3) and Rule 219(s)(2), emission offsets are not required as indicated in Rule 1304(d)(3). In accordance with Rule 1303 and Rule 1309.1, ERCs are required at an offset ratio of 1.2:1.

[b] Proposed Highgrove Project will enter the SCAQMD NO_x RECLAIM program (Regulation XX). NO_x emissions will be offset through purchase of RTCs at a ratio of 1:1 to actual emissions per year.

[c] CO Offsets may not be required if SCAQMD is redesignated attainment for the 8-hr CO ambient air quality standard. A redesignation request is pending.

[d] First year = 12 months of emissions plus commissioning emissions

Attachment AQ-9A

NOTE: This attachment contains revised tables from **AFC Appendix 8.1B**. The table revisions resulted from additional air modeling described in Data Response #9. With the exception of Table 8.1B-3AR and Table 8.1B-3CR, the letter "R" was added to the end of the table number to indicate that the table has been revised from the data originally presented in the AFC. Table 8.1B-3AR and Table 8.1B-3CR present commissioning information in addition to the commissioning information provided in the original application.

TABLE 8.1B-2R

AES Highgrove Power Plant Emission Scenarios - Normal Operation

Daily Emissions Scenarios based on Maximum daily operation of 24 hours/day

Annual Emissions Scenarios based on Maximum annual operation of 5475 hours/year

Normal Operation Scenario					Fuel Input[1,3]			Emissions[1,3]															Exhaust Stack Conditions				
Ambient	**GE**	**RH**	**Evap**	**Load**	**Per CT**	**Per CT**		**NOx**			**CO**			**VOC**			**Particulates**			**SO_2[2]**			Stack Temp	Flow	Stack Height	Stack Diameter	Velocity
Temp F	**Date**	**%**	**%**	**%**	**MMBtu/hr (HHV)**	**lb/hr**	**$MMFt^3$/hr**	**lb/hr**	**lb/day**	**lb/yr**	**lb/hr**	**lb/day**	**lb/yr**	**lb/hr**	**lb/day**	**lb/yr**	**lb/hr**	**lb/day**	**lb/yr**	**lb/hr**	**lb/day**	**lb/yr**	**F**	**ACFM**	**Feet**	**Feet**	**ft/s**
30	**12/19/2005**	30	Off	Base	881	38,594	0.87	11.2	268	61,190	11.7	280	63,986	2.2	53	11,977	6	144	32,850	0.6	14.8	3,376	743	883,683	90	13.50	102.89
30	**12/19/2005**	30	Off	75	694	30,383	0.68	8.8	211	48,144	9.2	220	50,246	1.8	43	9,855	6	144	32,850	0.5	11.7	2,658	737	743,130	90	13.50	86.53
30	**12/19/2005**	30	Off	50	510	22,339	0.50	6.5	155	35,382	6.7	162	36,844	1.3	31	6,961	6	144	32,850	0.4	8.6	1,954	755	595,326	90	13.50	69.32
80	**12/19/2005**	60	On	Base	852	37,337	0.84	10.8	260	59,243	11.3	272	62,048	2.2	53	12,198	6	144	32,850	0.6	14.3	3,266	784	861,409	90	13.50	100.30
80	**12/19/2005**	60	Off	Base	839	36,747	0.83	10.6	256	58,292	11.1	267	60,961	2.2	52	11,804	6	144	32,850	0.6	14.1	3,214	789	850,996	90	13.50	99.09
80	**12/19/2005**	60	On	75	668	29,281	0.66	8.5	204	46,427	8.9	212	48,454	1.6	37	8,541	6	144	32,850	0.5	11.2	2,561	763	723,990	90	13.50	84.30
80	**12/19/2005**	60	On	50	492	21,556	0.49	6.2	150	34,163	6.5	156	35,618	1.1	26	5,840	6	144	32,850	0.3	8.3	1,886	781	582,597	90	13.50	67.84
97	**12/19/2005**	20	On	Base	855	37,462	0.84	10.9	261	59,427	11.3	272	61,955	2.3	54	12,330	6	144	32,850	0.6	14.4	3,277	783	863,615	90	13.50	100.56
97	**12/19/2005**	20	Off	Base	817	35,803	0.81	10.4	249	56,790	10.9	261	59,471	2.0	49	11,169	6	144	32,850	0.6	13.7	3,132	796	833,580	90	13.50	97.06
97	**12/19/2005**	20	On	75	670	29,375	0.66	8.5	204	46,573	8.9	214	48,788	1.6	38	8,629	6	144	32,850	0.5	11.3	2,570	763	725,731	90	13.50	84.50
97	**12/19/2005**	20	On	50	494	21,637	0.49	6.3	150	34,293	6.5	156	35,676	1.3	30	6,862	6	144	32,850	0.3	8.3	1,893	779	584,169	90	13.50	68.02

(1) Source: GE Gas Turbine Performance Sheets for 30, 80, 97 F, all dated December 2005

(2) SO2 Emissions using the emission factor 0.0007 lb SO2 per mmBtu natural gas - Source: 0.25 gr sulfur/100 cf natural gas.

(3) Per CTG, assuming BACT levels of 3.5 ppm NOx, 6 ppm CO, and 2 ppm VOC. Daily emissions represent 24 hours per day per CTG. Annual emissions represent 5475 hours per CTG per year.

TABLE 8.1B-3AR
AES Highgrove Commissioning Schedule

	CTG 1				CTG 2				CTG 3			
Day	Activity	Duration [hr]	CTG Load [%]	Modeling Load (%)	Activity	Duration [hr]	CTG Load [%]	Modeling Load (%)	Activity	Duration [hr]	CTG Load [%]	Modeling Load (%)
1	CTG Testing (First fire and check for leaks)	8	0	0	No Operation	0	0	0	No Operation	0	0	0
2	CTG Testing (First fire and check for leaks)	8	0	0	No Operation	0	0	0	No Operation	0	0	0
3	CTG Testing (Synch and Check E stop)	6	0	0	No Operation	0	0	0	No Operation	0	0	0
4	CTG Testing (Synch and Check E stop)	6	0	0	No Operation	0	0	0	No Operation	0	0	0
5	CTG Testing (AVR testing)	6	0-5	5	No Operation	0	0	0	No Operation	0	0	0
6	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
7	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
8	CTG Testing (Break-In Run)	6	0-5	5	No Operation	0	0	0	No Operation	0	0	0
9	CTG Testing (Part-load tuning and AVR testing)	8	10-99	50	No Operation	0	0	0	No Operation	0	0	0
10	CTG Testing (Part-load tuning and AVR testing)	8	10-99	50	No Operation	0	0	0	No Operation	0	0	0
11	CTG Testing (Part-load tuning and AVR testing)	8	10-99	50	No Operation	0	0	0	No Operation	0	0	0
12	CTG Testing (Part-load tuning and AVR testing)	8	10-99	50	No Operation	0	0	0	No Operation	0	0	0
13	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
14	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
15	CTG Testing (Base Load tuning)	8	90-100	100	No Operation	0	0	0	No Operation	0	0	0
16	CTG Testing (Base Load tuning)	8	90-100	100	No Operation	0	0	0	No Operation	0	0	0
17	CTG Testing (Additional Part-load tuning as req'd)	8	10-99	50	No Operation	0	0	0	No Operation	0	0	0
18	CTG Testing (Additional Part-load tuning as req'd)	8	10-99	50	No Operation	0	0	0	No Operation	0	0	0
19	CTG Testing (Additional base load tuning as required)	8	90-100	100	No Operation	0	0	0	No Operation	0	0	0
20	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
21	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
22	CTG Testing (Additional base load tuning as required)	8	90-100	100	No Operation	0	0	0	No Operation	0	0	0
23	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
24	No Operation	0	0	0	CTG Testing (First fire and check for leaks)	8	0	0	No Operation	0	0	0
25	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
26	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
27	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
28	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
29	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
30	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
31	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
32	No Operation	0	0	0	CTG Testing (First fire and check for leaks)	8	0	0	No Operation	0	0	0
33	No Operation	0	0	0	CTG Testing (Synch and Check E stop)	6	0	0	No Operation	0	0	0

TABLE 8.1B-3AR
AES Highgrove Commissioning Schedule

	CTG 1				CTG 2				CTG 3			
Day	Activity	Duration [hr]	CTG Load [%]	Modeling Load (%)	Activity	Duration [hr]	CTG Load [%]	Modeling Load (%)	Activity	Duration [hr]	CTG Load [%]	Modeling Load (%)
34	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
35	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
36	No Operation	0	0	0	CTG Testing (Synch and Check E stop)	6	0	0	No Operation	0	0	0
37	No Operation	0	0	0	CTG Testing (AVR testing)	6	0-5	5	No Operation	0	0	0
38	No Operation	0	0	0	CTG Testing (Break-In Run)	6	0-5	5	No Operation	0	0	0
39	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
40	No Operation	0	0	0	CTG Testing (Part-load tuning and AVR testing)	8	10-99	50	No Operation	0	0	0
41	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
42	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
43	No Operation	0	0	0	CTG Testing (Part-load tuning and AVR testing)	8	10-99	50	No Operation	0	0	0
44	No Operation	0	0	0	CTG Testing (Part-load tuning and AVR testing)	8	10-99	50	No Operation	0	0	0
45	No Operation	0	0	0	CTG Testing (Part-load tuning and AVR testing)	8	10-99	50	No Operation	0	0	0
46	No Operation	0	0	0	CTG Testing (Base Load tuning)	8	90-100	100	No Operation	0	0	0
47	No Operation	0	0	0	CTG Testing (Base Load tuning)	8	90-100	100	No Operation	0	0	0
48	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
49	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
50	No Operation	0	0	0	CTG Testing (Additional Part-load tuning as req'd)	8	10-99	50	No Operation	0	0	0
51	No Operation	0	0	0	CTG Testing (Additional Part-load tuning as req'd)	8	10-99	50	No Operation	0	0	0
52	No Operation	0	0	0	CTG Testing (Additional base load tuning as required)	8	90-100	100	No Operation	0	0	0
53	No Operation	0	0	0	CTG Testing (Additional base load tuning as required)	8	90-100	100	No Operation	0	0	0
54	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
55	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
56	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
57	No Operation	0	0	0	No Operation	0	0	0	CTG Testing (First fire and check for leaks)	8	0	0
58	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
59	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
60	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
61	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
62	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
63	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
64	No Operation	0	0	0	No Operation	0	0	0	CTG Testing (First fire and check for leaks)	8	0	0
65	No Operation	0	0	0	No Operation	0	0	0	CTG Testing (Synch and Check E stop)	6	0	0
66	No Operation	0	0	0	No Operation	0	0	0	CTG Testing (Synch and Check E stop)	6	0	0

TABLE 8.1B-3AR
AES Highgrove Commissioning Schedule

	CTG 1				CTG 2				CTG 3			
Day	Activity	Duration [hr]	CTG Load [%]	Modeling Load (%)	Activity	Duration [hr]	CTG Load [%]	Modeling Load (%)	Activity	Duration [hr]	CTG Load [%]	Modeling Load (%)
67	No Operation	0	0	0	No Operation	0	0	0	CTG Testing (AVR testing)	6	0-5	5
68	No Operation	0	0	0	No Operation	0	0	0	CTG Testing (Break-In Run)	6	0-5	5
69	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
70	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
71	No Operation	0	0	0	No Operation	0	0	0	CTG Testing (Part-load tuning and AVR testing)	8	10-99	50
72	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
73	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
74	No Operation	0	0	0	No Operation	0	0	0	CTG Testing (Part-load tuning and AVR testing)	8	10-99	50
75	No Operation	0	0	0	No Operation	0	0	0	CTG Testing (Part-load tuning and AVR testing)	8	10-99	50
76	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
77	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
78	No Operation	0	0	0	No Operation	0	0	0	CTG Testing (Part-load tuning and AVR testing)	8	10-99	50
79	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
80	No Operation	0	0	0	No Operation	0	0	0	CTG Testing (Base Load tuning)	8	90-100	100
81	SCR/CO Catalyst installation	0	0	0	No Operation	0	0	0	CTG Testing (Base Load tuning)	8	90-100	100
82	SCR/CO Catalyst installation	0	0	0	No Operation	0	0	0	CTG Testing (Additional Part-load tuning as req'd)	8	10-99	50
83	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
84	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
85	SCR/CO Catalyst installation	0	0	0	No Operation	0	0	0	CTG Testing (Additional Part-load tuning as req'd)	8	10-99	50
86	No Operation	0	0	0	SCR/CO Catalyst installation	0	0	0	CTG Testing (Additional base load tuning as required)	8	90-100	100
87	No Operation	0	0	0	SCR/CO Catalyst installation	0	0	0	CTG Testing (Additional base load tuning as required)	8	90-100	100
88	No Operation	0	0	0	SCR/CO Catalyst installation	0	0	0	CTG Exhaust Cool Down	0	0	0
89	No Operation	0	0	0	No Operation	0	0	0	SCR/CO Catalyst installation	0	0	0
90	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
91	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
92	No Operation	0	0	0	No Operation	0	0	0	SCR/CO Catalyst installation	0	0	0
93	No Operation	0	0	0	No Operation	0	0	0	SCR/CO Catalyst installation	0	0	0
94	SCR AIG Balancing	8	50-100	0	No Operation	0	0	0	No Operation	0	0	0
95	No Operation	0	0	0	SCR AIG Balancing	8	50-100	0	No Operation	0	0	0
96	No Operation	0	0	0	No Operation	0	0	0	SCR AIG Balancing	8	50-100	0
97	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
98	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
99	Water Wash & Performance preparation	0	0	0	Water Wash & Performance preparation	0	0	0	Water Wash & Performance preparation	0	0	0

TABLE 8.1B-3AR
AES Highgrove Commissioning Schedule

	CTG 1				CTG 2				CTG 3			
Day	Activity	Duration [hr]	CTG Load [%]	Modeling Load (%)	Activity	Duration [hr]	CTG Load [%]	Modeling Load (%)	Activity	Duration [hr]	CTG Load [%]	Modeling Load (%)
100	Water Wash & Performance preparation	0	0	0	Water Wash & Performance preparation	0	0	0	Water Wash & Performance preparation	0	0	0
101	RATA / Pre-performance Testing/Source Testing	12	100	100	RATA / Pre-performance Testing/Source Testing	12	100	100	RATA / Pre-performance Testing/Source Testing	12	100	100
102	RATA / Pre-performance Testing/Source Testing	12	100	100	RATA / Pre-performance Testing/Source Testing	12	100	100	RATA / Pre-performance Testing/Source Testing	12	100	100
103	Performance Testing	12	50-100	100	Performance Testing	12	50-100	100	Performance Testing	12	50-100	100
104	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
105	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
106	CALISO Certification & PPA Test	12	50-100	100	CALISO Certification & PPA Test	12	50-100	100	CALISO Certification & PPA Test	12	50-100	100
107	Source Testing	12	50-100	100	Source Testing	12	50-100	100	Source Testing	12	50-100	100
108	Source Testing	12	50-100	100	Source Testing	12	50-100	100	Source Testing	12	50-100	100
109	Source Testing	12	50-100	100	Source Testing	12	50-100	100	Source Testing	12	50-100	100
110	Remove Emissions Test Equipment	0	0	0	Remove Emissions Test Equipment	0	0	0	Remove Emissions Test Equipment	0	0	0
111	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
112	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
113	Drift Testing	12	100	100	Drift Testing	12	100	100	Drift Testing	12	100	100
114	Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100	
115	Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100	
116	Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100	
117	Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100	
118	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
119	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
120	Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100	
121	Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100	
122	Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100	
123	Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100	
124	Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100	
125	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
126	No Operation	0	0	0	No Operation	0	0	0	No Operation	0	0	0
127	Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100	
128	Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100	
129	Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100	
130	Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	15	50-100	
131	Additional Hours to Burn out SCR/CO (For PM10 and VOC)	9	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	9	50-100		Additional Hours to Burn out SCR/CO (For PM10 and VOC)	9	50-100	
	Total CTG operation hours	**428**				**428**				**428**		

TABLE 8.1B-3BR
AES Highgrove Commissioning Emissions

Commissioning Phase	Pre- break-in Checkout	Controlled Break-in Operation	Water Injection Commissioning	Complete AVR Commissioning	SCR Commissioning	Full load testing & checkout	Totals[3]
Water Injection/% Effective	No	No	Yes/50	Yes	Yes	Yes	
SCR Installed/% Effective	No	No	No	No	Yes/50	Yes	
CO Catalyst Installed/% Effective	No	No	No	No	Yes/100	Yes/100	
Unit Operating Hours/CT	28	28	48	16	8	96	1,284
Units in Operation Simultaneously	1	1	1	1	1	1	
Average Load (Percent)	0	5	50	100	75	100	
NOx lb/hr[1]	91	99	175	81	35	11.2	
CO lb/hr	55	60	168	255	9	12	
VOC lb/hr	2	2	3	5	4	2	
CT Heat Input MMBtu/hr - HHV	150	180	500	881	700	881	
Emissions							
NOx lb/mmscf[2]	616	558	355	93	51	13	
CO lb/mmscf[2]	372	338	341	294	13	14	
VOC lb/mmscf[2]	14	11	6	6	6	2	

Source: General Electric
Notes: 1. Represents NOx emission rate at base load at 30 F ambient temperature.
2. Fuel heat content is 1015 MMBtu/MMSCF.
3. Includes 204 hours per CTG for completion of commissioning period.

Exhaust Stack Parameters for Commissioning Modeling by Load Rate for 80F Temperature Case

Load Rate Percent	Stack Temp F	Flow ACFM	Stack Height Feet	Stack Diameter Feet	Velocity ft/s
35	818	485185	90	13.50	56.49
50	781	582597	90	13.50	67.84
75	763	723990	90	13.50	84.30
100	789	850996	90	13.50	99.09

TABLE 8.1B-3CR
AES Highgrove Commissioning Emissions

Day	NOx Lb/Day	CO Lb/Day	VOC Lb/Day	SO2 Lb/Day	PM10 Lb/Day	NOx Lb/31 Days	CO Lb/31 Days	VOC Lb/31 Days	SO2 Lb/31 Days	PM10 Lb/31 Days	NOx Avg Lb/Day	CO Avg Lb/Day	VOC Avg Lb/Day	SO2 Avg Lb/Day	PM10 Avg Lb/Day
1	728	440	16	1	15	728	440	16	1	15	24	15	1	0	0
2	728	440	16	1	15	1,456	880	32	2	29	49	29	1	0	1
3	546	330	12	1	11	2,002	1,210	44	2	40	67	40	1	0	1
4	546	330	12	1	11	2,548	1,540	56	3	51	85	51	2	0	2
5	594	360	12	1	13	3,142	1,900	68	4	64	105	63	2	0	2
6	0	0	0	0	0	3,142	1,900	68	4	64	105	63	2	0	2
7	0	0	0	0	0	3,142	1,900	68	4	64	105	63	2	0	2
8	594	360	12	1	13	3,736	2,260	80	4	78	125	75	3	0	3
9	1,400	1,344	24	3	49	5,136	3,604	104	7	126	171	120	3	0	4
10	1,400	1,344	24	3	49	6,536	4,948	128	10	175	218	165	4	0	6
11	1,400	1,344	24	3	49	7,936	6,292	152	13	224	265	210	5	0	7
12	1,400	1,344	24	3	49	9,336	7,636	176	16	273	311	255	6	1	9
13	0	0	0	0	0	9,336	7,636	176	16	273	311	255	6	1	9
14	0	0	0	0	0	9,336	7,636	176	16	273	311	255	6	1	9
15	648	2,040	40	5	86	9,984	9,676	216	21	359	333	323	7	1	12
16	648	2,040	40	5	86	10,632	11,716	256	26	445	354	391	9	1	15
17	648	2,040	40	5	86	11,280	13,756	296	30	530	376	459	10	1	18
18	648	2,040	40	5	86	11,928	15,796	336	35	616	398	527	11	1	21
19	648	2,040	40	5	86	12,576	17,836	376	40	702	419	595	13	1	23
20	0	0	0	0	0	12,576	17,836	376	40	702	419	595	13	1	23
21	0	0	0	0	0	12,576	17,836	376	40	702	419	595	13	1	23
22	648	2,040	40	5	86	13,224	19,876	416	45	788	441	663	14	2	26
23	0	0	0	0	0	13,224	19,876	416	45	788	441	663	14	2	26
24	728	440	16	1	15	13,952	20,316	432	46	803	465	677	14	2	27
25	0	0	0	0	0	13,952	20,316	432	46	803	465	677	14	2	27
26	0	0	0	0	0	13,952	20,316	432	46	803	465	677	14	2	27
27	0	0	0	0	0	13,952	20,316	432	46	803	465	677	14	2	27
28	0	0	0	0	0	13,952	20,316	432	46	803	465	677	14	2	27
29	0	0	0	0	0	13,952	20,316	432	46	803	465	677	14	2	27
30	0	0	0	0	0	13,952	20,316	432	46	803	465	677	14	2	27
31	0	0	0	0	0	13,952	20,316	432	46	803	465	677	14	2	27
32	728	440	16	1	15	13,952	20,316	432	46	803	465	677	14	2	27
33	546	330	12	1	11	13,770	20,206	428	46	799	459	674	14	2	27
34	0	0	0	0	0	13,224	19,876	416	45	788	441	663	14	2	26
35	0	0	0	0	0	12,678	19,546	404	45	777	423	652	13	1	26
36	546	330	12	1	11	12,630	19,516	404	44	775	421	651	13	1	26
37	594	360	12	1	13	13,224	19,876	416	45	788	441	663	14	2	26
38	594	360	12	1	13	13,818	20,236	428	46	801	461	675	14	2	27
39	0	0	0	0	0	13,224	19,876	416	45	788	441	663	14	2	26
40	1,400	1,344	24	3	49	13,224	19,876	416	45	788	441	663	14	2	26
41	0	0	0	0	0	11,824	18,532	392	42	739	394	618	13	1	25
42	0	0	0	0	0	10,424	17,188	368	40	691	347	573	12	1	23
43	1,400	1,344	24	3	49	10,424	17,188	368	40	691	347	573	12	1	23
44	1,400	1,344	24	3	49	11,824	18,532	392	42	739	394	618	13	1	25

TABLE 8.1B-3CR
AES Highgrove Commissioning Emissions

Day	NOx Lb/Day	CO Lb/Day	VOC Lb/Day	SO2 Lb/Day	PM10 Lb/Day	NOx Lb/31 Days	CO Lb/31 Days	VOC Lb/31 Days	SO2 Lb/31 Days	PM10 Lb/31 Days	NOx Avg Lb/Day	CO Avg Lb/Day	VOC Avg Lb/Day	SO2 Avg Lb/Day	PM10 Avg Lb/Day
45	1,400	1,344	24	3	49	13,224	19,876	416	45	788	441	663	14	2	26
46	648	2,040	40	5	86	13,224	19,876	416	45	788	441	663	14	2	26
47	648	2,040	40	5	86	13,224	19,876	416	45	788	441	663	14	2	26
48	0	0	0	0	0	12,576	17,836	376	40	702	419	595	13	1	23
49	0	0	0	0	0	11,928	15,796	336	35	616	398	527	11	1	21
50	648	2,040	40	5	86	11,928	15,796	336	35	616	398	527	11	1	21
51	648	2,040	40	5	86	12,576	17,836	376	40	702	419	595	13	1	23
52	648	2,040	40	5	86	13,224	19,876	416	45	788	441	663	14	2	26
53	648	2,040	40	5	86	13,224	19,876	416	45	788	441	663	14	2	26
54	0	0	0	0	0	13,224	19,876	416	45	788	441	663	14	2	26
55	0	0	0	0	0	12,496	19,436	400	44	774	417	648	13	1	26
56	0	0	0	0	0	12,496	19,436	400	44	774	417	648	13	1	26
57	728	440	16	1	15	13,224	19,876	416	45	788	441	663	14	2	26
58	0	0	0	0	0	13,224	19,876	416	45	788	441	663	14	2	26
59	0	0	0	0	0	13,224	19,876	416	45	788	441	663	14	2	26
60	0	0	0	0	0	13,224	19,876	416	45	788	441	663	14	2	26
61	0	0	0	0	0	13,224	19,876	416	45	788	441	663	14	2	26
62	0	0	0	0	0	13,224	19,876	416	45	788	441	663	14	2	26
63	0	0	0	0	0	12,496	19,436	400	44	774	417	648	13	1	26
64	728	440	16	1	15	12,678	19,546	404	45	777	423	652	13	1	26
65	546	330	12	1	11	13,224	19,876	416	45	788	441	663	14	2	26
66	546	330	12	1	11	13,770	20,206	428	46	799	459	674	14	2	27
67	594	360	12	1	13	13,818	20,236	428	46	801	461	675	14	2	27
68	594	360	12	1	13	13,818	20,236	428	46	801	461	675	14	2	27
69	0	0	0	0	0	13,224	19,876	416	45	788	441	663	14	2	26
70	0	0	0	0	0	13,224	19,876	416	45	788	441	663	14	2	26
71	1,400	1,344	24	3	49	13,224	19,876	416	45	788	441	663	14	2	26
72	0	0	0	0	0	13,224	19,876	416	45	788	441	663	14	2	26
73	0	0	0	0	0	13,224	19,876	416	45	788	441	663	14	2	26
74	1,400	1,344	24	3	49	13,224	19,876	416	45	788	441	663	14	2	26
75	1,400	1,344	24	3	49	13,224	19,876	416	45	788	441	663	14	2	26
76	0	0	0	0	0	11,824	18,532	392	42	739	394	618	13	1	25
77	0	0	0	0	0	11,176	16,492	352	38	654	373	550	12	1	22
78	1,400	1,344	24	3	49	11,928	15,796	336	35	616	398	527	11	1	21
79	0	0	0	0	0	11,928	15,796	336	35	616	398	527	11	1	21
80	648	2,040	40	5	86	12,576	17,836	376	40	702	419	595	13	1	23
81	648	2,040	40	5	86	12,576	17,836	376	40	702	419	595	13	1	23
82	648	2,040	40	5	86	12,576	17,836	376	40	702	419	595	13	1	23
83	0	0	0	0	0	11,928	15,796	336	35	616	398	527	11	1	21
84	0	0	0	0	0	11,280	13,756	296	30	530	376	459	10	1	18
85	648	2,040	40	5	86	11,928	15,796	336	35	616	398	527	11	1	21
86	648	2,040	40	5	86	12,576	17,836	376	40	702	419	595	13	1	23
87	648	2,040	40	5	86	13,224	19,876	416	45	788	441	663	14	2	26
88	0	0	0	0	0	12,496	19,436	400	44	774	417	648	13	1	26

TABLE 8.1B-3CR
AES Highgrove Commissioning Emissions

Day	NOx Lb/Day	CO Lb/Day	VOC Lb/Day	SO2 Lb/Day	PM10 Lb/Day	NOx Lb/31 Days	CO Lb/31 Days	VOC Lb/31 Days	SO2 Lb/31 Days	PM10 Lb/31 Days	NOx Avg Lb/Day	CO Avg Lb/Day	VOC Avg Lb/Day	SO2 Avg Lb/Day	PM10 Avg Lb/Day
89	0	0	0	0	0	12,496	19,436	400	44	774	417	648	13	1	26
90	0	0	0	0	0	12,496	19,436	400	44	774	417	648	13	1	26
91	0	0	0	0	0	12,496	19,436	400	44	774	417	648	13	1	26
92	0	0	0	0	0	12,496	19,436	400	44	774	417	648	13	1	26
93	0	0	0	0	0	12,496	19,436	400	44	774	417	648	13	1	26
94	280	72	32	4	68	12,776	19,508	432	48	842	426	650	14	2	28
95	280	72	32	4	68	12,328	19,140	448	51	896	411	638	15	2	30
96	280	72	32	4	68	12,062	18,882	468	55	953	402	629	16	2	32
97	0	0	0	0	0	11,516	18,552	456	54	942	384	618	15	2	31
98	0	0	0	0	0	10,922	18,192	444	53	929	364	606	15	2	31
99	0	0	0	0	0	10,328	17,832	432	53	916	344	594	14	2	31
100	0	0	0	0	0	10,328	17,832	432	53	916	344	594	14	2	31
101	402	432	72	22	387	10,730	18,264	504	75	1,302	358	609	17	2	43
102	402	432	72	22	387	9,733	17,352	552	94	1,640	324	578	18	3	55
103	402	432	72	22	387	10,135	17,784	624	116	2,027	338	593	21	4	68
104	0	0	0	0	0	10,135	17,784	624	116	2,027	338	593	21	4	68
105	0	0	0	0	0	8,735	16,440	600	114	1,978	291	548	20	4	66
106	402	432	72	22	387	7,737	15,528	648	133	2,316	258	518	22	4	77
107	402	432	72	22	387	8,140	15,960	720	155	2,703	271	532	24	5	90
108	402	432	72	22	387	8,542	16,392	792	177	3,090	285	546	26	6	103
109	402	432	72	22	387	7,544	15,480	840	197	3,427	251	516	28	7	114
110	0	0	0	0	0	7,544	15,480	840	197	3,427	251	516	28	7	114
111	0	0	0	0	0	6,896	13,440	800	192	3,342	230	448	27	6	111
112	0	0	0	0	0	6,248	11,400	760	187	3,256	208	380	25	6	109
113	402	432	72	22	387	6,003	9,792	792	204	3,556	200	326	26	7	119
114	168	180	30	9	161	6,170	9,972	822	213	3,718	206	332	27	7	124
115	168	180	30	9	161	6,338	10,152	852	223	3,879	211	338	28	7	129
116	168	180	30	9	161	5,858	8,292	842	227	3,954	195	276	28	8	132
117	168	180	30	9	161	5,377	6,432	832	231	4,029	179	214	28	8	134
118	0	0	0	0	0	4,729	4,392	792	226	3,943	158	146	26	8	131
119	0	0	0	0	0	4,729	4,392	792	226	3,943	158	146	26	8	131
120	168	180	30	9	161	4,897	4,572	822	236	4,104	163	152	27	8	137
121	168	180	30	9	161	5,065	4,752	852	245	4,265	169	158	28	8	142
122	168	180	30	9	161	5,232	4,932	882	254	4,426	174	164	29	8	148
123	168	180	30	9	161	5,400	5,112	912	263	4,588	180	170	30	9	153
124	168	180	30	9	161	5,568	5,292	942	273	4,749	186	176	31	9	158
125	0	0	0	0	0	5,288	5,220	910	269	4,680	176	174	30	9	156
126	0	0	0	0	0	5,008	5,148	878	265	4,612	167	172	29	9	154
127	168	180	30	9	161	4,895	5,256	876	270	4,705	163	175	29	9	157
128	168	180	30	9	161	5,063	5,436	906	279	4,866	169	181	30	9	162
129	168	180	30	9	161	5,230	5,616	936	289	5,027	174	187	31	10	168
130	168	180	30	9	161	5,398	5,796	966	298	5,188	180	193	32	10	173
131	101	108	18	6	97	5,499	5,904	984	303	5,285	183	197	33	10	176

TABLE 8.1B-4R
AES Highgrove Modeling Emissions Summary

	Scenario	NOx (lb/hr)	CO (lb/hr)	PM10 (lb/hr)	SO2 (lb/hr)	Velocity (m/s)	Velocity (ft/s)	Temperature F	Temperature K
Annual	30F Base Load	7.99	*	3.73	0.38	31.4	102.9	743	668
	30F 75% Load	6.66	*	3.73	0.31	26.4	86.5	737	665
	30F 50% Load	5.36	*	3.73	0.24	21.1	69.3	755	675
	80F Base Load + Evap	7.79	*	3.73	0.37	30.6	100.3	784	691
	80F Base Load	7.69	*	3.73	0.37	30.2	99.1	789	693
	80F 75% Load	6.48	*	3.73	0.30	25.7	84.3	763	679
	80F 50% Load	5.23	*	3.73	0.23	20.7	67.8	781	689
	97F Base Load + Evap	7.81	*	3.73	0.37	30.6	100.6	783	691
	97F Base Load	7.54	*	3.73	0.36	29.6	97.1	796	697
	97F 75% Load	6.50	*	3.73	0.30	25.8	84.5	763	679
	97F 50% Load	5.25	*	3.73	0.23	20.7	68.0	779	688
24-hour	30F Base Load	12.18	*	5.98	0.61	31.4	102.9	743	668
	30F 75% Load	9.96	*	5.98	0.49	26.4	86.5	737	665
	30F 50% Load	7.78	*	5.98	0.37	21.1	69.3	755	675
	80F Base Load + Evap	11.85	*	5.98	0.60	30.6	100.3	784	691
	80F Base Load	11.69	*	5.98	0.59	30.2	99.1	789	693
	80F 75% Load	9.66	*	5.98	0.48	25.7	84.3	763	679
	80F 50% Load	7.57	*	5.98	0.36	20.7	67.8	781	689
	97F Base Load + Evap	11.88	*	5.98	0.60	30.6	100.6	783	691
	97F Base Load	11.43	*	5.98	0.57	29.6	97.1	796	697
	97F 75% Load	9.69	*	5.98	0.48	25.8	84.5	763	679
	97F 50% Load	7.60	*	5.98	0.36	20.7	68.0	779	688
	Pre- break-in Checkout	76	*	*	*	17.2	56.5	818	710
	Controlled Break-in Operation	58	*	*	*	17.2	56.5	818	710
	Water Injection Commissioning	175	*	*	*	20.7	67.8	781	689
	Complete AVR Commissioning	41	*	*	*	30.2	99.1	789	694
	SCR Commissioning	35	*	*	*	25.7	84.3	763	679
	Full load testing & checkout	11	*	*	*	30.2	99.1	789	694
8-hour	30F Base Load	*	19.06	*	*	31.4	102.9	743	668
	30F 75% Load	*	16.77	*	*	26.4	86.5	737	665
	30F 50% Load	*	14.54	*	*	21.1	69.3	755	675
	80F Base Load + Evap	*	18.74	*	*	30.6	100.3	784	691
	80F Base Load	*	18.56	*	*	30.2	99.1	789	693
	80F 75% Load	*	16.48	*	*	25.7	84.3	763	679
	80F 50% Load	*	14.34	*	*	20.7	67.8	781	689
	97F Base Load + Evap	*	18.73	*	*	30.6	100.6	783	691
	97F Base Load	*	18.31	*	*	29.6	97.1	796	697
	97F 75% Load	*	16.53	*	*	25.8	84.5	763	679
	97F 50% Load	*	14.35	*	*	20.7	68.0	779	688
	Pre- break-in Checkout	*	55	*	*	17.2	56.5	818	710
	Controlled Break-in Operation	*	60	*	*	17.2	56.5	818	710
	Water Injection Commissioning	*	168	*	*	20.7	67.8	781	689
	Complete AVR Commissioning	*	255	*	*	30.2	99.1	789	694
	SCR Commissioning	*	9	*	*	25.7	84.3	763	679
	Full load testing & checkout	*	12	*	*	30.2	99.1	789	694
3-hour	30F Base Load	*	*	*	0.60	31.4	102.9	743	668
	30F 75% Load	*	*	*	0.54	26.4	86.5	737	665
	30F 50% Load	*	*	*	0.48	21.1	69.3	755	675
	80F Base Load + Evap	*	*	*	0.59	30.6	100.3	784	691
	80F Base Load	*	*	*	0.59	30.2	99.1	789	693
	80F 75% Load	*	*	*	0.53	25.7	84.3	763	679
	80F 50% Load	*	*	*	0.47	20.7	67.8	781	689
	97F Base Load + Evap	*	*	*	0.59	30.6	100.6	783	691
	97F Base Load	*	*	*	0.58	29.6	97.1	796	697
	97F 75% Load	*	*	*	0.53	25.8	84.5	763	679
	97F 50% Load	*	*	*	0.47	20.7	68.0	779	688
	Pre- break-in Checkout	*	*	*	*	17.2	56.5	818	710
	Controlled Break-in Operation	*	*	*	*	17.2	56.5	818	710
	Water Injection Commissioning	*	*	*	*	20.7	67.8	781	689
	Complete AVR Commissioning	*	*	*	*	30.2	99.1	789	694
	SCR Commissioning	*	*	*	*	25.7	84.3	763	679
	Full load testing & checkout	*	*	*	*	30.2	99.1	789	694
1-hour	30F Base Load	23.24	41.20	*	0.59	31.4	102.9	743	668
	30F 75% Load	22.76	39.57	*	0.57	26.4	86.5	737	665
	30F 50% Load	22.29	37.97	*	0.54	21.1	69.3	755	675
	80F Base Load + Evap	23.16	40.97	*	0.59	30.6	100.3	784	691
	80F Base Load	23.13	40.84	*	0.59	30.2	99.1	789	693
	80F 75% Load	22.70	39.35	*	0.56	25.7	84.3	763	679
	80F 50% Load	22.25	37.83	*	0.54	20.7	67.8	781	689
	97F Base Load + Evap	23.17	40.96	*	0.59	30.6	100.6	783	691
	97F Base Load	23.07	40.66	*	0.58	29.6	97.1	796	697
	97F 75% Load	22.70	39.39	*	0.56	25.8	84.5	763	679
	97F 50% Load	22.25	37.84	*	0.54	20.7	68.0	779	688
	Pre- break-in Checkout	91	55	*	*	17.2	56.5	818	710
	Controlled Break-in Operation	99	60	*	*	17.2	56.5	818	710
	Water Injection Commissioning	175	168	*	*	20.7	67.8	781	689
	Complete AVR Commissioning	81	255	*	*	30.2	99.1	789	694
	SCR Commissioning	35	9	*	*	25.7	84.3	763	679
	Full load testing & checkout	11	12	*	*	30.2	99.1	789	694

TABLE 8.1B-5R
AES Highgrove Startup and Shutdown Emissions

Pollutant	Startup lb/event	Shutdown lb/event	Startup lb/hour	Shutdown lb/hour
NOx	16.7	4.3	27.0	13.1
CO	15.4	18.2	25.2	27.5
VOC	2.1	1.6	4.0	3.4
PM10	3.5	1.1	8.5	6
SOx	0.36	0.11	0.86	0.60
NH3	2.86	0.90	7.9	5.8

Source: GE Energy and engineering estimates.
Start is assumed to take 37 minutes for NOx and 10 minutes for CO, VOC, SO2, and PM10. Shutdown takes 11 minutes.
Exhaust Parameters for Starts and Shutdown Modeling for the 80 F Case at a 50% load

TABLE 8.1B-6AR

AES Highgrove HAP Emission Estimates

Assume:
Assume heat input at 30 F at base load

Operating Hours for each CTG: 8,760 Hours/Year

Gas Heat Content (MMBtu/MMCF) =	1,015	MMBtu/MMSCF	1 CTG		3 CTGs	
Total Heat Input	881	MMBtu/Hr HHV	0.868	MMCF/Hr	22,811	MMCF/Yr

Turbine Emissions

Compound	Emission Factor (Lb/MMCF)[a]	Maximum CTG Heat Input (mmBtu/hr)	Gas Input (MMCF/hr)	lb/hr/CT	lb/hr/3-CT	lb/yr/CT	TPY/CT[d]	lb/yr/3-CT[d]	TPY/3-CT[d]
Ammonia[b]	5 ppm	881	0.868	6.0	18.0	52,531	26.3	157,592	78.8
Acetaldehyde	0.040600	881	0.868	0.035	0.1	308.7	0.154	926	0.5
Acrolein	0.003690	881	0.868	0.00320	0.01	28.1	0.014	84	0.04
Benzene	0.003330	881	0.868	0.0029	0.01	25.3	0.013	76	0.04
1,3-Butadiene	0.000436	881	0.868	0.00038	0.001	3.3	0.002	10	0.005
Ethylbenzene	0.032480	881	0.868	0.0282	0.1	247.0	0.12	741	0.4
Formaldehyde	0.365400	881	0.868	0.317	1.0	2,778	1.4	8,335	4.2
Hexane	0.259000	881	0.868	0.225	0.7	1,969	1.0	5,908	3.0
Naphthalene	0.001320	881	0.868	0.0011	0.003	10.0	0.005	30.1	0.015
PAH[c]	0.000014	881	0.868	0.00001	0.00004	0.11	0.00005	0.3	0.0002
Propylene Oxide	0.029435	881	0.868	0.0255	0.1	223.8	0.112	671	0.34
Toluene	0.131950	881	0.868	0.115	0.3	1,003	0.5	3,010	1.5
Xylene	0.064960	881	0.868	0.056	0.2	494	0.2	1,482	0.7
TOTAL HAPs						7,091	3.5	21,273	10.6

Notes:

(1) Source - GE - Estimated Performance and Emissions at 30F, dated December 19, 2005

[a] Obtained from AP-42 Table 3.1-3 revised 4/00 for natural gas-fired combustion turbines. Formaldehyde, Benzene, and Acrolein emission factors are from the Background document for AP-42 Section 3.1, Table 3.4-1 for a natural gas fired combustion turbine with an oxidation catalyst. PAH emission factor for uncontrolled natural gas fired turbine. Hexane emission factor from California Air Toxic Emission Factor database.

[b] Based on an exhaust NH_3 limit of 5 ppmv @ 15% O_2 and a F-factor of 8710. This value represents 24 hours per day and 365 days per year of operation.

[c] Carcinogenic PAHs only; naphthalene considered separately. Emission Factor based on two separate source tests (2002 and 2004) from the Delta Energy Center located in Pittsburg, CA.

[d] Calculated assuming 8,760 hours per year per unit to provide a conservative estimate of toxic emissions with actual operations expected to be 5,475 hours per year per unit.

TABLE 8.1B-6BR

AES Highgrove Cooling Tower Toxic Emissions Analysis

Cooling Tower Recirculation Rate per Cooling Tower Cell[a]	7,000	GPM	7,005,600	Pounds/Hr
Drift Eliminator Efficiency[b]	0.001	Percent		
Cooling Tower Cycles of Concentration	10			
Cooling Tower Drift	70.056	Pounds/Hr		
Annual Operating Hours	8760	hours/yr		

Toxic Compounds[c] Chemical Name	CAS Number	Design Case Cooling Tower Influent mg/L	Max. TDS for Cooling Tower Discharge mg/L	Cooling Tower Emissions Per CT lb/hr	Annual Cooling Tower Toxic Emissions per CT[d] lb/yr
Arsenic	7440-38-2	0.000637	0.00637	4.46E-07	3.91E-03
Copper	7440-50-8	0.00159	0.0159	1.11E-06	9.76E-03
Nickel	7440-02-0	0.00182	0.0182	1.28E-06	1.12E-02
Silver	7440-22-4	0.0074	0.074	5.18E-06	4.54E-02
Antimony	7440-36-0	0.001	0.01	7.01E-07	6.14E-03
Beryllium	7440-41-7	0.001	0.01	7.01E-07	6.14E-03
Cadmium	7440-43-9	0.0002	0.002	1.40E-07	1.23E-03
Chromium (total)	18540-29-9	0.001	0.01	7.01E-07	6.14E-03
Lead	7439-92-1	0.001	0.01	7.01E-07	6.14E-03
Manganese	7439-96-5	0.005	0.05	3.50E-06	3.07E-02
Mercury	7439-97-6	0.0005	0.005	3.50E-07	3.07E-03
Selenium	7782-49-2	0.001	0.01	7.01E-07	6.14E-03
Zinc	7440-66-6	0.005	0.05	3.50E-06	3.07E-02
Acrylonitrile	107-13-1	2	20	1.40E-03	1.23E+01
Allyl chloride	107-05-1	0.5	5	3.50E-04	3.07E+00
Benzene	71-43-2	0.5	5	3.50E-04	3.07E+00
Bromomethane	74-83-9	0.5	5	3.50E-04	3.07E+00
2-Butanone	78-93-3	2	20	1.40E-03	1.23E+01
Carbon disulfide	75-15-0	0.5	5	3.50E-04	3.07E+00
Carbon tetrachloride	56-23-5	0.5	5	3.50E-04	3.07E+00
Chlorobenzene	108-90-7	0.5	5	3.50E-04	3.07E+00
Chloroethane	75-00-3	0.5	5	3.50E-04	3.07E+00
Chloroform	67-66-3	0.5	5	3.50E-04	3.07E+00
1,2-Dibromo-3-chloropropane	96-12-8	0.5	5	3.50E-04	3.07E+00
1,2-Dibromoethane	106-93-4	0.5	5	3.50E-04	3.07E+00
1,4-Dichlorobenzene	106-46-7	0.5	5	3.50E-04	3.07E+00
1,1-Dichloroethane	75-34-3	0.5	5	3.50E-04	3.07E+00
1,2-Dichloroethane	107-06-2	0.5	5	3.50E-04	3.07E+00
1,1-Dichloroethene	75-35-4	0.5	5	3.50E-04	3.07E+00
Ethylbenzene	100-41-4	0.5	5	3.50E-04	3.07E+00
Methylene chloride	75-09-2	2	20	1.40E-03	1.23E+01
Methyl-t-butyl ether	1634-04-4	0.5	5	3.50E-04	3.07E+00
Naphthalene	91-20-3	0.5	5	3.50E-04	3.07E+00
Styrene	100-42-5	0.5	5	3.50E-04	3.07E+00
1,1,2,2-Tetrachloroethane	79-34-5	0.5	5	3.50E-04	3.07E+00
Tetrachloroethene	127-18-4	0.5	5	3.50E-04	3.07E+00
Toluene	108-88-3	0.5	5	3.50E-04	3.07E+00
1,1,1-Trichloroethane	71-55-6	0.5	5	3.50E-04	3.07E+00
1,1,2-Trichloroethane	79-00-5	0.5	5	3.50E-04	3.07E+00
Trichloroethene	79-01-6	0.5	5	3.50E-04	3.07E+00
Vinyl chloride	75-01-4	0.5	5	3.50E-04	3.07E+00
o-Xylene	95-47-6	0.5	5	3.50E-04	3.07E+00
m-Xylene	108-38-3	0.5	5	3.50E-04	3.07E+00
p-Xylene	106-42-3	0.5	5	3.50E-04	3.07E+00

1. Influent concentration data were tested on November 18, 2004 (Calscience Environmental Laboratories, Inc)
2. For chemicals that were not detected (ND) during the source test, the reporting limits were used to calculate the emissions.
3. It was assumed that the total chromium is hexavalent chromium

a. Marley NC Class model NC8312K 02
b. Vendor drift rate.
c. TDS from Well #2 water sample from 12/2004.
d. Calculated assuming 8,760 hours per year per tower to provide a conservative estimate of toxic emissions with actual operations expected to be 5,475 hours per year per tower.

TABLE 8.1B-7R

AES Highgrove Cooling Tower Criteria Emissions

Assumed

Cooling tower operates 15 hours/day, 365 days per year at the design recirculation rate with 10 cycles of concentration.
2 Cooling Tower Cells per CT.

Givens

Cooling Tower Recirculation Rate per Cooling Tower Cell[a]	7,000 GPM	7,005,600 Pounds/Hr per Tower (2-cells)
Drift Eliminator Efficiency[b]	0.0010 Percent	
Cooling Tower Cycles of Concentration	10	
Cooling Tower Drift	70.1 Pounds/Hr	

Component[c]	Design Case Cooling Tower Influent (mg/L)	Max. TDS for Cooling Tower Discharge (mg/L)	Cooling Tower $PM_{10/2.5}$ Emissions Per CT (Lb/Hr)	Annual Cooling Tower $PM_{10/2.5}$ Emissions per CT Tons/Year[d]	Annual Cooling Tower $PM_{10/2.5}$ Emissions for 3 CTs Tons/Year[d]
Total Dissolved Solids	280	**2,800**	0.20	0.54	1.61

Notes

a. Marley NC Class model NC8312K 02

b. Vendor drift rate.

c. TDS from Well #2 water sample from 12/2004.

d. Calculated assuming each tower operates 5,475 hours per year

TABLE 8.1B-9R
AES Highgrove Mitigation Liability for Ambient Air Temperature 30 F Case

Pollutant[1, 2]	Daily Emissions (Pounds)	Monthly Emissions (Pounds)	Average Daily (Pounds)	ERCs Liability (Pounds/Day)	1st Year RTCs Liability (Pounds)	RTCs Liability (Pounds)
NOx	575.3	17,834	594.5	-	255,989	209,978
CO	703.0	21,792	726.4	871.7	-	-
VOC	116.0	3,597	119.9	143.9	-	-
SO_2	29.3	908	30.3	36.3	-	-
PM_{10}[3]	285.0	8,835	294.5	353.4	-	-

Notes
1. Daily emissions based on 15 hours per day per CTG, plus 2 starts/stops for 3 CTG per day.
2. Hourly emissions used are based on 30 F, base load without evaporators operating.
3. PM_{10} emissions do not include the 3 cooling towers as they are exempt from SCAQMD ERC requirements.

Attachment AQ-9B

NOTE: This attachment contains revised tables and one figure from **AFC Appendix 8.1C**. The revisions resulted from additional air modeling described in Data Response #9. The letter "R" was added to the end of the table number to indicate that the table has been revised from the data originally presented in the AFC.

AES Highgrove AFC

Table 8.1C-1R Summary Table of Stack Parameters (ISCST3 Input)

97F							97F50L		97F75L		97FBL		97FBL + Evap	
	Source ID	Easting (X) (m)	Northing (Y) (m)	Base Elev. (m)	Stack Height (m)	Stack Diam. (m)	Temp. (K)	Exit Vel. (m/s)	Temp. (K)	Exit Vel. (m/s)	Temp. (K)	Exit Vel. (m/s)	Temp. (K)	Exit Vel. (m/s)
1	CTGSTK1	469380	3764693	286.21	27.43	4.11	688.32	20.732	679.04	25.756	697.37	29.584	690.59	30.66
2	CTGSTK2	469386.9	3764647	286.21	27.43	4.11	688.32	20.732	679.04	25.756	697.37	29.584	690.59	30.66
3	CTGSTK3	469393.8	3764600	286.21	27.43	4.11	688.32	20.732	679.04	25.756	697.37	29.584	690.59	30.66
4	CL1	469356.9	3764648	286.21	7.10	4.11	NA	NA	NA	NA	NA	NA	NA	NA
5	CL2	469361.9	3764648	286.21	7.10	4.11	NA	NA	NA	NA	NA	NA	NA	NA
6	CL3	469363.9	3764601	286.21	7.10	4.11	NA	NA	NA	NA	NA	NA	NA	NA
7	CL4	469368.9	3764601	286.21	7.10	4.11	NA	NA	NA	NA	NA	NA	NA	NA
8	CL5	469405.3	3764552	286.21	7.10	4.11	NA	NA	NA	NA	NA	NA	NA	NA
9	CL6	469410.3	3764552	286.21	7.10	4.11	NA	NA	NA	NA	NA	NA	NA	NA

80F							80F50L		80F75L		80FBL		80FBL + Evap	
	Source ID	Easting (X) (m)	Northing (Y) (m)	Base Elev. (m)	Stack Height (m)	Stack Diam. (m)	Temp. (K)	Exit Vel. (m/s)	Temp. (K)	Exit Vel. (m/s)	Temp. (K)	Exit Vel. (m/s)	Temp. (K)	Exit Vel. (m/s)
1	CTGSTK1	469380	3764693	286.21	27.43	4.11	689.26	24.12	679.26	29.97	693.71	35.23	690.93	35.66
2	CTGSTK2	469386.9	3764647	286.21	27.43	4.11	689.26	24.12	679.26	29.97	693.71	35.23	690.93	35.66
3	CTGSTK3	469393.8	3764600	286.21	27.43	4.11	689.26	24.12	679.26	29.97	693.71	35.23	690.93	35.66
4	CL1	469356.9	3764648	286.21	7.10	4.11	322.48	42.93	NA	NA	NA	NA	NA	NA
5	CL2	469361.9	3764648	286.21	7.10	4.11	322.48	42.93	NA	NA	NA	NA	NA	NA
6	CL3	469363.9	3764601	286.21	7.10	4.11	322.48	42.93	NA	NA	NA	NA	NA	NA
7	CL4	469368.9	3764601	286.21	7.10	4.11	322.48	42.93	NA	NA	NA	NA	NA	NA
8	CL5	469405.3	3764552	286.21	7.10	4.11	322.48	42.93	NA	NA	NA	NA	NA	NA
9	CL6	469410.3	3764552	286.21	7.10	4.11	322.48	42.93	NA	NA	NA	NA	NA	NA

30F							30F50L		30F75L		30FBL	
	Source ID	Easting (X) (m)	Northing (Y) (m)	Base Elev. (m)	Stack Height (m)	Stack Diam. (m)	Temp. (K)	Exit Vel. (m/s)	Temp. (K)	Exit Vel. (m/s)	Temp. (K)	Exit Vel. (m/s)
1	CTGSTK1	469380	3764693	286.21	27.43	4.11	674.82	24.64	664.82	30.76	668.15	36.58
2	CTGSTK2	469386.9	3764647	286.21	27.43	4.11	674.82	24.64	664.82	30.76	668.15	36.58
3	CTGSTK3	469393.8	3764600	286.21	27.43	4.11	674.82	24.64	664.82	30.76	668.15	36.58
4	CL1	469356.9	3764648	286.21	7.10	4.11	NA	NA	NA	NA	NA	NA
5	CL2	469361.9	3764648	286.21	7.10	4.11	NA	NA	NA	NA	NA	NA
6	CL3	469363.9	3764601	286.21	7.10	4.11	NA	NA	NA	NA	NA	NA
7	CL4	469368.9	3764601	286.21	7.10	4.11	NA	NA	NA	NA	NA	NA
8	CL5	469405.3	3764552	286.21	7.10	4.11	NA	NA	NA	NA	NA	NA
9	CL6	469410.3	3764552	286.21	7.10	4.11	NA	NA	NA	NA	NA	NA

AES Highgrove AFC
Table 8.1C-2aR Summary Table of Building Parameters (ISCST3 Input)

Building Name	Number of Tiers	Tier Number	Base Elevation (ft)	Tier Height (m)	Number of Corners	Corner 1 East (X) (m)	Corner 1 North (Y) (m)	Corner 2 East (X) (m)	Corner 2 North (Y) (m)	Corner 3 East (X) (m)	Corner 3 North (Y) (m)	Corner 4 East (X) (m)	Corner 4 North (Y) (m)	Corner 5 East (X) (m)	Corner 5 North (Y) (m)	Corner 6 East (X) (m)	Corner 6 North (Y) (m)	Corner 7 East (X) (m)	Corner 7 North (Y) (m)	Corner 8 East (X) (m)	Corner 8 North (Y) (m)
AIRIN1	1	1	939	11.97	8	469,354	3,764,673	469,358	3,764,673	469,358	3,764,672	469,369	3,764,672	469,369	3,764,666	469,358	3,764,666	469,358	3,764,664	469,354	3,764,664
AIRIN2	1	1	939	11.97	8	469,361	3,764,627	469,365	3,764,627	469,365	3,764,625	469,376	3,764,625	469,376	3,764,619	469,365	3,764,619	469,365	3,764,618	469,361	3,764,618
AIRIN3	1	1	939	11.97	8	469,368	3,764,580	469,372	3,764,580	469,372	3,764,578	469,383	3,764,578	469,383	3,764,572	469,372	3,764,572	469,372	3,764,571	469,368	3,764,571
CONWAR	1	1	939	7.32	4	469,451	3,764,653	469,469	3,764,653	469,469	3,764,610	469,451	3,764,610								
CAN1	1	1	939	11.58	5	469,375	3,764,677	469,384	3,764,677	469,385	3,764,690	469,380	3,764,693	469,375	3,764,690						
CAN2	1	1	939	11.58	5	469,382	3,764,631	469,391	3,764,631	469,392	3,764,644	469,387	3,764,647	469,382	3,764,643						
CAN3	1	1	939	11.58	5	469,389	3,764,584	469,399	3,764,584	469,399	3,764,597	469,394	3,764,600	469,389	3,764,597						
MISC1	1	1	939	4.00	4	469,403	3,764,665	469,410	3,764,665	469,410	3,764,656	469,403	3,764,656								
MISC2	1	1	939	4.00	4	469,410	3,764,619	469,417	3,764,619	469,417	3,764,609	469,410	3,764,609								
MISC3	1	1	939	4.00	4	469,411	3,764,566	469,418	3,764,566	469,418	3,764,557	469,411	3,764,557								
HeatEx1	1	1	939	4.88	4	469,366	3,764,653	469,366	3,764,656	469,378	3,764,656	469,378	3,764,653								
main1	1	1	939	4.52	4	469,369	3,764,666	469,369	3,764,671	469,377	3,764,671	469,377	3,764,666								
vent1	1	1	939	12.12	4	469,377	3,764,671	469,377	3,764,666	469,383	3,764,666	469,383	3,764,671								
gen1	1	1	939	8.76	4	469,384	3,764,671	469,391	3,764,671	469,391	3,764,667	469,384	3,764,667								
PWRCNTR1	1	1	939	5.79	4	469,410	3,764,648	469,410	3,764,652	469,425	3,764,652	469,425	3,764,648								
Main2	1	1	939	4.52	4	469,376	3,764,620	469,376	3,764,625	469,384	3,764,625	469,384	3,764,620								
Vent2	1	1	939	12.12	4	469,384	3,764,625	469,384	3,764,620	469,390	3,764,620	469,390	3,764,625								
Gen2	1	1	939	8.76	4	469,391	3,764,624	469,398	3,764,624	469,398	3,764,620	469,391	3,764,620								
HeatEx2	1	1	939	4.88	4	469,373	3,764,606	469,373	3,764,610	469,385	3,764,610	469,385	3,764,606								
PwrCntr2	1	1	939	5.79	4	469,405	3,764,628	469,405	3,764,633	469,433	3,764,633	469,433	3,764,628								
Main3	1	1	939	4.52	4	469,383	3,764,573	469,383	3,764,578	469,391	3,764,578	469,391	3,764,573								
Vent3	1	1	939	12.12	4	469,391	3,764,578	469,391	3,764,573	469,397	3,764,573	469,397	3,764,578								
Gen3	1	1	939	8.76	4	469,398	3,764,577	469,405	3,764,577	469,405	3,764,573	469,398	3,764,573								
HeatEx3	1	1	939	4.88	4	469,380	3,764,559	469,380	3,764,563	469,392	3,764,563	469,392	3,764,559								
PwrCntr3	1	1	939	5.79	4	469,413	3,764,581	469,413	3,764,586	469,428	3,764,586	469,428	3,764,581								
COOL3	1	1	939	5.58	4	469,403	3,764,555	469,403	3,764,548	469,412	3,764,548	469,412	3,764,555								
BakerTanks	1	1	939	3.56	4	469,443	3,764,707	469,443	3,764,695	469,453	3,764,695	469,453	3,764,707								
WaterTre	1	1	939	6.10	4	469,452	3,764,668	469,452	3,764,656	469,470	3,764,657	469,470	3,764,669								
Cooling1	1	1	939	5.58	4	469,355	3,764,652	469,355	3,764,644	469,364	3,764,644	469,364	3,764,652								
Cooling2	1	1	939	5.58	4	469,362	3,764,605	469,362	3,764,598	469,371	3,764,598	469,371	3,764,605								

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Table 8.1C-2bR Summary Table of Tank Parameters (ISCST3 Input)

	Number of Tiers	Tier Number	Base Elevation (ft)	Tank Height (m)	Tank Center UTM X (m)	Tank Center UTM Y (m)	Tank Diameter (ft)	Comments
Wastewater	1	1	939	7.3152	469,462	3,764,708	27	100,000-gallon capacity
Demineral	1	1	939	7.3152	469,462	3,764,694	27	100,000-gallon capacity
Raw Water	1	1	939	9.7536	469,462	3,764,679	44	350,000-gallon capacity

Table 8.1C-3R Screening Commissioning and Operational Modeling Parameters (Turbines only)

		NOx		CO		PM10		SO2		Velocity		Temperature	
	Scenario	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(m/s)	(ft/s)	F	K
Annual	30F Base Load	7.99	1.01	*	*	3.73	0.47	0.38	0.05	31.36	102.89	743.2	668.3
	30F 75% Load	6.66	0.84	*	*	3.73	0.47	0.31	0.04	26.37	86.53	736.7	664.7
	30F 50% Load	5.36	0.68	*	*	3.73	0.47	0.24	0.03	21.13	69.32	755.1	674.9
	80F Base Load + Evap	7.79	0.98	*	*	3.73	0.47	0.37	0.05	30.57	100.30	784.3	691.1
	80F Base Load	7.69	0.97	*	*	3.73	0.47	0.37	0.05	30.20	99.09	788.5	693.4
	80F 75% Load	6.48	0.82	*	*	3.73	0.47	0.30	0.04	25.69	84.30	763.4	679.5
	80F 50% Load	5.23	0.66	*	*	3.73	0.47	0.23	0.03	20.68	67.84	780.6	689.0
	97F Base Load + Evap	7.81	0.98	*	*	3.73	0.47	0.37	0.05	30.65	100.56	783.4	690.6
	97F Base Load	7.54	0.95	*	*	3.73	0.47	0.36	0.05	29.58	97.06	795.6	697.4
	97F 75% Load	6.50	0.82	*	*	3.73	0.47	0.30	0.04	25.76	84.50	762.6	679.0
	97F 50% Load	5.25	0.66	*	*	3.73	0.47	0.23	0.03	20.73	68.02	779.3	688.3
24-hour	30F Base Load	*	*	*	*	5.98	0.75	0.61	0.08	31.36	102.89	743.2	668.3
	30F 75% Load	*	*	*	*	5.98	0.75	0.49	0.06	26.37	86.53	736.7	664.7
	30F 50% Load	*	*	*	*	5.98	0.75	0.37	0.05	21.13	69.32	755.1	674.9
	80F Base Load + Evap	*	*	*	*	5.98	0.75	0.60	0.08	30.57	100.30	784.3	691.1
	80F Base Load	*	*	*	*	5.98	0.75	0.59	0.07	30.20	99.09	788.5	693.4
	80F 75% Load	*	*	*	*	5.98	0.75	0.48	0.06	25.69	84.30	763.4	679.5
	80F 50% Load	*	*	*	*	5.98	0.75	0.36	0.05	20.68	67.84	780.6	689.0
	97F Base Load + Evap	*	*	*	*	5.98	0.75	0.60	0.08	30.65	100.56	783.4	690.6
	97F Base Load	*	*	*	*	5.98	0.75	0.57	0.07	29.58	97.06	795.6	697.4
	97F 75% Load	*	*	*	*	5.98	0.75	0.48	0.06	25.76	84.50	762.6	679.0
	97F 50% Load	*	*	*	*	5.98	0.75	0.36	0.05	20.73	68.02	779.3	688.3
	Pre- break-in Checkout	*	*	*	*	*	*	*	*	17.22	56.49	818.0	709.8
	Controlled Break-in	*	*	*	*	*	*	*	*	17.22	56.49	818.0	709.8
	Water Injection	*	*	*	*	*	*	*	*	20.68	67.84	781.0	689.3
	Complete AVR	*	*	*	*	*	*	*	*	30.20	99.09	789.0	693.7
	SCR Commissioning	*	*	*	*	*	*	*	*	25.69	84.30	763.0	679.3
	Full load testing &	*	*	*	*	*	*	*	*	30.20	99.09	789.0	693.7
8-hour	30F Base Load	*	*	19.06	2.40	*	*	*	*	31.36	102.89	743.2	668.3
	30F 75% Load	*	*	16.77	2.11	*	*	*	*	26.37	86.53	736.7	664.7
	30F 50% Load	*	*	14.54	1.83	*	*	*	*	21.13	69.32	755.1	674.9
	80F Base Load + Evap	*	*	18.74	2.36	*	*	*	*	30.57	100.30	784.3	691.1
	80F Base Load	*	*	18.56	2.34	*	*	*	*	30.20	99.09	788.5	693.4
	80F 75% Load	*	*	16.48	2.08	*	*	*	*	25.69	84.30	763.4	679.5
	80F 50% Load	*	*	14.34	1.81	*	*	*	*	20.68	67.84	780.6	689.0
	97F Base Load + Evap	*	*	18.73	2.36	*	*	*	*	30.65	100.56	783.4	690.6
	97F Base Load	*	*	18.31	2.31	*	*	*	*	29.58	97.06	795.6	697.4
	97F 75% Load	*	*	16.53	2.08	*	*	*	*	25.76	84.50	762.6	679.0
	97F 50% Load	*	*	14.35	1.81	*	*	*	*	20.73	68.02	779.3	688.3
	Pre- break-in Checkout	*	*	55	6.93	*	*	*	*	17.22	56.49	818.0	709.8
	Controlled Break-in	*	*	60	7.56	*	*	*	*	17.22	56.49	818.0	709.8
	Water Injection	*	*	168	21.17	*	*	*	*	20.68	67.84	781.0	689.3
	Complete AVR	*	*	255	32.13	*	*	*	*	30.20	99.09	789.0	693.7
	SCR Commissioning	*	*	9	1.13	*	*	*	*	25.69	84.30	763.0	679.3
	Full load testing &	*	*	12	1.51	*	*	*	*	30.20	99.09	789.0	693.7
3-hour	30F Base Load	*	*	*	*	*	*	0.60	0.08	31.36	102.89	743.2	668.3
	30F 75% Load	*	*	*	*	*	*	0.54	0.07	26.37	86.53	736.7	664.7
	30F 50% Load	*	*	*	*	*	*	0.48	0.06	21.13	69.32	755.1	674.9
	80F Base Load + Evap	*	*	*	*	*	*	0.59	0.07	30.57	100.30	784.3	691.1
	80F Base Load	*	*	*	*	*	*	0.59	0.07	30.20	99.09	788.5	693.4
	80F 75% Load	*	*	*	*	*	*	0.53	0.07	25.69	84.30	763.4	679.5
	80F 50% Load	*	*	*	*	*	*	0.47	0.06	20.68	67.84	780.6	689.0
	97F Base Load + Evap	*	*	*	*	*	*	0.59	0.07	30.65	100.56	783.4	690.6
	97F Base Load	*	*	*	*	*	*	0.58	0.07	29.58	97.06	795.6	697.4
	97F 75% Load	*	*	*	*	*	*	0.53	0.07	25.76	84.50	762.6	679.0
	97F 50% Load	*	*	*	*	*	*	0.47	0.06	20.73	68.02	779.3	688.3
	Pre- break-in Checkout	*	*	*	*	*	*	*	*	17.22	56.49	818.0	709.8
	Controlled Break-in	*	*	*	*	*	*	*	*	17.22	56.49	818.0	709.8
	Water Injection	*	*	*	*	*	*	*	*	20.68	67.84	781.0	689.3
	Complete AVR	*	*	*	*	*	*	*	*	30.20	99.09	789.0	693.7
	SCR Commissioning	*	*	*	*	*	*	*	*	25.69	84.30	763.0	679.3
	Full load testing &	*	*	*	*	*	*	*	*	30.20	99.09	789.0	693.7
1-hour	30F Base Load	23.24	2.93	41.20	5.19	*	*	0.59	0.07	31.36	102.89	743.2	668.3
	30F 75% Load	22.76	2.87	39.57	4.99	*	*	0.57	0.07	26.37	86.53	736.7	664.7
	30F 50% Load	22.29	2.81	37.97	4.78	*	*	0.54	0.07	21.13	69.32	755.1	674.9
	80F Base Load + Evap	23.16	2.92	40.97	5.16	*	*	0.59	0.07	30.57	100.30	784.3	691.1
	80F Base Load	23.13	2.91	40.84	5.15	*	*	0.59	0.07	30.20	99.09	788.5	693.4
	80F 75% Load	22.70	2.86	39.35	4.96	*	*	0.56	0.07	25.69	84.30	763.4	679.5
	80F 50% Load	22.25	2.80	37.83	4.77	*	*	0.54	0.07	20.68	67.84	780.6	689.0
	97F Base Load + Evap	23.17	2.92	40.96	5.16	*	*	0.59	0.07	30.65	100.56	783.4	690.6
	97F Base Load	23.07	2.91	40.66	5.12	*	*	0.58	0.07	29.58	97.06	795.6	697.4
	97F 75% Load	22.70	2.86	39.39	4.96	*	*	0.56	0.07	25.76	84.50	762.6	679.0
	97F 50% Load	22.25	2.80	37.84	4.77	*	*	0.54	0.07	20.73	68.02	779.3	688.3
	Pre- break-in Checkout	91	11.47	55	6.93	*	*	*	*	17.22	56.49	818.0	709.8
	Controlled Break-in	99	12.47	60	7.56	*	*	*	*	17.22	56.49	818.0	709.8
	Water Injection	175	22.05	168	21.17	*	*	*	*	20.68	67.84	781.0	689.3
	Complete AVR	81	10.21	255	32.13	*	*	*	*	30.20	99.09	789.0	693.7
	SCR Commissioning	35	4.41	9	1.13	*	*	*	*	25.69	84.30	763.0	679.3
	Full load testing &	11	1.41	12	1.51	*	*	*	*	30.20	99.09	789.0	693.7

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Table 8.1C-4R Detailed Opeational Modeling Parameters (PM10 Only)

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)	PM10 (24-hr) (lb/hr)	PM10 (24-hr) (g/s)	PM10 Annual (lb/hr)	PM10 Annual (g/s)
CTGSTK1	North CTG Stack	469380	3764693	286.21	27.432	689	20.676	4.115	5.98	0.7539	3.73	0.4704
CTGSTK2	Middle CTG Stack	469387	3764647	286.21	27.432	689	20.676	4.115	5.98	0.7539	3.73	0.4704
CTGSTK3	South CTG STack	469394	3764600	286.21	27.432	689	20.676	4.115	5.98	0.7539	3.73	0.4704
CL1	West Cell for CTGSTK1	469357	3764648	286.21	7.1018	322.48	42.927	4.115	0.0981	0.0124	0.0613	0.0077
CL2	East Cell for CTGSTK1	469362	3764648	286.21	7.1018	322.48	42.927	4.115	0.0981	0.0124	0.0613	0.0077
CL3	West Cell for CTGSTK2	469364	3764601	286.21	7.1018	322.48	42.927	4.115	0.0981	0.0124	0.0613	0.0077
CL4	East Cell for CTGSTK2	469369	3764601	286.21	7.1018	322.48	42.927	4.115	0.0981	0.0124	0.0613	0.0077
CL5	West Cell for CTGSTK3	469405	3764552	286.21	7.1018	322.48	42.927	4.115	0.0981	0.0124	0.0613	0.0077
CL6	East Cell for CTGSTK3	469410	3764552	286.21	7.1018	322.48	42.927	4.115	0.0981	0.0124	0.0613	0.0077

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Table 8.1C-5R Commissioning Modeling Results Summary (ug/m3)

			NOx (ug/m3)				CO (ug/m3)			
	Scenario[1]	Model	All	STK1	STK2	STK3	All	STK1	STK2	STK3
8-hour	Pre- break-in Checkout	ISCST3	NA	NA	NA	NA	NA	49.1	44.0	40.2
	Controlled Break-in Operation	ISCST3	NA	NA	NA	NA	NA	53.6	48.0	43.9
	Water Injection Commissioning	ISCST3	NA	NA	NA	NA	NA	139.1	121.7	107.5
	Complete AVR Commissioning	ISCST3	NA	NA	NA	NA	NA	167.3	139.9	119.6
	SCR Commissioning	ISCST3	NA	NA	NA	NA	NA	6.6	5.7	4.9
	Full load testing & checkout	ISCST3	NA	NA	NA	NA	17.41	7.9	6.6	5.6
1-hour	Pre- break-in Checkout	ISCST3	NA	194.0	185.5	177.6	NA	117.2	112.1	107.3
	Controlled Break-in Operation	ISCST3	NA	211.0	201.8	193.2	NA	127.9	122.3	117.1
	Water Injection Commissioning [2]	ISCST3	NA	350.8	335.9	321.8	NA	336.7	322.4	309.0
	Water Injection Commissioning [2]	ISC_OLM	NA	126.6	110.4	106.8	NA	NA	NA	NA
	Complete AVR Commissioning	ISCST3	NA	133.1	128.0	123.1	NA	419.0	402.8	387.6
	SCR Commissioning	ISCST3	NA	63.6	61.1	58.6	NA	16.4	15.7	15.1
	Full load testing & checkout	ISCST3	53.0	18.4	17.7	17.0	56.9	19.7	19.0	18.2

[1] Commissioning schedule assumes only one unit is commissioned at a time with the exception of the full load and testing phase (during full load and testing all three units will be operated simultaneously).

[2] Impacts predicted for the water injection commissioning phase using ISCST3 exceeded the 1-hour standard when the background concentration was added. Therefore, ISC_OLM was used to refine the predicted impacts.

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Table 8.1C-6R Operational Modeling Results Summary (SCREENING)
Concentrations DO NOT Include Background.

		NOx (ug/m3)				CO (ug/m3)				PM10 (ug/m3)				SO2 (ug/m3)			
	Scenario	**All**	**STK1**	**STK2**	**STK3**	**All**	**STK1**	**STK2**	**STK3**	**All**	**STK1**	**STK2**	**STK3**	**All**	**STK1**	**STK2**	**STK3**
Annual	30F Base Load	0.753	0.254	0.250	0.249	*	*	*	*	0.3516	0.119	0.119	0.119	0.0361	0.012	0.012	0.012
	30F 75% Load	0.668	0.226	0.223	0.221	*	*	*	*	0.3745	0.127	0.127	0.127	0.0311	0.011	0.011	0.011
	30F 50% Load	0.573	0.194	0.193	0.189	*	*	*	*	0.3992	0.135	0.135	0.135	0.0255	0.009	0.009	0.009
	80F Base Load + Evap	0.734	0.248	0.244	0.243	*	*	*	*	0.3516	0.119	0.119	0.119	0.0351	0.012	0.012	0.012
	80F Base Load	0.728	0.246	0.242	0.241	*	*	*	*	0.3531	0.119	0.119	0.119	0.0347	0.012	0.012	0.012
	80F 75% Load	0.652	0.220	0.218	0.216	*	*	*	*	0.3755	0.127	0.127	0.127	0.0302	0.010	0.010	0.010
	80F 50% Load	0.561	0.190	0.189	0.185	*	*	*	*	0.3998	0.135	0.135	0.135	0.0248	0.008	0.008	0.008
	97F Base Load + Evap	0.735	0.249	0.244	0.243	*	*	*	*	0.3513	0.119	0.119	0.119	0.0351	0.012	0.012	0.012
	97F Base Load	0.718	0.243	0.238	0.238	*	*	*	*	0.3552	0.120	0.120	0.120	0.0341	0.012	0.012	0.012
	97F 75% Load	0.653	0.221	0.218	0.216	*	*	*	*	0.3753	0.127	0.127	0.127	0.0303	0.010	0.010	0.010
	97F 50% Load	0.562	0.190	0.189	0.185	*	*	*	*	0.3996	0.135	0.135	0.135	0.0249	0.008	0.008	0.008
24-hour	30F Base Load	*	*	*	*	*	*	*	*	3.5057	1.297	1.297	1.297	0.3602	0.133	0.133	0.133
	30F 75% Load	*	*	*	*	*	*	*	*	3.8835	1.459	1.459	1.459	0.3195	0.120	0.120	0.120
	30F 50% Load	*	*	*	*	*	*	*	*	4.2851	1.645	1.645	1.645	0.2666	0.102	0.102	0.102
	80F Base Load + Evap	*	*	*	*	*	*	*	*	3.5090	1.299	1.299	1.299	0.3495	0.129	0.129	0.129
	80F Base Load	*	*	*	*	*	*	*	*	3.5305	1.308	1.308	1.308	0.3464	0.128	0.128	0.128
	80F 75% Load	*	*	*	*	*	*	*	*	3.9040	1.469	1.469	1.469	0.3105	0.117	0.117	0.117
	80F 50% Load	*	*	*	*	*	*	*	*	4.2970	1.651	1.651	1.651	0.2590	0.100	0.100	0.100
	97F Base Load + Evap	*	*	*	*	*	*	*	*	3.5037	1.297	1.297	1.297	0.3501	0.130	0.130	0.130
	97F Base Load	*	*	*	*	*	*	*	*	3.5672	1.324	1.324	1.324	0.3417	0.127	0.127	0.127
	97F 75% Load	*	*	*	*	*	*	*	*	3.9000	1.467	1.467	1.467	0.3110	0.117	0.117	0.117
	97F 50% Load	*	*	*	*	*	*	*	*	4.2935	1.649	1.649	1.649	0.2596	0.100	0.100	0.100
8-hour	30F Base Load	*	*	*	*	27.363	12.395	10.353	8.849	*	*	*	*	*	*	*	*
	30F 75% Load	*	*	*	*	27.834	12.271	10.453	8.981	*	*	*	*	*	*	*	*
	30F 50% Load	*	*	*	*	28.208	11.992	10.484	9.253	*	*	*	*	*	*	*	*
	80F Base Load + Evap	*	*	*	*	26.960	12.207	10.200	8.719	*	*	*	*	*	*	*	*
	80F Base Load	*	*	*	*	26.926	12.174	10.183	8.707	*	*	*	*	*	*	*	*
	80F 75% Load	*	*	*	*	27.569	12.133	10.349	8.894	*	*	*	*	*	*	*	*
	80F 50% Load	*	*	*	*	27.966	11.868	10.386	9.171	*	*	*	*	*	*	*	*
	97F Base Load + Evap	*	*	*	*	26.882	12.176	10.171	8.694	*	*	*	*	*	*	*	*
	97F Base Load	*	*	*	*	26.950	12.154	10.185	8.712	*	*	*	*	*	*	*	*
	97F 75% Load	*	*	*	*	27.620	12.159	10.369	8.911	*	*	*	*	*	*	*	*
	97F 50% Load	*	*	*	*	27.943	11.864	10.380	9.162	*	*	*	*	*	*	*	*
3-hour	30F Base Load	*	*	*	*	*	*	*	*	*	*	*	*	1.8776	0.650	0.650	0.650
	30F 75% Load	*	*	*	*	*	*	*	*	*	*	*	*	1.8682	0.648	0.648	0.648
	30F 50% Load	*	*	*	*	*	*	*	*	*	*	*	*	1.8325	0.637	0.637	0.637
	80F Base Load + Evap	*	*	*	*	*	*	*	*	*	*	*	*	1.8499	0.641	0.641	0.641
	80F Base Load	*	*	*	*	*	*	*	*	*	*	*	*	1.8473	0.640	0.640	0.640
	80F 75% Load	*	*	*	*	*	*	*	*	*	*	*	*	1.8494	0.642	0.642	0.642
	80F 50% Load	*	*	*	*	*	*	*	*	*	*	*	*	1.8152	0.631	0.631	0.631
	97F Base Load + Evap	*	*	*	*	*	*	*	*	*	*	*	*	1.8499	0.641	0.641	0.641
	97F Base Load	*	*	*	*	*	*	*	*	*	*	*	*	1.8442	0.639	0.639	0.639
	97F 75% Load	*	*	*	*	*	*	*	*	*	*	*	*	1.8499	0.642	0.642	0.642
	97F 50% Load	*	*	*	*	*	*	*	*	*	*	*	*	1.8160	0.631	0.631	0.631
1-hour	30F Base Load	109.349	37.879	36.427	35.056	193.878	67.161	64.585	62.155	*	*	*	*	2.7924	0.967	0.967	0.967
	30F 75% Load	118.563	41.152	39.493	37.929	206.119	71.542	68.658	65.939	*	*	*	*	2.9543	1.025	1.025	1.025
	30F 50% Load	128.067	44.544	42.656	40.878	218.157	75.879	72.662	69.633	*	*	*	*	3.1102	1.082	1.082	1.082
	80F Base Load + Evap	109.179	37.823	36.370	35.000	193.087	66.892	64.321	61.899	*	*	*	*	2.7776	0.962	0.962	0.962
	80F Base Load	109.686	38.003	36.538	35.158	193.662	67.099	64.513	62.076	*	*	*	*	2.7857	0.965	0.965	0.965
	80F 75% Load	118.894	41.273	39.603	38.030	206.150	71.563	68.668	65.940	*	*	*	*	2.9523	1.025	1.025	1.025
	80F 50% Load	128.194	44.592	42.698	40.915	217.970	75.820	72.600	69.568	*	*	*	*	3.1051	1.080	1.080	1.080
	97F Base Load + Evap	109.046	37.776	36.326	34.959	192.743	66.771	64.207	61.791	*	*	*	*	2.7753	0.961	0.961	0.961
	97F Base Load	110.565	38.315	36.831	35.433	194.830	67.517	64.901	62.437	*	*	*	*	2.8003	0.970	0.970	0.970
	97F 75% Load	118.801	41.239	39.572	38.001	206.148	71.560	68.667	65.941	*	*	*	*	2.9508	1.024	1.024	1.024
	97F 50% Load	128.117	44.564	42.672	40.891	217.833	75.771	72.554	69.526	*	*	*	*	3.1040	1.080	1.080	1.080

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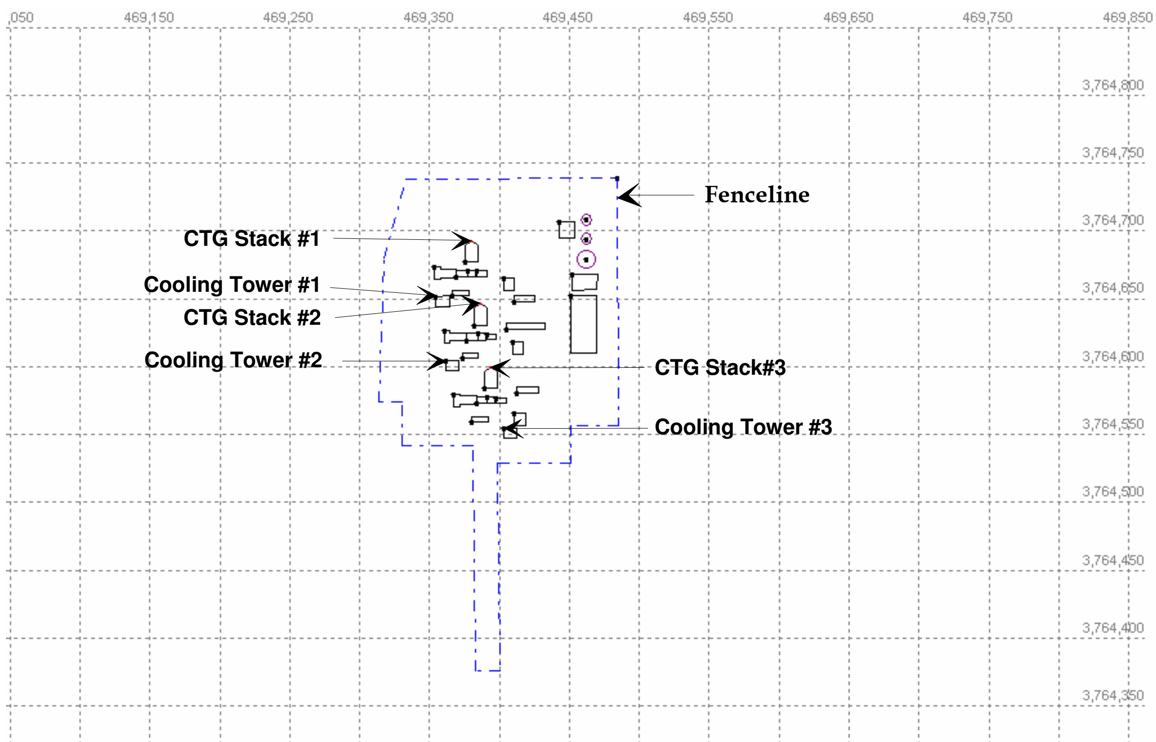
Table 8.1C-7R Operational Modeling Results Summary (Detailed - PM10 Only)

		PM10 Concentration (ug/m3)				
	Scenario	**All**	**STK1**	**STK2**	**STK3**	**Cooling Tower**
Annual	80F 50% Load	0.419	0.135	0.135	0.132	0.036
24-hour	80F 50% Load	4.500	1.651	1.445	1.372	0.348

Figure 8.1C-1R

Revised AESH Facility Layout used for ISCST3 Modeling



BACKGROUND: MODELING RESULTS FOR SENSITIVE RECEPTORS

The applicant states that the power plant project is 1,000 feet from the nearest classroom in the nearby proposed Colton High School #3 site. However, the students at the proposed school would be considered sensitive receptors and must be treated accordingly in the air quality analysis. Additionally, within one mile of the proposed power plant site, there are a significant number of residential neighborhoods. Neighborhoods such as these typically contain nursing homes, daycare facilities and even small clinics or hospitals. The applicant has made no indication in the application of any such facilities. These facilities would also be considered sensitive receptors and must be treated accordingly in the air quality analysis. While these receptors are sensitive to all pollutants emitted, the ambient air quality is such that only the PM10/PM2.5 emissions from the proposed power plant project may cause a direct impact on the receptors.

DATA REQUEST

17. Please provide a complete list, with an attached map, identifying all parks and recreational areas (see figure 2.2-3), daycare facilities, schools (public and private), nursing homes/facilities and clinics or hospitals within 10 kilometers of the proposed power plant project site. Please include on the list the project's PM10/PM2.5 air emissions impacts at each sensitive receptor listed.

    Response: As a result of the modeling, Tables AQ17-1A through AQ17-1C presented in Data Response #17, Set 1A have been revised. They have been replaced with the attached Tables AQ17-1AR through AQ17-1CR which show the project's 24-hour and annual PM_{10} and $PM_{2.5}$ impacts at each sensitive receptor within 10 kilometers of the project.

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Table AQ17-1AR Summary of Receptors and the Predicted PM10 and PM2.5 Impacts at Each Receptor

Source of Locations: EDR Offsite Receptor Report (January 20, 2006)

ISC Model Scenario: 80F 50%Load - Actual emissions for Gas Turbines and Cooling Towers - 24 hr and annual

Date: November 28, 2006

			UTM (NAD 27)		Predicted PM10 Impact (ug/m3)		Predicted PM2.5 Impact (ug/m3)	
EDR Receptor Name	NAME	EDR Receptor Type	Easting (m)	Northing (m)	24-Hour	Annual	24-Hour	Annual
A1	RUSD/HIGHGROVE HEADSTART STATE PRESCHOOL	Daycare	469900	3763783	0.4408	0.0372	0.4408	0.0372
A2	HIGHGROVE ELEMENTARY	Public Schools	469900	3763783	0.4408	0.0372	0.4408	0.0372
B3	IMMANUEL BAPTIST SCHOOL	Private School	470178	3764115	0.5571	0.0946	0.5571	0.0946
B4	IMMANUEL BAPTST PRESCHOOL	Daycare	470178	3764115	0.5571	0.0946	0.5571	0.0946
C5	GRAND TERRACE SCHOOL	GNIS Schools	470368	3765889	0.3474	0.0155	0.3474	0.0155
C6	GRAND TERRACE ELEMENTARY	Public Schools	470368	3765889	0.3474	0.0155	0.3474	0.0155
D7	TERRACE HILLS SCHOOL	GNIS Schools	471197	3765332	0.6079	0.0335	0.6079	0.0335
D8	TERRACE HILLS MIDDLE	Public Schools	471197	3765332	0.6079	0.0335	0.6079	0.0335
D9	AZURE HILLS ELEMENTARY SCHOOL	Private School	471105	3765554	0.4835	0.0269	0.4835	0.0269
11	CENTER FOR EMPLOYMENT TRAINING-RIVERSIDE	Colleges	467679	3762349	0.4109	0.0286	0.4109	0.0286
E12	TERRACE VIEW ELEMENTARY - CHILD CARE	Daycare	471570	3766661	0.4467	0.0223	0.4467	0.0223
E13	TERRACE VIEW SCHOOL	GNIS Schools	471570	3766661	0.4467	0.0223	0.4467	0.0223
14	FOUR D SUCCESS ACADEMY	Colleges	471203	3767327	0.4334	0.0147	0.4334	0.0147
15	TERRACE VIEW ELEMENTARY	Public Schools	471570	3766661	0.4467	0.0223	0.4467	0.0223
16	CALIFORNIA SCHOOL OF COURT REPORTING-RIVERSIDE	Colleges	468229	3761128	1.3720	0.0522	1.3720	0.0522
F18	UNITED TRUCK DRIVING SCHOOL	Colleges	468874	3760904	0.8112	0.0869	0.8112	0.0869
F19	UNITED TRUCK DRIVING SCHOOL	Colleges	468874	3760904	0.8112	0.0869	0.8112	0.0869
20	SAN SALVADOR SCHOOL	GNIS Schools	469452	3768220	0.4901	0.0198	0.4901	0.0198
G21	WESTERN HEALTHCARE CENTER	Nursing Homes	472403	3767324	0.2371	0.0093	0.2371	0.0093
G22	KINDER CARE LEARNING CENTER	Private School	472495	3767324	0.2545	0.0096	0.2545	0.0096
23	COMPUTER EDUCATION INSTITUTE-RIVERSIDE	Colleges	467951	3760907	1.1612	0.0521	1.1612	0.0521
H24	CITY OF COLTON/WILSON ELEMENTARY SCHOOL	Daycare	470007	3768440	0.6342	0.0237	0.6342	0.0237
H25	WILSON SCHOOL	GNIS Schools	470007	3768440	0.6342	0.0237	0.6342	0.0237
I26	FREMONT ELEMENTARY	Public Schools	466476	3761688	0.3204	0.0193	0.3204	0.0193
27	UNIVERSITY HEIGHTS MIDDLE	Public Schools	468873	3760571	0.8142	0.0887	0.8142	0.0887
I28	RUSD/FREMONT HEADSTART SITE	Daycare	466476	3761688	0.3204	0.0193	0.3204	0.0193
29	TEMPLE CHRISTIAN SCHOOL	Private School	469176	3768553	0.6463	0.0260	0.6463	0.0260
I30	FREMONT SCHOOL	GNIS Schools	466476	3761688	0.3204	0.0193	0.3204	0.0193
J31	EAST VALLEY COMMUNITY DAY	Public Schools	471390	3767992	0.5790	0.0196	0.5790	0.0196
K32	HIGHLAND ELEMENTARY	Public Schools	469796	3760347	1.6912	0.1515	1.6912	0.1515
J33	SUMMIT CAREER COLLEGE	Colleges	471574	3767992	0.4976	0.0166	0.4976	0.0166
K35	UNIVERSITY CHILDRENS CENTER & PRESCHOOL	Daycare	469796	3760347	1.6912	0.1515	1.6912	0.1515
37	NORTH HIGH SCHOOL	GNIS Schools	468132	3760019	1.1203	0.0516	1.1203	0.0516
M38	ISLAMIC ACADEMY OF RIVERSIDE	Daycare	469055	3759684	0.6630	0.0898	0.6630	0.0898
M39	RIVERSIDE GARDEN SCHOOL	Private School	469055	3759684	0.6630	0.0898	0.6630	0.0898
40	RECHE CANYON REHAB & HEALTH CARE CENTER	Nursing Homes	473510	3767210	0.4107	0.0176	0.4107	0.0176
41	COOLEY RANCH ELEMENTARY	Public Schools	471397	3770431	1.5735	0.0287	1.5735	0.0287
42	COLTON HIGH	Public Schools	469088	3769663	0.5728	0.0233	0.5728	0.0233
N43	UNIVERSITY OF CALIFORNIA-RIVERSIDE	Colleges	469236	3758574	0.9439	0.1147	0.9439	0.1147
44	SLOVER MOUNTAIN HIGH (CONT.)	Public Schools	468165	3769777	0.6665	0.0246	0.6665	0.0246
45	SOMOS HERMANAS UNIDAS	Colleges	470380	3769880	0.7824	0.0226	0.7824	0.0226
O46	PLYMOUTH TOWER	Nursing Homes	465824	3760360	0.4126	0.0215	0.4126	0.0215
P47	APPLE TREE LEARNING CENTER	Daycare	471086	3759345	1.1875	0.0971	1.1875	0.0971
N48	UNIVERSITY OF CALIFORNIA RIVERSIDE	GNIS Schools	469236	3758574	0.9439	0.1147	0.9439	0.1147
P49	BIG SPRINGS SCHOOL	Private School	471086	3759345	1.1875	0.0971	1.1875	0.0971
Q50	RUSD/LONGFELLOW HEADSTART	Daycare	466838	3759580	0.8883	0.0444	0.8883	0.0444
Q51	LONGFELLOW ELEMENTARY	Public Schools	466838	3759580	0.8883	0.0444	0.8883	0.0444
Q52	LONGFELLOW SCHOOL	GNIS Schools	466838	3759580	0.8883	0.0444	0.8883	0.0444
53	RECHE CANYON ELEMENTARY	Public Schools	474984	3765986	0.5107	0.0490	0.5107	0.0490
O54	CONTINUATION SCHOOL	GNIS Schools	466008	3760138	0.3904	0.0242	0.3904	0.0242
55	BRYANT SCHOOL	GNIS Schools	464995	3760918	0.2599	0.0163	0.2599	0.0163
R56	NAACP HEAD START/STATE PRESCHOOL	Daycare	467206	3759246	1.0104	0.0472	1.0104	0.0472
S58	WASHINGTON HIGH (ALTER.)	Public Schools	471119	3769989	1.1657	0.0192	1.1657	0.0192
59	ARROWHEAD REGIONAL MEDICAL CENTER	Medical Center	467428	3770001	0.6172	0.0202	0.6172	0.0202
R60	UNIVERSITY HEIGHTS JUNIOR HIGH SCHOOL	GNIS Schools	467206	3759246	1.0104	0.0472	1.0104	0.0472
S61	WASHINGTON SCHOOL	GNIS Schools	471119	3769989	1.1657	0.0192	1.1657	0.0192
T62	GRANT SCHOOL	GNIS Schools	469552	3770659	0.5796	0.0285	0.5796	0.0285
T63	GRANT (ULYSSES) ELEMENTARY	Public Schools	469552	3770659	0.5796	0.0285	0.5796	0.0285
64	REALTY INSTITUTE	Colleges	473423	3769095	0.2753	0.0089	0.2753	0.0089
U65	ST. JOHN'S LUTHERAN EVANGELICAL CHURCH OF COLTOI	Daycare	470383	3770656	0.5067	0.0202	0.5067	0.0202

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Table AQ17-1AR Summary of Receptors and the Predicted PM10 and PM2.5 Impacts at Each Receptor

Source of Locations: EDR Offsite Receptor Report (January 20, 2006)

ISC Model Scenario: 80F 50%Load - Actual emissions for Gas Turbines and Cooling Towers - 24 hr and annual

Date: November 28, 2006

			UTM (NAD 27)		Predicted PM10 Impact (ug/m3)		Predicted PM2.5 Impact (ug/m3)	
EDR Receptor Name	NAME	EDR Receptor Type	Easting (m)	Northing (m)	24-Hour	Annual	24-Hour	Annual
U66	IMMACULATE CONCEPTION SCHOOL	GNIS Schools	470383	3770656	0.5067	0.0202	0.5067	0.0202
V67	LINCOLN SCHOOL	GNIS Schools	470660	3770655	0.8872	0.0207	0.8872	0.0207
V68	LINCOLN (ABRAHAM) ELEMENTARY	Public Schools	470660	3770655	0.8872	0.0207	0.8872	0.0207
69	HYATT SCHOOL	GNIS Schools	471269	3758568	1.1124	0.0932	1.1124	0.0932
W70	CHESTMORE ELEMENTARY	Public Schools	463727	3767464	0.4823	0.0320	0.4823	0.0320
W71	CJUSD/CRESTMORE SITE	Daycare	463727	3767464	0.4823	0.0320	0.4823	0.0320
W72	CRESTMORE SCHOOL	GNIS Schools	463727	3767464	0.4823	0.0320	0.4823	0.0320
X73	ST. FRANCES DE SALES PRESCHOOL	Daycare	465544	3759363	0.3637	0.0245	0.3637	0.0245
X74	ST FRANCIS DE SALES ELEM SCHOOL	Private School	465544	3759363	0.3637	0.0245	0.3637	0.0245
Y75	CJUSD/ALICE BIRNEY ELEMENTARY SCHOOL	Daycare	471305	3770653	1.0804	0.0183	1.0804	0.0183
X76	SAINT FRANCIS SCHOOL	GNIS Schools	465544	3759363	0.3637	0.0245	0.3637	0.0245
77	UNIVERSITY OF CALIFORNIA EXPERIMENT STATION	GNIS Schools	468957	3758021	0.5636	0.0728	0.5636	0.0728
Y78	BIRNEY SCHOOL	GNIS Schools	471305	3770653	1.0804	0.0183	1.0804	0.0183
79	COLTON MIDDLE	Public Schools	469369	3770992	0.5508	0.0264	0.5508	0.0264
Z80	LINCOLN (ABRAHAM) CONTINUATION	Public Schools	466188	3758807	0.8432	0.0397	0.8432	0.0397
Z81	LEARNING CENTER	GNIS Schools	466188	3758585	0.7663	0.0400	0.7663	0.0400
AA82	ROGERS (PAUL) ELEMENTARY	Public Schools	468723	3771105	0.4849	0.0249	0.4849	0.0249
AA83	CITY OF COLTON/PAUL ROGERS ELEMENTARY SCHOOL	Daycare	468723	3771105	0.4849	0.0249	0.4849	0.0249
Y84	BIRNEY (ALICE) ELEMENTARY	Public Schools	471305	3770653	1.0804	0.0183	1.0804	0.0183
AB85	RIVERSIDE FAITH TEMPLE CHURCH TODDLER CENTER	Daycare	466649	3758472	1.0369	0.0435	1.0369	0.0435
AB86	EASTSIDE CHRISTIAN ACADEMY	Private School	466649	3758472	1.0369	0.0435	1.0369	0.0435
AC87	EMERSON SCHOOL	GNIS Schools	467387	3758248	1.2787	0.0400	1.2787	0.0400
AA88	ROGERS SCHOOL	GNIS Schools	468723	3771105	0.4849	0.0249	0.4849	0.0249
AC89	EMERSON ELEMENTARY	Public Schools	467387	3758248	1.2787	0.0400	1.2787	0.0400
90	INTERNAL CONTROL	Colleges	473059	3770981	0.4854	0.0159	0.4854	0.0159
AD91	GRANT SCHOOL	GNIS Schools	464713	3759588	0.2987	0.0166	0.2987	0.0166
Z92	OUR LADY OF GUADALUPE ACADEMY	GNIS Schools	466188	3758585	0.7663	0.0400	0.7663	0.0400
AD93	RIVERSIDE COMMUNITY HOSPITAL	Medical Center	464897	3759366	0.3667	0.0172	0.3667	0.0172
AD94	RIVERSIDE COMMUNITY HOSPITAL	Nursing Homes	464897	3759366	0.3667	0.0172	0.3667	0.0172
AD95	RUSD/GRANT ELEMENTARY SCHOOL	Daycare	464713	3759588	0.2987	0.0166	0.2987	0.0166
AD96	GRANT ELEMENTARY	Public Schools	464713	3759588	0.2987	0.0166	0.2987	0.0166
AD97	RIVERSIDE COMMUNITY HOSPITAL	AHA Hospitals	464897	3759366	0.3667	0.0172	0.3667	0.0172
98	CRESTVIEW CONVALESCENT HOSPITAL	Nursing Homes	465861	3770339	0.5247	0.0141	0.5247	0.0141
AD100	CALVARY PRESBYTERIAN CHURCH NS	Private School	464804	3759255	0.3642	0.0169	0.3642	0.0169
AD101	CALVARY PRESBYTERIAN CHURCH NURSERY SCHOOL	Daycare	464804	3759255	0.3642	0.0169	0.3642	0.0169
AE102	LOMA LINDA UNIVERSITY	GNIS Schools	475910	3767425	0.5276	0.0225	0.5276	0.0225
103	GARCIA (ERNEST) ELEMENTARY	Public Schools	467894	3771441	0.6564	0.0214	0.6564	0.0214
104	LOMA LINDA UNIVERSITY MED CNTR	AHA Hospitals	475910	3767425	0.5276	0.0225	0.5276	0.0225
AF105	BEVERLY MANOR RIVERSIDE	Nursing Homes	463974	3759480	0.2533	0.0145	0.2533	0.0145
AG106	ARBUCKLE SCHOOL	GNIS Schools	462690	3761813	0.3293	0.0152	0.3293	0.0152
107	MORRIS (GEORGIA) ELEMENTARY	Public Schools	464296	3771454	0.3218	0.0112	0.3218	0.0112
AG108	INA ARBUCKLE ELEMENTARY SCHOOL/HEADSTART	Daycare	462690	3761813	0.3293	0.0152	0.3293	0.0152
AG109	INA ARBUCKLE ELEMENTARY	Public Schools	462690	3761813	0.3293	0.0152	0.3293	0.0152
110	JEHUE (WILLIAM G.) MIDDLE	Public Schools	467063	3771222	0.5036	0.0181	0.5036	0.0181
AH111	ZIMMERMAN (WALTER) ELEMENTARY	Public Schools	467606	3768004	0.7934	0.0161	0.7934	0.0161
AH112	ZIMMERMAN SCHOOL	GNIS Schools	467606	3768004	0.7934	0.0161	0.7934	0.0161
AI113	MCKINLEY SCHOOL	GNIS Schools	469556	3771768	0.5044	0.0250	0.5044	0.0250
AE114	LOMA LINDA UNIVERSITY MEDICAL CENTER	Medical Center	475910	3767425	0.5276	0.0225	0.5276	0.0225
115	SHERIFFS ACADEMY	GNIS Schools	470618	3757350	0.8057	0.0960	0.8057	0.0960
AI116	MCKINLEY (WILLIAM) ELEMENTARY	Public Schools	469556	3771768	0.5044	0.0250	0.5044	0.0250
AF117	COMMUNITY CARE ON PALM	Nursing Homes	463696	3759259	0.2346	0.0138	0.2346	0.0138
AJ118	CENTRAL MIDDLE	Public Schools	464434	3758924	0.3689	0.0168	0.3689	0.0168
AJ119	RIVERSIDE COMMUNITY COLLEGE	Colleges	464526	3758923	0.3701	0.0168	0.3701	0.0168
120	SAN BERNARDINO VALLEY COLLEGE	GNIS Schools	471216	3771652	1.1889	0.0246	1.1889	0.0246
AK121	BLOOMINGTON JUNIOR HIGH SCHOOL	GNIS Schools	463642	3769238	0.4302	0.0186	0.4302	0.0186
AL122	EDEN LUTHERAN SCHOOL	Daycare	464250	3759257	0.3001	0.0157	0.3001	0.0157
AL123	EDEN LUTHERN DAY SCHOOL	Private School	464250	3759257	0.3001	0.0157	0.3001	0.0157
AK124	COLTON JUSD HEAD START BLOOMINGTON	Daycare	463642	3769238	0.4302	0.0186	0.4302	0.0186
AK125	BLOOMINTON MIDDLE	Public Schools	463642	3769238	0.4302	0.0186	0.4302	0.0186
AM126	URBITA SCHOOL	GNIS Schools	471862	3771539	1.4112	0.0256	1.4112	0.0256

AES Highgrove

Table AQ17-1AR Summary of Receptors and the Predicted PM10 and PM2.5 Impacts at Each Receptor
Source of Locations: EDR Offsite Receptor Report (January 20, 2006)
ISC Model Scenario: 80F 50%Load - Actual emissions for Gas Turbines and Cooling Towers - 24 hr and annual
Date: November 28, 2006

			UTM (NAD 27)		Predicted PM10 Impact (ug/m3)		Predicted PM2.5 Impact (ug/m3)	
EDR Receptor Name	NAME	EDR Receptor Type	Easting (m)	Northing (m)	24-Hour	Annual	24-Hour	Annual
AM127	URBITA ELEMENTARY	Public Schools	471862	3771539	1.4112	0.0256	1.4112	0.0256
AJ128	RIVERSIDE COMMUNITY CHILD DEVELOPMENT CENTER	Daycare	464526	3758923	0.3701	0.0168	0.3701	0.0168
AJ129	CITY COLLEGE	GNIS Schools	464710	3758701	0.3638	0.0173	0.3638	0.0173
AN130	GRIMES SCHOOL	GNIS Schools	464199	3770123	0.3783	0.0132	0.3783	0.0132
AJ131	CENTRAL JUNIOR HIGH SCHOOL	GNIS Schools	464434	3758924	0.3689	0.0168	0.3689	0.0168
AN132	GRIMES (RUTH) ELEMENTARY	Public Schools	464199	3770123	0.3783	0.0132	0.3783	0.0132
AL133	FIRST UNITED METHODIST CHURCH NURSERY SCHOOL	Daycare	464250	3759257	0.3001	0.0157	0.3001	0.0157
AO134	KINDER-CARE LEARNING CENTERS	Daycare	469600	3756910	0.9224	0.0961	0.9224	0.0961
AO135	KINDER CARE LEARNING CENTER	Private School	469600	3756910	0.9224	0.0961	0.9224	0.0961
136	LA PETITE ACADEMY	Private School	475270	3769533	0.2481	0.0109	0.2481	0.0109
AP137	UNION ACADEMY	GNIS Schools	475914	3768645	0.3329	0.0168	0.3329	0.0168
138	URBITA SCHOOL (HISTORICAL)	GNIS Schools	471862	3771539	1.4112	0.0256	1.4112	0.0256
AP139	LOMA LINDA ACADEMY	Private School	476005	3768423	0.3691	0.0185	0.3691	0.0185
AQ140	HERITAGE GRADENS HEALTH CARE CENTER	Nursing Homes	476649	3767312	0.4436	0.0248	0.4436	0.0248
AR141	LOMA LINDA CHILDRENS CENTER KI	Private School	476373	3767867	0.4616	0.0207	0.4616	0.0207
142	RIALTO HIGH	Public Schools	467066	3772109	0.4295	0.0176	0.4295	0.0176
AR143	LOMA LINDA INFANT CENTER	Daycare	476373	3767867	0.4616	0.0207	0.4616	0.0207
144	SIMPSON (SAMUEL W.) ELEMENTARY	Public Schools	465033	3771229	0.4286	0.0125	0.4286	0.0125
AQ145	LOMA LINDA UNIV COMMUNITY HOSP	AHA Hospitals	476649	3767312	0.4436	0.0248	0.4436	0.0248
AQ146	JERRY L PETTIS MEM VET HOSP	AHA Hospitals	476649	3767312	0.4436	0.0248	0.4436	0.0248
AS147	MILOR CONTINUATION HIGH	Public Schools	465495	3771449	0.5211	0.0134	0.5211	0.0134
AS148	ZUPANIC (CHARLES) HIGH (ALTER.)	Public Schools	465495	3771449	0.5211	0.0134	0.5211	0.0134
AT150	BLOOMINGTON CHRISTIAN DAY SCHOOL	Daycare	463738	3770236	0.3353	0.0131	0.3353	0.0131
AT151	BLOOMINGTON CHRISTIAN SCHOOL	Private School	463738	3770236	0.3353	0.0131	0.3353	0.0131
AT152	BRIGHT BEGINNINGS PRESCHOOL OF RIALTO	Daycare	463738	3770236	0.3353	0.0131	0.3353	0.0131
153	MULBERRY CHILDCARE	Private School	464108	3770567	0.3636	0.0126	0.3636	0.0126
154	MISSION JUNIOR HIGH SCHOOL	GNIS Schools	461676	3762483	0.3277	0.0224	0.3277	0.0224
AU155	RICHARDSON JUNIOR HIGH SCHOOL	GNIS Schools	471587	3772316	1.0229	0.0216	1.0229	0.0216
AU156	RICHARDSON PREP HI	Public Schools	471587	3772316	1.0229	0.0216	1.0229	0.0216
AV157	JUSD/WEST ELEMENTARY PRESCHOOL/HEADSTART	Daycare	461674	3761817	0.3223	0.0173	0.3223	0.0173
AV158	WEST RIVERSIDE ELEMENTARY	Public Schools	461674	3761817	0.3223	0.0173	0.3223	0.0173
AV159	WEST RIVERSIDE SCHOOL	GNIS Schools	461674	3761817	0.3223	0.0173	0.3223	0.0173
AW160	KELLEY SCHOOL	GNIS Schools	467810	3773769	0.5663	0.0188	0.5663	0.0188
161	METCALF SCHOOL	GNIS Schools	471403	3772427	1.0483	0.0218	1.0483	0.0218
AW162	KELLEY ELEMENTARY	Public Schools	467810	3773769	0.5663	0.0188	0.5663	0.0188
AX163	ALCOTT SCHOOL	GNIS Schools	466366	3756921	0.9197	0.0407	0.9197	0.0407
AX164	ALCOTT ELEMENTARY	Public Schools	466366	3756921	0.9197	0.0407	0.9197	0.0407
AR165	LINDA VALLEY CARE CENTER	Nursing Homes	476835	3767866	0.4633	0.0194	0.4633	0.0194
AZ170	BOYD ELEMENTARY	Public Schools	466237	3772333	0.6759	0.0142	0.6759	0.0142
AZ171	BOYD SCHOOL	GNIS Schools	466237	3772333	0.6759	0.0142	0.6759	0.0142
BA172	RIVERSIDE TEMPLE BETH EL NURSERY SCHOOL	Daycare	465812	3756923	0.9317	0.0383	0.9317	0.0383
BA173	TEMPLE BETH EL CHILD DEV CENTER	Private School	465812	3756923	0.9317	0.0383	0.9317	0.0383
BB174	VISTA PACIFIC CONVALESCENT	Nursing Homes	461123	3762596	0.3929	0.0201	0.3929	0.0201
BB175	VISTA PACIFIC CENTER	Nursing Homes	461123	3762596	0.3929	0.0201	0.3929	0.0201
BC176	SAN BERNARDINO CITY SCHOOL DIST.-ALLDRED CHILD DE	Daycare	471589	3772759	1.0205	0.0209	1.0205	0.0209
177	SENECA ELEMENTARY	Public Schools	472741	3756679	0.7627	0.0625	0.7627	0.0625
BA178	POLYTECHNIC HIGH	Public Schools	465811	3756701	0.9377	0.0377	0.9377	0.0377
179	HARRIS (RUTH O.) MIDDLE	Public Schools	461421	3767695	0.5529	0.0272	0.5529	0.0272
180	BLOOMINGTON HIGH SCHOOL	GNIS Schools	461885	3768469	0.3691	0.0245	0.3691	0.0245
BC181	LYDLE CREEK ELEMENTARY	Public Schools	471589	3772759	1.0205	0.0209	1.0205	0.0209
BC183	LYTLE CREEK SCHOOL	GNIS Schools	471589	3772759	1.0205	0.0209	1.0205	0.0209
BA184	POLYTECHNIC HIGH SCHOOL	GNIS Schools	465996	3756590	0.9311	0.0386	0.9311	0.0386
BD185	MAGNOLIA SCHOOL	GNIS Schools	463690	3757818	0.3632	0.0157	0.3632	0.0157
BE186	CARDEN SCHOOL	GNIS Schools	464797	3757259	0.7360	0.0294	0.7360	0.0294
187	STEPS COMMUNITY DAY	Public Schools	461029	3762153	0.3214	0.0193	0.3214	0.0193
BE188	MONTESSORI ACADEMY	Private School	464612	3757260	0.6246	0.0262	0.6246	0.0262
BF189	BURBANK ELEMENTARY	Public Schools	473524	3772199	0.5366	0.0144	0.5366	0.0144
BD190	ANZA CASTLE PRESCHOOL	Daycare	463690	3757818	0.3632	0.0157	0.3632	0.0157
BD191	MAGNOLIA ELEMENTARY SCHOOL	Daycare	463690	3757818	0.3632	0.0157	0.3632	0.0157
BE192	MONTESSORI ACADEMY	Daycare	464612	3757260	0.6246	0.0262	0.6246	0.0262

AES Highgrove

Table AQ17-1AR Summary of Receptors and the Predicted PM10 and PM2.5 Impacts at Each Receptor
Source of Locations: EDR Offsite Receptor Report (January 20, 2006)
ISC Model Scenario: 80F 50%Load - Actual emissions for Gas Turbines and Cooling Towers - 24 hr and annual
Date: November 28, 2006

			UTM (NAD 27)		Predicted PM10 Impact (ug/m3)		Predicted PM2.5 Impact (ug/m3)	
EDR Receptor Name	NAME	EDR Receptor Type	Easting (m)	Northing (m)	24-Hour	Annual	24-Hour	Annual
BD193	MAGNOLIA ELEMENTARY	Public Schools	463690	3757818	0.3632	0.0157	0.3632	0.0157
BD194	ST PAUL LUTHERAN SCHOOL	Private School	463782	3757707	0.3569	0.0158	0.3569	0.0158
195	MILL SCHOOL	GNIS Schools	474814	3771530	0.2704	0.0078	0.2704	0.0078
BF197	BURBANK SCHOOL	GNIS Schools	473524	3772199	0.5366	0.0144	0.5366	0.0144
BG198	HIDDEN SPRINGS ELEMENTARY	Public Schools	475244	3759666	0.4826	0.0574	0.4826	0.0574
BD199	KNOLLWOOD HOSPITAL	GNIS Schools	463506	3757929	0.3518	0.0153	0.3518	0.0153
BH200	KNOLLWOOD PSYCH & CHEMICAL DEPEND CTR	Medical Center	463513	3759814	0.3013	0.0171	0.3013	0.0171
BG201	VISTA HEIGHTS (MIDDLE)	Public Schools	475980	3758444	0.3522	0.0392	0.3522	0.0392
202	CURTIS (SAM V.) ELEMENTARY	Public Schools	465037	3772338	0.4671	0.0122	0.4671	0.0122
203	CALIFORNIA SOUTHERN LAW SCHOOL	Colleges	463781	3757485	0.3599	0.0158	0.3599	0.0158
204	PACHAPPA SCHOOL	GNIS Schools	464334	3757150	0.4794	0.0223	0.4794	0.0223
205	LEWIS (MARY B.) ELEMENTARY	Public Schools	461732	3770686	0.3129	0.0145	0.3129	0.0145
BI206	RIO VISTA HIGH (CONT.)	Public Schools	460389	3763818	0.4649	0.0233	0.4649	0.0233
BI207	NUEVA VISTA CONTINUATION HIGH	Public Schools	460389	3763818	0.4649	0.0233	0.4649	0.0233
BJ208	SMITH SCHOOL	GNIS Schools	463002	3770904	0.3016	0.0120	0.3016	0.0120
BJ209	SMITH (GERALD A.) ELEMENTARY	Public Schools	463002	3770904	0.3016	0.0120	0.3016	0.0120
BH210	FIRST CHRISTIAN NURSERY SCHOOL	Daycare	463413	3757708	0.3592	0.0151	0.3592	0.0151
BH211	COMMUNITY CARE AND REHAB CNTR	Nursing Homes	463413	3757708	0.3592	0.0151	0.3592	0.0151
BK212	ST. JOHNS CHILD CARE CENTER	Daycare	460476	3762488	0.3893	0.0188	0.3893	0.0188
BK213	RUSTIC LANE ELEMENTARY	Public Schools	460476	3762488	0.3893	0.0188	0.3893	0.0188
BL214	CASEY ELEMENTARY	Public Schools	467071	3773550	0.4230	0.0154	0.4230	0.0154
BL215	CASEY ELEMENTARY SCHOOL-ROOM E-4	Daycare	467071	3773550	0.4230	0.0154	0.4230	0.0154
BK216	RUBIDOUX HIGH SCHOOL	GNIS Schools	460566	3761933	0.3366	0.0193	0.3366	0.0193
217	VICTORIA ELEMENTARY	Public Schools	465347	3756038	0.8147	0.0334	0.8147	0.0334
BH219	GROWING PLACE, TOO	Daycare	463413	3757708	0.3592	0.0151	0.3592	0.0151
BM220	JUSD/PACIFIC AVENUE ELEMENTARY	Daycare	460748	3761267	0.3220	0.0148	0.3220	0.0148
BN221	RUSTIC LANE SCHOOL	GNIS Schools	460476	3762488	0.3893	0.0188	0.3893	0.0188
BH222	THE GROWING PLACE	Private School	463228	3757709	0.3259	0.0146	0.3259	0.0146
BM223	PACIFIC AVENUE ELEMENTARY	Public Schools	460748	3761267	0.3220	0.0148	0.3220	0.0148
BN224	JUSD/RUSTIC LANE ELEMENTARY STATE PRESCHOOL	Daycare	460476	3762488	0.3893	0.0188	0.3893	0.0188
BL225	CASEY SCHOOL	GNIS Schools	467071	3773550	0.4230	0.0154	0.4230	0.0154
BM226	PACIFIC AVENUE SCHOOL	GNIS Schools	460748	3761267	0.3220	0.0148	0.3220	0.0148
227	RUBIDOUX HIGH	Public Schools	460566	3761933	0.3366	0.0193	0.3366	0.0193
BO228	YMCA OF RIVERSIDE - HOPE LUTHERAN CHURCH	Daycare	465347	3756038	0.8147	0.0334	0.8147	0.0334
BP230	CASTLE VIEW ELEMENTARY	Public Schools	468301	3755140	0.5872	0.0782	0.5872	0.0782
BM232	TREE HOUSE PRE-SCHOOL, THE	Daycare	460748	3761267	0.3220	0.0148	0.3220	0.0148
233	SECURITY OFFICERS TRAINING ACADEMY	Colleges	473250	3773087	0.9620	0.0148	0.9620	0.0148
234	CANYON SPRINGS HIGH	Public Schools	475886	3757668	0.2806	0.0331	0.2806	0.0331
BO235	VICTORIA SCHOOL	GNIS Schools	465347	3756038	0.8147	0.0334	0.8147	0.0334
BP236	CASTLE VIEW SCHOOL	GNIS Schools	468301	3755140	0.5872	0.0782	0.5872	0.0782
237	VALLEY HYPNOSIS CENTER	Colleges	463502	3757042	0.3485	0.0153	0.3485	0.0153
BQ238	LEWIS SCHOOL	GNIS Schools	462171	3770686	0.4334	0.0143	0.4334	0.0143
BQ239	CASA MARIA CONVALESCENT HOSPITAL	Nursing Homes	462079	3770686	0.4107	0.0146	0.4107	0.0146
240	BRYN MAWR ELEMENTARY	Public Schools	478678	3766642	0.3574	0.0313	0.3574	0.0313
241	WATTS SCHOOL	GNIS Schools	465595	3773334	0.5793	0.0125	0.5793	0.0125
242	RIVERSIDE CHRISTIAN DAY SCHOOL	Private School	463683	3756044	0.4574	0.0200	0.4574	0.0200

AES Highgrove

Table AQ17-1BR Summary of Receptors and the Predicted PM10 and PM2.5 Impacts at Each Receptor

ISC Model Scenario: 80F 50%Load - Actual emissions for Gas Turbines and Cooling Towers - 24 hr and annual

Park Receptors
Date: November 28, 2006

	UTM (NAD 27)		Predicted PM10 Impact (ug/m3)		Predicted PM2.5 Impact (ug/m3)	
Name	Easting (m)	Northing (m)	24-Hour	Annual	24-Hour	Annual
Reid Park	467028	3763822	0.2758	0.0195	0.2758	0.0195
AB Brown Sports Complex	467396	3763303	0.2049	0.0158	0.2049	0.0158
Fairmount Park	465807	3761389	0.2425	0.0165	0.2425	0.0165
Samuel Evans Sports Complex	464626	3759203	0.3536	0.0166	0.3536	0.0166
Highland Park	469688	3760652	1.7764	0.1653	1.7764	0.1653
Pico Park	469929	3764642	0.1495	0.0164	0.1495	0.0164
Terrace Hills Community Park	471505	3765259	0.7534	0.0658	0.7534	0.0658
Colony Park	473868	3768043	0.3269	0.0099	0.3269	0.0099
Veterans Park	470302	3768412	1.1735	0.0236	1.1735	0.0236
Boardwell Park- Stratton Recreation Center	467219	3758473	1.2793	0.0430	1.2793	0.0430
Memorial Park Pool	461162	3761428	0.3090	0.0144	0.3090	0.0144
Fiesta Village	472175	3767383	0.2254	0.0092	0.2254	0.0092
Villegas Community Center	463435	3756880	0.3355	0.0151	0.3355	0.0151
Box Springs Mountain Park	473294	3762625	1.3250	0.2093	1.3250	0.2093
Agua Mansa Cementery	469120	3767970	0.4607	0.0195	0.4607	0.0195
Mt. Rubidoux Park	463795	3760243	0.4786	0.0390	0.4786	0.0390
White Park	465157	3760068	0.3252	0.0184	0.3252	0.0184
Newman Park	465047	3759410	0.3752	0.0182	0.3752	0.0182
Loring Park	464441	3760787	0.3219	0.0181	0.3219	0.0181
Carlson Park	463994	3760913	0.2966	0.0190	0.2966	0.0190
Tequesquito Arroyo Park	463612	3759280	0.2171	0.0136	0.2171	0.0136
Bobby Bonds Park and Sports Complex	467197	3759038	1.0565	0.0465	1.0565	0.0465
Dario Vasquez Park	466614	3758777	0.9856	0.0431	0.9856	0.0431
Lincoln Park	466061	3759062	0.8742	0.0367	0.8742	0.0367
Andulka Park	467800	3757545	0.6095	0.0484	0.6095	0.0484
Swanson Park	467246	3756264	0.8570	0.0606	0.8570	0.0606
Castleview Park	468314	3754789	0.5691	0.0753	0.5691	0.0753
Westbluff Park	476063	3758158	0.3336	0.0355	0.3336	0.0355
Hidden Springs Community Park	475142	3759897	0.4558	0.0616	0.4558	0.0616
Leonardo Baily Park	478909	3766858	0.3154	0.0281	0.3154	0.0281
Hulda Crooks Park	477526	3766287	0.4294	0.0380	0.4294	0.0380
Elmer Digno Park	475999	3768285	0.4212	0.0192	0.4212	0.0192
Sun Park	477504	3769020	0.3733	0.0167	0.3733	0.0167
Mill Community Park	474728	3771344	0.2745	0.0080	0.2745	0.0080
Lytle Creek Park	471558	3772567	1.0385	0.0216	1.0385	0.0216
Viaduct Park	471218	3773351	0.7748	0.0216	0.7748	0.0216
Municipal Baseball Park	472840	3772824	1.1400	0.0156	1.1400	0.0156
Meadowbrook Fields	473998	3773085	0.5140	0.0138	0.5140	0.0138
Nunez Park	470079	3773918	0.4143	0.0197	0.4143	0.0197
Nicholson Park	467830	3773548	0.5775	0.0189	0.5775	0.0189
Davis Park	468565	3771142	0.5690	0.0245	0.5690	0.0245
Margaret Todd Park	465257	3773356	0.5426	0.0121	0.5426	0.0121
Rialto City Park	465587	3773361	0.5772	0.0124	0.5772	0.0124
Anderson Park	464981	3771941	0.4633	0.0126	0.4633	0.0126
Rialto City Park	466120	3770743	0.5883	0.0149	0.5883	0.0149
George E Brown Jr Park	467002	3770536	0.8194	0.0183	0.8194	0.0183
Ayala Park	462678	3769688	0.3719	0.0168	0.3719	0.0168
Kessler Park	462974	3767297	0.4794	0.0218	0.4794	0.0218

AES Highgrove

Table AQ17-1BR Summary of Receptors and the Predicted PM10 and PM2.5 Impacts at Each Receptor

ISC Model Scenario: 80F 50%Load - Actual emissions for Gas Turbines and Cooling Towers - 24 hr and annual

Park Receptors
Date: November 28, 2006

	UTM (NAD 27)		Predicted PM10 Impact (ug/m3)		Predicted PM2.5 Impact (ug/m3)	
Name	Easting (m)	Northing (m)	24-Hour	Annual	24-Hour	Annual
Avalon Park	463822	3763811	0.4271	0.0292	0.4271	0.0292
Municipal Park	470968	3769859	1.1176	0.0207	1.1176	0.0207
Central Park	470657	3769894	1.1411	0.0223	1.1411	0.0223
Fleming Park	470144	3769830	0.4300	0.0216	0.4300	0.0216
Rich Dauer Park	472830	3767995	0.2168	0.0088	0.2168	0.0088
Riverside Sports Center	469295	3760024	0.8929	0.0974	0.8929	0.0974
Mount Vernon Park	470823	3760224	1.4274	0.1161	1.4274	0.1161
U C Riverside Stadium	469595	3759600	1.3936	0.1345	1.3936	0.1345
E T Patterson Park	467593	3759663	1.3087	0.0481	1.3087	0.0481
North Park	466079	3759752	0.4416	0.0295	0.4416	0.0295

AES Highgrove

Table AQ17-1CR Summary of Receptors and the Predicted PM10 and PM2.5 Impacts at Each Receptor

Source of Locations: EDR Offsite Receptor Report (January 20, 2006)
ISC Model Scenario: 80F 50%Load - Actual emissions for Gas Turbines and Cooling Towers - 24 hr and annual
Date: November 28, 2006

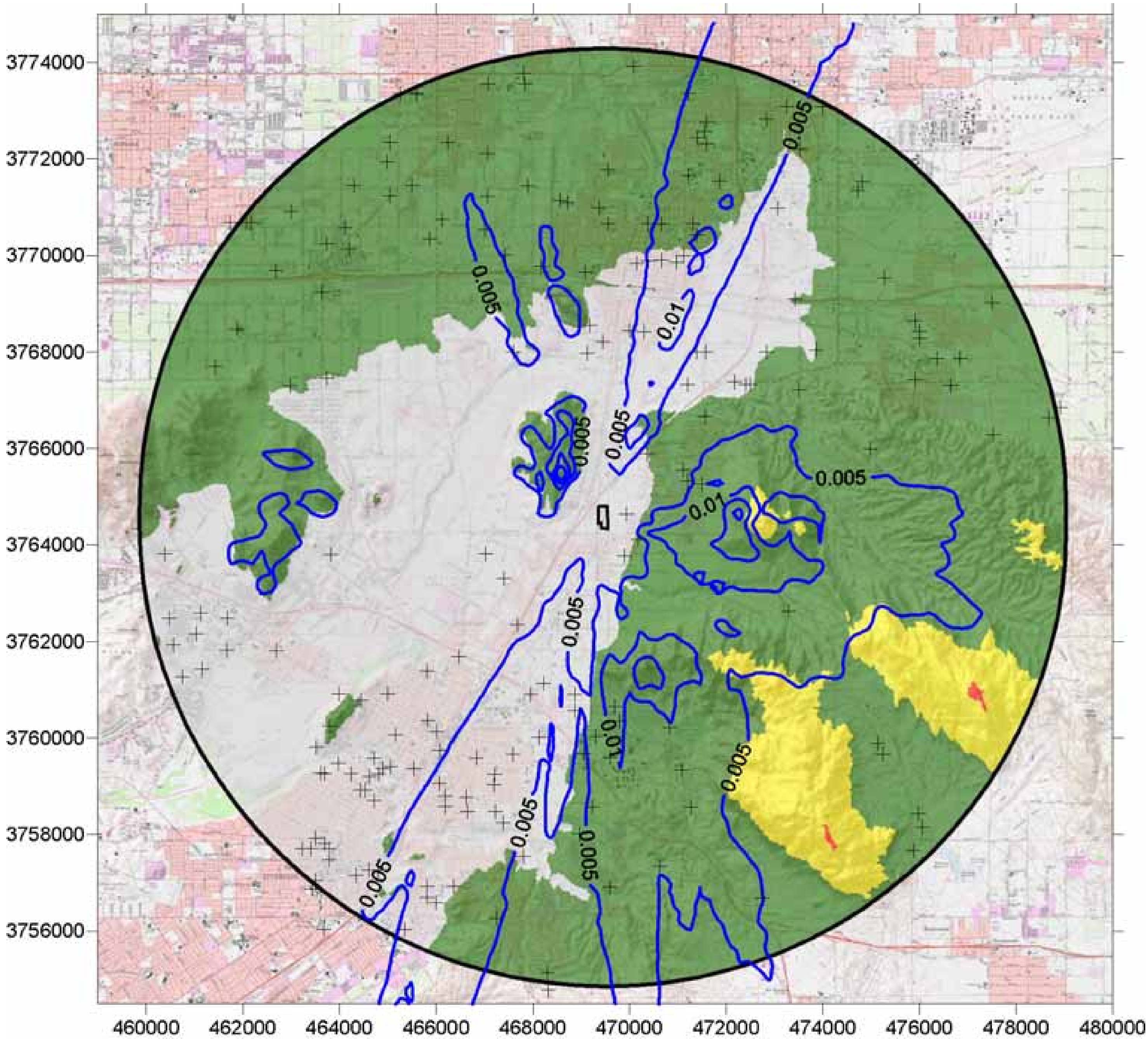
EDR Receptor Name	NAME	EDR Receptor Type	UTM (NAD 27) Easting* (m)	UTM (NAD 27) Northing* (m)	Predicted PM10 Impact (ug/m3) 24-Hour*	Predicted PM10 Impact (ug/m3) Annual*	Predicted PM2.5 Impact (ug/m3) 24-Hour*	Predicted PM2.5 Impact (ug/m3) Annual*
10	AZURE HILLS CHILDREN CENTER	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42
17	MY LITTLE SCHOOL HOUSE NURSERY	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42
L34	GATEWAY NURSEY SCHOOL	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42
L36	UNIVERSITY OF CALIFORNIA, RIVERSIDE CHILDRENS CTR.	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42
57	PRESBYTERIAN NURSERY SCHOOL	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42
99	ABC WONDERWORLD PRESCHOOL	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42
149	RUBIDOUX CHILD CARE CENTER	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42
AY167	FIRST BAPTIST DAY NURSERY	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42
AY168	IMMANUEL LUTHERAN PRESCHOOL	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42
169	THE GROWING PLACE	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42
182	RIALTO CHILD DEVELOPMENT CENTER	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42
196	JOYFUL NOISE	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42
218	YMCA/VICTORIA SCHOOL	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42
229	PEPPERCREEK PRESCHOOL	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42
231	GROWING PLACE, TOO, THE	Daycare	NA	NA	< 4.5	< 0.42	< 4.5	< 0.42

NA: Sites were listed in the EDR report but did not include an address or latitude/longitude. Assumed 24-hour and annual impacts are less than the maximum modeled impacts.

DATA REQUEST

18. Please provide maps showing isopleths of the project's PM10/PM2.5 air emission impacts for the maximum 24-hour and annual-average standards and all sensitive receptors listed in the above data request within 10 kilometers of the proposed power plant project site.

Response: Figures AQ18-1 through AQ18-4 present the project's PM_{10} and $PM_{2.5}$ impacts as a percentage of the federal standards.



LEGEND

- Project Site
- 6-Mile Buffer of Project Site

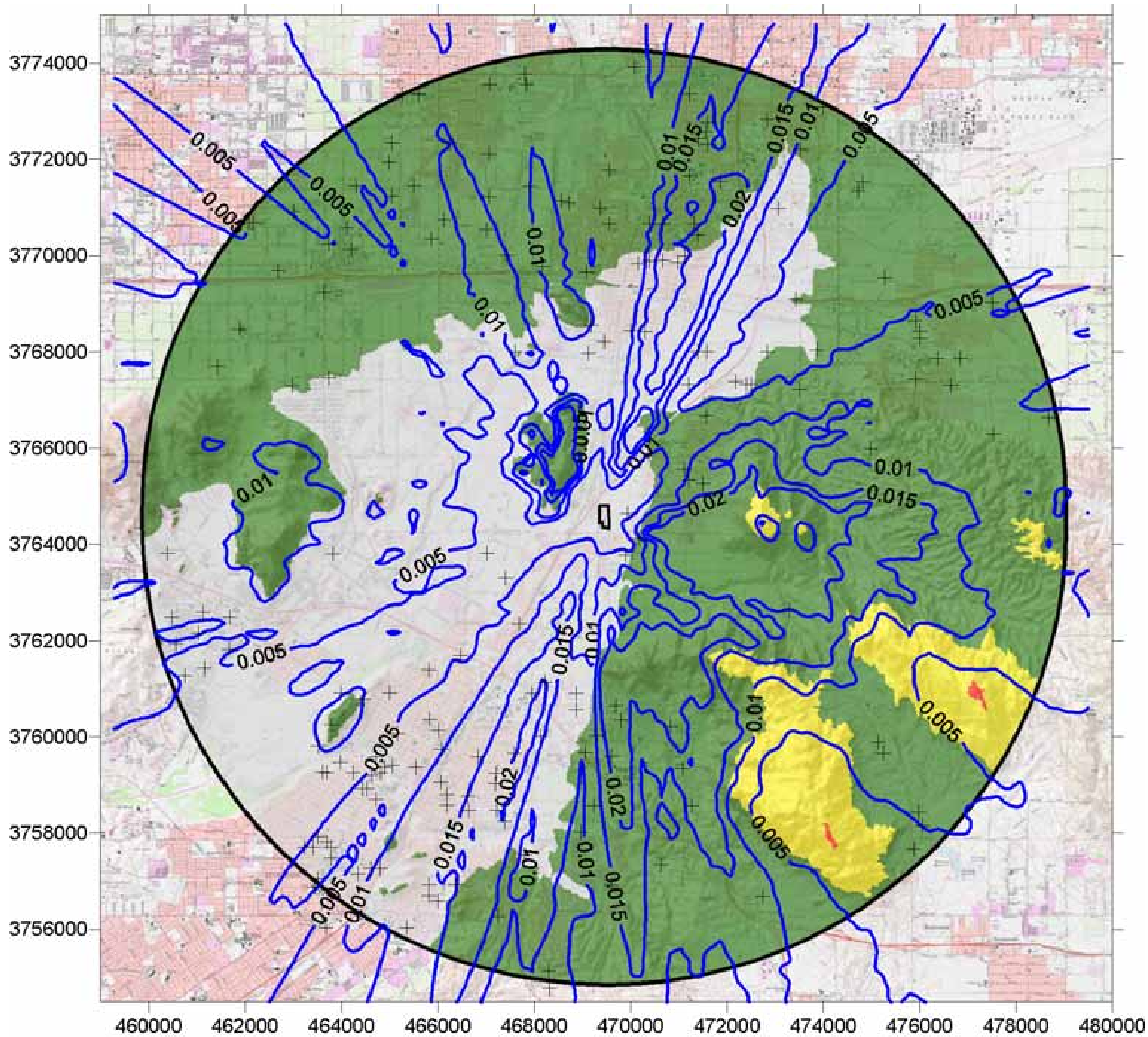
Elevations in feet above sea level

- 0 - 1,000
- 1,001 - 2,000
- 2,001 - 3,000
- 3,000+
- Sensitive Receptors within the 6-Mile Buffer

FIGURE AQ18-1
PERCENT (%) OF THE 24-HOUR PM10 NAAQS (150 ug/m3)
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA

CH2MHILL

ES112006001SAC fig_AQ18-1.ai 12-07-06 afint



LEGEND

Project Site

6-Mile Buffer of Project Site

Elevations in feet above sea level

0 - 1,000

1,001 - 2,000

2,001 - 3,000

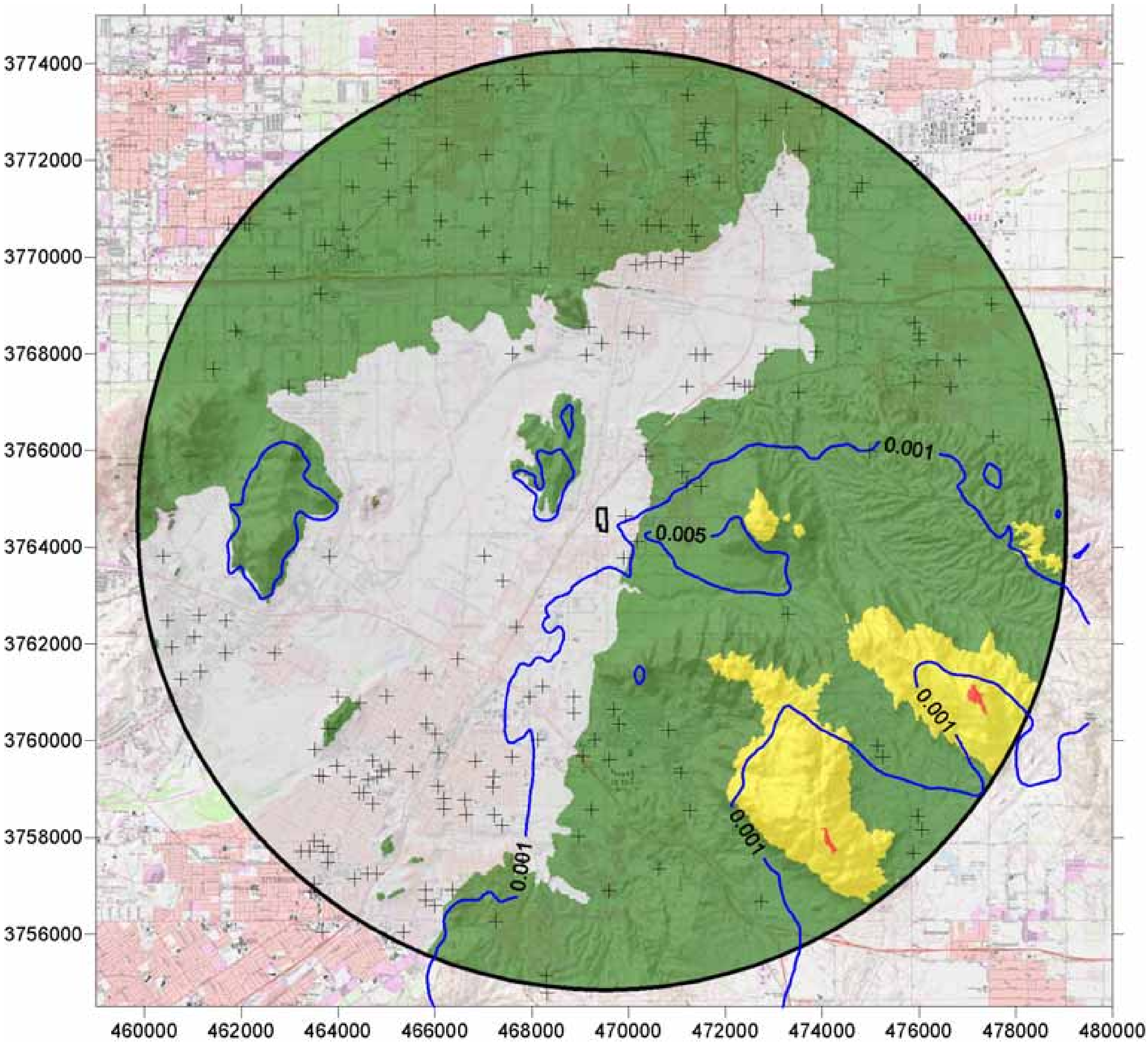
3,000+

Sensitive Receptors within the 6-Mile Buffer

FIGURE AQ18-2
PERCENT (%) OF THE 24-HOUR PM2.5 NAAQS (65 ug/m3)
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA

CH2MHILL

ES112006001SAC fig_AQ18-2.ai 12-07-06 afint



LEGEND

- Project Site
- 6-Mile Buffer of Project Site

Elevations in feet above sea level

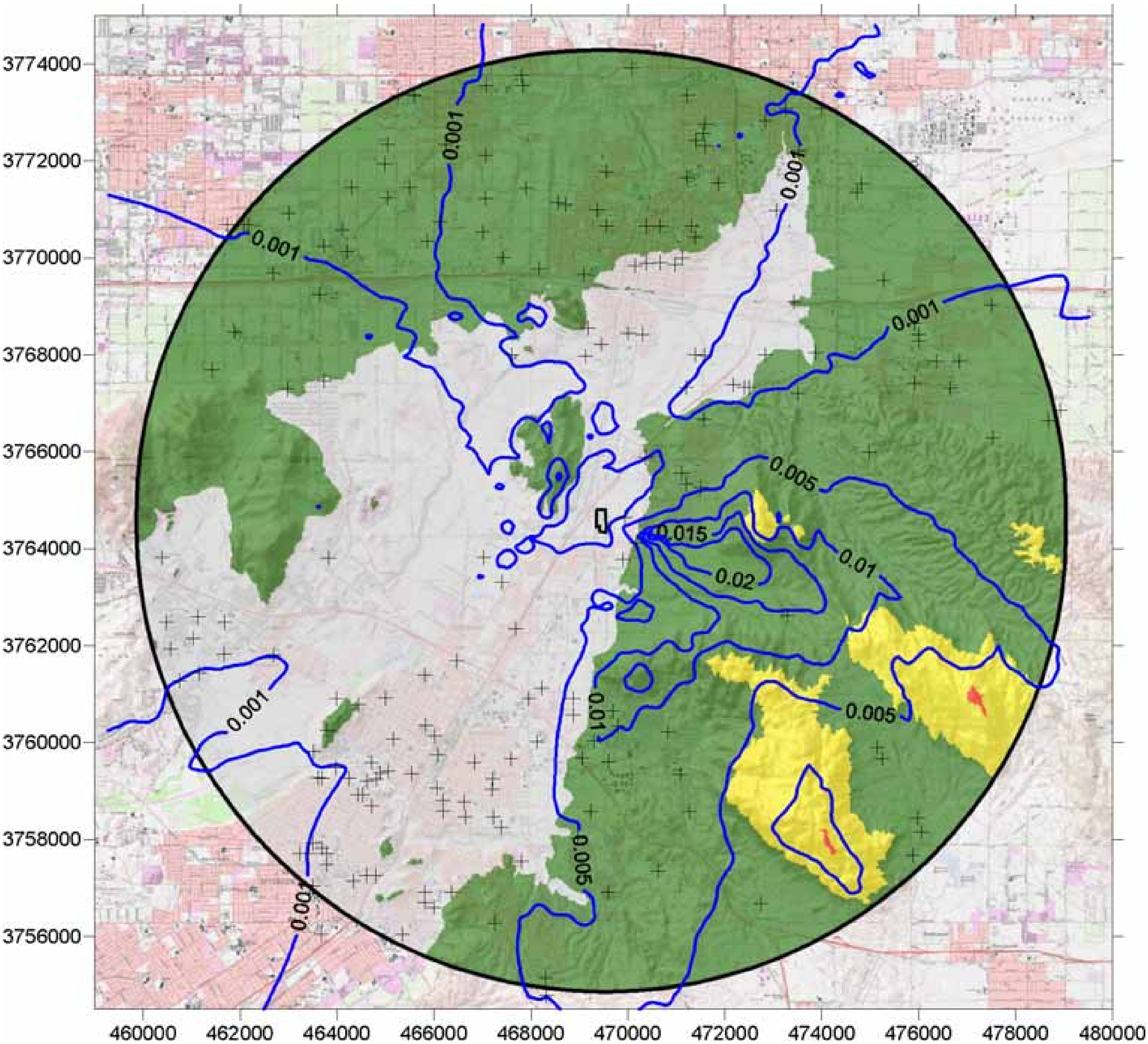
- 0 - 1,000
- 1,001 - 2,000
- 2,001 - 3,000
- 3,000+
- Sensitive Receptors within the 6-Mile Buffer

FIGURE AQ18-3
PERCENT (%) OF THE ANNUAL PM10 NAAQS (50 ug/m3)

AES HIGHGROVE
GRAND TERRACE, CALIFORNIA

CH2MHILL

ES112006001SAC fig_AQ18-3.ai 12-07-06 afint



LEGEND

- Project Site
- 6-Mile Buffer of Project Site

Elevations in feet above sea level

- 0 - 1,000
- 1,001 - 2,000
- 2,001 - 3,000
- 3,000+
- Sensitive Receptors within the 6-Mile Buffer

FIGURE AQ18-4
PERCENT (%) OF THE ANNUAL PM2.5 NAAQS (15 ug/m3)
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA

CH2MHILL

ES112006001SAC fig_AQ18-4.ai 12-06-06 afint

AES HIGHGROVE PROJECT
(06-AFC-2)
DATA RESPONSES, SET 1B

Technical Area: Biological Resources
CEC Author: N. Misa Ward

BACKGROUND

Table 8.2-5 on page 8.2-25 indicates that a number of staff members from biological resources agencies have been contacted regarding the project and potential biological issues of concern. Staff could not find any documentation that describes communication with the California Department of Fish and Game (CDFG), U.S. Fish and Wildlife Service (USFWS), or U.S. Army Corps of Engineers (USACE) regarding sensitive biological resources, such as sensitive species or waters of the U.S., which may occur in the project area.

DATA REQUEST

23. Please provide any supporting documents (e.g. letters or records of conversation) that resulted from communication with CDFG, USFWS, and USACE regarding potential impacts to sensitive biological resources or waters of the U. S.

    Response: For some reason only the first page of the records of conversation appeared in Data Response, Set 1A. The entire set of records of conversation are being resubmitted as Attachment BR-23.

ATTACHMENT BR-23

CH2MHILL TELEPHONE CONVERSATION RECORD

Call To:	Sheila Aguinaldo		CDFG
Phone No.:	562-594-4916	**Date:**	February 07, 2006
Call From:	Linda Anton	**Time:**	11:50 AM
Message Taken By:	CH2M HILL		
Subject:	AESE Highgrove SAA		
Project No.:	**322752**		

On February 07, 2006, I spoke with Ms. Sheila Aguinaldo of the CDFG regarding the installation of the natural gas pipeline over the water crossings for the AES Highgrove project. Ms. Aguinaldo stated that a Streambed Alteration Agreement would be required for this action. She also provided the updated fee schedule.

You replied on 2/6/2006 12:59 PM.
Attachments can contain viruses that may harm your computer. Attachments may not display correctly.

Anton, Linda/SCO

From:	Nancy_Ferguson@fws.gov [Nancy_Ferguson@fws.gov]	**Sent:**	Mon 2/6/2006 12:53 PM
To:	Anton, Linda/SCO		
Cc:			
Subject:	Re: Species List Request		
Attachments:	SB Co species list [Feb 06].doc(42KB) Gasline_Revised_NORTHERN_2.pdf(5MB)		

Linda,

I have attached a County-wide species list. However, whether any of these species occur within your project area will need to be determined by a consulting biologist.

(See attached file: SB Co species list [Feb 06].doc)

Nancy Ferguson, Ph.D.
U.S. Fish and Wildlife Service
Chief, San Bernardino County Division
Carlsbad Fish and Wildlife Office
760-431-9440 ext. 244

<Linda.Anton@CH2M
.com>
To
02/03/2006 02:06 PM <nancy_ferguson@fws.gov>
cc

Subject
Species List Request

Good afternoon Nancy,

I'd like to request a species list for a project in San Bernardino County. The project is located at 12700 Taylor Street in Grand Terrace. Our project requires an evaluation of all species within a one mile radius of the project site as well 1,000 feet on each side of the linear corridors. A Map of the proposed project area and northern section of the linear corridors is attached.

Thank you
Linda R Anton
CH2M HILL/Biologist
lanton@ch2m.com
714-697-6689(See attached file: Gasline_Revised_NORTHERN_2.pdf)

CH2MHILL TELEPHONE CONVERSATION RECORD

Call To:	Jeremy Salas		USACOE
Phone No.:	213-452-3425	**Date:**	April 03, 2006
Call From:	Linda Anton	**Time:**	11:43 AM
Message Taken By:	CH2M HILL		
Subject:	AES Highgrove 404 Permitting		
Project No.:	**322752**		

On April 03, 2006, I spoke with Mr. Jeremy Salas of the ACOE regarding the jurisdictional status of the Riverside Canal. Mr. Salas stated that although he was not familiar with that particular canal, if the canal or its tributaries flow into the Santa Ana River, then it is jurisdictional.

CH2MHILL TELEPHONE CONVERSATION RECORD

Call To:	Jeremy Salas		USACOE
Phone No.:	213-452-3425	**Date:**	February 07, 2006
Call From:	Linda Anton	**Time:**	11:02 AM
Message Taken By:	CH2M HILL		
Subject:	AES Highgrove 404 Permitting		
Project No.:	**322752**		

On February 07, 2006, I spoke with Mr. Jeremy Salas of the ACOE regarding the potential crossing of the Riverside and Gage Canals as well as Springbrook Wash for the installation of the natural gas line on the AES Highgrove Project. I explained to Mr. Salas that the natural gasline would be installed within the existing roadway at the water crossings using either HDD or trenching. Mr. Salas stated that permitting is not required for either method as long as the pipeline is installed within the roadway or beneath the waterway.

AES HIGHGROVE PROJECT
(06-AFC-2)
DATA RESPONSES, SET 1B

Technical Area: Cultural Resources
CEC Author: Dorothy Torres and Beverly Bastian

BACKGROUND

Guidance in federal law states that cultural resources over 50 years of age may be eligible for the National Register of Historic Places. The existing Generating Station (HGS) and Highgrove Substation, both built in the 1950s, are more than 45 years old, and both will be affected by the project. Guidance from the California Office of Historic Preservation (Instructions for Recording Historical Resources, March 1995) states that properties should be considered for eligibility to the California Register at 45 years of age because a project might take as long as 5 years to reach completion. The existing HGS would be demolished as a result of the project.

The proposed project would connect to the electrical grid using Highgrove Substation bays that are now used as connections for the existing plant. A new building would be constructed within the boundaries of the substation to house a control room for the repositioned controls now housed in the HGS. The changes that would occur may be considered impacts. Staff needs to determine whether the existing HGS and Highgrove Substation are eligible for the California Register and whether the HP project will impact the values that may qualify them for eligibility to the California Register.

After significance of a property is considered, it must then be assessed to determine whether it retains integrity. If it retains integrity and if values that make the cultural resources significant (eligible for the California Register) will be impacted, then the impact is significant and mitigation would be necessary. The eligibility evaluation of the existing HGS and Highgrove Substation must be completed by someone who meets the Secretary of Interior's Standards for architectural history (preferably with industrial structure experience).

DATA REQUEST

28. Please provide a discussion of the significance of the resource(s) under CEQA Section 15064.5 (a), (3), (A), (B), (C), & (D) on the appropriate Department of Parks and Recreation (DPR) forms, including the evaluation form, and provide staff with a copy of the assessment and the specialist's conclusions regarding the significance of the two properties.

    Response: JRP Historical Consultants evaluated both the Generating Station and Highgrove Substation and found neither to be eligible. The DPR forms are included as Attachments CR-28A and 28B.

BACKGROUND

Table 8.3-2 provides a list of previously recorded historical resources identified during the Archival Research search described in Section 8.3.3.5.2. During a site visit to the proposed project location, staff drove the proposed gas line route. It appears that none of the residences identified in Table 8.3-2 are within 50 feet of the gas line route or of the proposed HP site. From information compiled by the CHRIS it appears that during the 1980s, the Riverside Historical Commission recorded numerous historic residences in the vicinity of Iowa Avenue, but did not record commercial building. Commercial buildings that are more than 45 years old may be affected by vibrations from jack hammers or heavy equipment used to construct the gas pipeline. It does appear that there are two previously recorded residences that might (as determined from the CHRIS map) be within 50 feet of the gas pipeline route.

DATA REQUEST

31. Please have a qualified architectural historian who meets the Secretary of Interior Standards in Architectural History conduct a reconnaissance-level (windshield) survey of the natural gas pipeline route and provide a brief report characterizing the street-side built environment as industrial, commercial, or residential zones, including general descriptions of each zone. This request for a survey by a qualified architectural historian is consistent with staff's overall approach for identifying potential significant historic resources. Please identify and record on a DPR 523 form any commercial buildings that appear to be over 45 years of age located within 50 feet of the project site or the gas line route. Please provide copies of the completed DPR forms.

Response: JRP Historical Consultants performed the reconnaissance-level (windshield) survey of the natural gas pipeline route. Their summary report follows:

The pipeline begins in the industrial area surrounding the Riverside Canal Power Company (i.e., former SCE Highgrove Generating Station). The industrial nature of the area continues until the route turns south along Iowa Avenue. Between Main Street and Center Street, Iowa Avenue is faced by tightly packed residential and commercial buildings. Parking lots or small yards face the road. Sadeo's Market, on the southwest corner of Iowa Avenue and Villa Street, is in this portion of the route (the DPR form is provided as Attachment CR-31A). South of Center Street the lots become larger on the west side of Iowa Avenue with larger industrial buildings. Between Spring Street and Malborough Avenue, Iowa Avenue traverses large modern commercial and industrial developments with generous setbacks. An anomaly in this portion is 725 Iowa, the Riverside Welding building (the DPR form is provided as Attachment CR-31B). This building is much smaller than its neighbors and is quite close to the road. Iowa Avenue is faced with modern apartment complexes and commercial development from Spruce to the experimental orange groves of the University of California, Riverside. Beginning on Iowa Avenue and continuing along Martin Luther King Jr. Boulevard and south along Canyon Crest Drive the pipeline transverses the University of California Experiment Station. This area is open with orange groves and university parking. A few buildings face the road; a grouping on the south side of Martin Luther King Jr. Boulevard opposite of university parking and a grouping of greenhouses along Canyon Crest Drive were noted. They are set back from the road and not within 50 feet of the center of the road. South of the university lands, Canyon Crest Drive is characterized by residential subdivisions set back more than 50 feet from the center of the road and in instances walled off from the road. South of Country Club Drive, the east side of Canyon Crest Drive is a nature reserve with no construction. Canyon Crest Drive is a divided four-lane road. The central divider has mature plantings and trees.

32. Please determine whether CHRIS number 6936 at 1677 Elliot Street, and CHRIS number 6933 at 1197 Church Street still exist. If the buildings are still present in those locations, please determine whether the buildings are within 50 feet of the proposed gas line route. If they are within 50 feet, please discuss potential damage to each building from vibrations caused by jack hammers or heavy equipment that would be used to install the gas line and identify appropriate mitigation.

Response: JRP Historical Consultants provided the following text in response:

Elliot Street is located more than a half mile from the proposed gas line. 1677 Elliot Street is no longer extant. Church Street intersects with Iowa Avenue south of Main Street. 1197 Church Street is still extant and in good condition. It is at least 100 yards from the intersection and is, therefore, well outside the 50-foot zone.

ATTACHMENT CR-28A

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # ______
HRI # ______
Trinomial ______
NRHP Status Code 6Z
Other Listings ______
Review Code ______ Reviewer ______ Date ______

Page 1 **of** 15 ***Resource Name or #** (Assigned by recorder) Highgrove Generating Station

P1. Other Identifier: Highgrove Generating Station

***P2. Location:** ☐ **Not for Publication** ☒ **Unrestricted** ***a. County** San Bernardino

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** San Bernardino South **Date** 1980 **T** 2S; **R** 4W; SE ¼ **of Sec** 6; MD **B.M.**

c. Address 12700 Taylor St. City Grand Terrace Zip 92313

d. UTM: (give more than one for large and/or linear resources) Zone ______; ______mE/ ______mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

The Highgrove Generating Station is a combination natural gas and fuel oil burning steam generating electrical power plant located east of I-215 in Highgrove, in San Bernardino County on the north side of the San Bernardino and Riverside county line. The 35-acre complex contains four units each with a boiler, a generator and a cooling tower; subsidiary maintenance structures; and an administration building. Consistent with National Register guidelines and standard professional cultural resource management practices, this integrated industrial facility is treated as a single resource for the purpose of evaluating its potential historic significance. Each structure is described individually below, and the locations of the structures in relation to each other are shown on the attached **Sketch Map**. (See Continuation Sheet).

***P3b. Resource Attributes:** (List attributes and codes) HP9 Public utility building

***P4. Resources Present:** ☒ Building ☐ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5a. Photo or Drawing (Photo required for buildings, structures, and objects.)

P5b. Description of Photo: (View, date, accession#) Photograph 1. Generating station, camera facing southwest, November 14, 2006.

***P6. Date Constructed/Age and Sources:** ☒ Historic ☐ Prehistoric ☐ Both
1951-1955

***P7. Owner and Address:**
AES Highgrove
12700 Taylor St.
Grand Terrace, CA 92313

***P8. Recorded by:** (Name, affiliation, address)
Rand Herbert/ Cheryl Brookshear
JRP Historical Consulting, LLC
1490 Drew Ave, Suite 110,
Davis, CA 95618

***P9. Date Recorded:** November 14, 2006

***P10. Survey Type:** (Describe) Single Site

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") None

***Attachments:** ☐ None ☐ Location Map ☐ Sketch Map ☒ Continuation Sheet ☒ Building, Structure, and Object Record ☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record ☐ Artifact Record ☐ Photograph Record ☐ Other (list) ______

Primary # ______________________
HRI # ______________________

BUILDING, STRUCTURE, AND OBJECT RECORD

***NRHP Status Code** 6Z
***Resource Name or #** (Assigned by recorder) Highgrove Generating Station

B1. Historic Name: Highgrove Power Plant
B2. Common Name: Highgrove Power Plant
B3. Original Use: Power Plant B4. Present Use: Decommissioned
***B5. Architectural Style:** Industrial
***B6. Construction History:** (Construction date, alteration, and date of alterations) Units 1 and 2 1951, Unit 3 1953, and Unit 4 1955.

***B7. Moved?** ☒ **No** ☐ **Yes** ☐ **Unknown** **Date:** ______ **Original Location:** ______
***B8. Related Features:** Subsidiary buildings and structures including administration building.

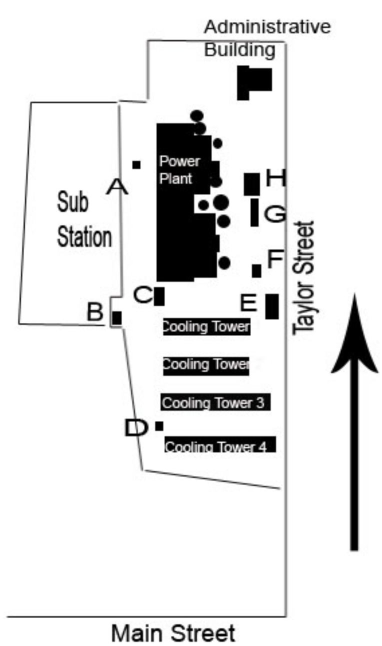
B9. Architect: Fluor Corporation Limited, Los Angeles b. Builder: Fluor Corporation Limited, Los Angeles
***B10. Significance: Theme** n/a **Area** n/a
Period of Significance n/a **Property Type** n/a **Applicable Criteria** n/a
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

The Highgrove Generating Station does not appear to be a historic resource for the purposes of CEQA. The power plant, built between 1951 and 1955, is not associated with events that have made a significant contribution to the history of the local area, region or state (Criterion A and 1). The property does not appear to have been associated with a person who made significant contributions to local, state or national history (Criterion B and 2). The building does not embody characteristics of a type, period, region or method of construction. It is not the work or a master and does not have high engineering value (Criterion C and 3). Rarely buildings can provide information about historical methods of construction (Criterion D and 4); however, information on this building is recorded elsewhere and it does not appear to be a primary source in this regard. This property has been evaluated in accordance with Section 15064.5(a)(2)-(3) of the CEQA Guidelines, using the criteria outlined in Section 5024.1 of the California Public Resources Code, and does appear to be a historical resource for the purposes of CEQA. (See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)
***B12. References:**

Williams, *Energy and the Making of Modern California;*
Termuehlen, *100 Years of Power Plant Development*,
Klure, *California Electric Power Company;* for additional citations see also footnotes in B10. Significance.

(Sketch Map with north arrow)



B13. Remarks:

***B14. Evaluator:** Rand Herbert/ Cheryl Brookshear

***Date of Evaluation:** November 2006

(This space reserved for official comments.)

***Resource Name or #** (Assigned by recorder) Highgrove Generating Station

***Recorded by** Rand Herbert/ Cheryl Brookshear *Date November 14, 2006 ☒ Continuation ☐ Update

P3a. Description (continued):

Administration Building

The administration building consists of a single story square on the east and a 1 ½ story rectangle on the west. The entire building is clad in long thin bricks. The eastern portion has deep eaves and a low hip roof. Two large single-pane windows face east. An entrance porch supported by square brick columns faces south. High ribbon windows flank the entrance. (**Photograph 1)** The western portion has a flat roof. The west side has a large picture window, a double glass door and a single personnel door with an overhang. The south end has a decorative brick pattern. (**Photograph 2)**

Photograph 2. Administration Building, camera facing northwest

Photograph 3. Administration Building, camera facing north

Main Plant

The main portion of the plant consists of four generating units. The units are in line, with the boiler and exhaust stacks to the east, and the turbines and generators to the west. The units were built and numbered beginning at the north end. A poured concrete deck connects the units and four metal mesh bridges connect the firing deck to the generator deck. Both decks are about 10 to 15 feet above grade. The boilers and stacks dominate the complex. The boilers are surrounded by an open steel beam superstructure with steel decks. The boilers are clad in insulation. Units 2 and 4 have added corrugated metal flue and stack coverings in some areas. Units 1 and 2 are approximately 35 feet tall and units 3 and 4 are about 45 feet. The stacks are west of the superstructure. Units 1 and 2 have stacks approximately 70 feet tall the stacks of Units 3 and 4 are approximately 116 feet tall. (**Photograph 1; Photograph 4**)

Photograph 4. Boilers, flues and stacks, camera facing northwest

Each boiler has six doors on the west side. (**Photograph 5**) Units 3 and 4 have an air circulator system of large curving ducts along the sides. Unit 3 has a mechanized feed system of pipes covering the boiler doors.

Photograph 5. Unit 1 boiler doors, camera facing southeast

Photograph 6. Unit 3 boiler feeder, camera facing northeast

Two control buildings are located between the units. The first control building is located between Units 1 and 2; the second is located between Units 3 and 4. Both are two story rectangular buildings with flat roofs, constructed of poured concrete, and have glass-fronted control rooms on the west side. (**Photograph 7**) A double glass door leads from the firing deck to the control room. On the east side each has a double metal door at ground level. The control building between Units 1 and 2 has four three by four light windows on the second floor. The other control building between units 3 and 4 has two industrial steel sash windows of three by four lights; the center and top row of lights are operable. (**Photograph 8**)

Photograph 7. Unit 1& 2 Control room, camera facing east

Photograph 8. Unit 3 & 4 Control room, camera facing west

Two water tanks are north of Unit 1, and two more are between Units 2 and 3. The generators sit across from their respective boilers on the generator deck above the turbines. A 45-ton overhead traveling crane runs on rails located on either side of the generator deck. (**Photograph 9**) The General Electric generators are sheathed in metal and have metal shelters over the northern half of them. (**Photograph 10**) The rectangular shelters have frieze bands and flat roofs that curve on the north and south edges, giving them a slight Moderne appearance.

Photograph 9. Traveling service crane, camera facing southwest

Photograph 10. Generator deck, camera facing southwest

Under each generator within the poured concrete foundations are the turbines. (**Photograph 11**) To the west of each turbine at ground level is a large horizontal tank with large pipe that heads underground. These are a part of the hydrogen cooling system for the turbines. (**Photograph 12**) A set of wires and pipes connect the generators with the transformers in the neighboring substation.

Photograph 11. Unit 1 turbine, camera facing north.

Photograph 12. Hydrogen cooling tank, camera facing southeast

Service Shed 1 (A)

The service shed is located between the turbines and the substation. It is a small rectangular building 6 feet by 10 feet with a shed roof. (**Photograph 13**) The building has a wood frame clad in corrugated fiberglass. It has a double door facing east.

Photograph 13. Service Shed 1, camera facing northwest.

Photograph 14. Service Shed 2, camera facing southwest.

Service Shed 2 (B)

This raised bead metal shed is located at the southeast corner of the substation. The shed is approximately 8 feet by 16 feet with a side gable roof. The edges of the eaves are curved and a circular vent is on the ridge. A large double, hinged door faces east. (**Photograph 14**)

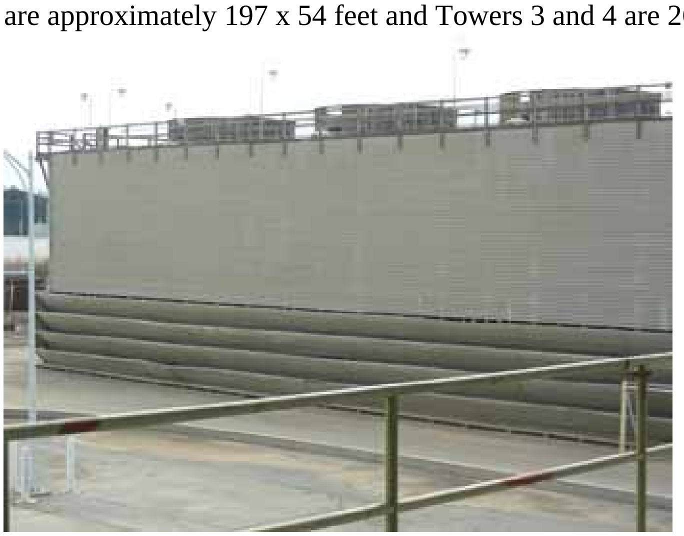
Hazardous Materials Building (C)

South of the main plant is a concrete block hazardous materials shed. (**Photograph 15**) The building has an enclosed room on the south side and two bays at grade level and a third excavated loading bay all under a traversite shed roof.

Photograph 15. Hazardous Materials Building, camera facing northwest.

Cooling Towers

The cooling towers are large rectangular structures at the south end of the property. (**Photographs 16-18**) They run lengthwise east to west with Tower 1 at the north and Tower 4 at the south. The towers are spaced about 60 feet apart. Each tower has a concrete pit with Allis Chalmers condenser pumps at the west end. The poured concrete foundation creates a basin about five feet below grade. Redwood framing is placed on equally spaced concrete piers within the basin. Open metal grid work is supported by the redwood framing. The towers are clad with horizontal corrugated fiberglass siding. The upper edges of the bottom three courses of siding are tilted out, creating vents. Redwood stairs are on the exterior. Between Towers 1 and 2 and between 3 and 4 a series pipes exit the ground and enter the building high on the sides. Towers 1 and 2 are approximately 197 x 54 feet and Towers 3 and 4 are 262 x 54 feet.



Photograph 16. Cooling Tower 1, camera facing southeast.

Photograph 17. Pipes entering Cooling Towers 1 and 2, camera facing west.

Photograph 18. Interior of Cooling Tower 3 showing metal gridwork. Camera facing north.

Cathodic Protection Rectifier (D)

This small, square concrete block building with shed roof is located between Cooling Towers 3 and 4. It has a metal door. (**Photograph 19**)

Photograph 19. Camera facing west.

Photograph 20. Chemical Storage camera facing southeast.

Chemical Storage Building (E)

The chemical storage shed has a side-gable roof with curved eaves. The building is clad in raised bead metal sheeting. The enclosed portion has a sliding personnel door and a 12-light industrial metal sash window. The upper two courses of the window louver open. The south end is open on the west side, creating two bays. A third bay is created by a fiberglass extension with shed roof on the north side. (**Photograph 20**)

Char Processing (F)

The char processing unit is west of Unit 4 and attached to the plant by pipes. The char unit has two tanks and a smaller fuel tank. A conveyor removes material to a concrete bin to the west. The process is controlled in a shed-roofed building with metal sash holding plywood and sliding windows. One plywood door is located on the south side. (**Photograph 21**)

Photograph 21. Char Processing, camera facing north.

Mobile Building (G)

One mobile building is present on the site. It is a doublewide mobile home with a side-gable roof and vertical metal siding and horizontal bands at top and bottom. The building has two doors protected by shed roofs supported by metal pipes and reached by metal stairs. The building has one single-pane window. (**Photograph 22**)

Photograph 22. Mobile Unit, camera facing northeast.

Photograph 23. Vehicle shelter, camera facing northeast.

Vehicle Shelter (H)

The shelter has two bays under a corrugated metal roof supported by steel I-beams. (**Photograph 23**)

B10. Significance (continued):

General History of Steam Plants in California

Steam plants comprised the first generation of electric generating facilities in California. British designer Sir Charles Parsons built the first steam turbine-generator in 1884, and almost immediately others began making improvements upon his original concept. The earliest steam generating plants were little more than steam engines converted to drive a generator rather than a locomotive. By the beginning of the twentieth century, power plants with steam turbines began to replace the original steam engine power plants. Aegidius Elling of Norway is credited with creating the first applied method of injecting steam into the combustion chambers of a gas turbine engine in 1903-04. Within a relatively short time, the technology of engines capable of supplying power and electricity improved greatly. New and better methods and designs helped to spread electricity to a wide range of commercial buildings and residences.[1]

In the beginning stages of development of steam turbine power plants, the materials needed to withstand the high temperatures of modern turbines were not yet available. Technology and improvements for steam turbine engines continued to advance throughout the 1920s and 1930s, leading to a generation of more efficient turbine power plants in the 1950s. By this time, utilities retired or replaced many of the older steam-electric plant generating units following the construction of more modern units. While the technology of turbine power plants peaked in the 1950s, it appears to have remained relatively unchanged until the 1980s, despite the availability of newer technology that would allow an increase of pressure and heat for the systems.[2]

Steam power generation has been an important part of California's power production throughout the twentieth century, although the over-all importance of steam diminished considerably during the 1920-1940 era, when a large number of hydroelectric generating facilities came on line throughout the state. In 1920, hydroelectric power accounted for 69% of all electrical power generated in California. By 1930, that figure had risen to 76%; it rose again to 89% in 1940. Rapid construction of new thermal or steam-electric generating units, however, accounted for most of the new power capacity in the state after 1941. By 1950, hydroelectricity accounted for only 59% of the total, falling to 27% in 1960. Some new hydroelectric plants were built during the 1960s, chiefly associated with federal and state water projects, but by 1970, hydroelectric plants accounted for only 31% of all electricity generated in California.[3]

These statistics, however, mask the effort of both Pacific Gas & Electric Company (PG&E) and Southern California Edison (SCE), California's largest electrical utility providers, to build large-scale steam generation plants as early as the 1920s. James Williams, a historian of energy policies and practices in California, noted that the decision by PG&E and SCE to build steam plants may be attributed to several converging trends in the mid- to late-1920s. First, a persistent drought in California caused the major utilities to begin to question the reliability of systems relying so heavily upon hydroelectricity. This drought began in 1924 and continued, on and off, for a decade. At about the same time, new power plants on the East Coast (where steam had always played a more important role than in California) achieved far greater efficiencies than had previously been possible. Between 1900 and 1930, for example, the fuel efficiency of steam plants, measured in kilowatts

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[1] Heinz Termuehlen, *100 Years of Power Plant Development: Focus on Steam and Gas Turbines as Prime Movers*, (New York: ASME Press, 2001), 11; Douglas Stephen Beck and David Gordon Wilson, *Gas Turbine Regenerators*, (New York: Chapman & Hall, 1996), 30; William A. Myers, *Iron Men and Copper Wires: A Centennial History of the Southern California Edison Company*, (Glendale, CA: Trans-Anglo Books, 1984), 8.

[2] Termuehlen, *100 Years of Power Plant Development*, 21-28.

[3] James C. Williams, *Energy and the Making of Modern California* (Akron, Ohio: University of Akron Press, 1997), 374.

per barrel of oil, increased more than nine-fold. In addition, new natural gas lines were completed that could bring new supplies to both northern and southern California in the late 1920s, tapping large reserves in the San Joaquin Valley. Natural gas has always played an important role in steam electric power generation in California.[4]

Steam generation plants also fit the "build and grow" philosophy based on Samuel Insull's example. In the "build and grow" plan, electric companies encouraged electrical use to establish a market, and thus justify the need to build new generating plants. The new plants used new more efficient technologies and had a smaller operating margin than the old plants. The company passed some of the savings along to customers, thereby encouraging more electrical use. California companies were able to keep the "build and grow" cycle active through the 1960s.[5]

The confluence of these various factors – a drought, new steam generator technologies, new supplies of natural gas, and the "build and grow" philosophy – induced PG&E, SCE, and other utilities to begin construction of large steam plants during the late 1920s and early 1930s. In 1929, the Great Western Power Company (which was absorbed by PG&E in 1930) built a large steam plant on San Francisco Bay, near the Hunters Point shipyard, fitted with two 55 MW generators.[6] PG&E built a steam plant in Oakland in 1928, called Station C. SCE had an even longer history of steam generation, having operated its large facility at Long Beach on Terminal Island throughout most of the 20th century. By World War II, the Long Beach plant was huge, with eleven units on line that had been constructed in stages beginning in 1911. In Southern California, the Los Angeles Department of Water and Power constructed a steam station at Seal Beach consisting of two units installed in 1925 and 1928. These steam plants proved to be both profitable and reliable for the various utilities. In 1930, the PG&E vice-president for engineering wrote, "under the circumstances which now prevail, it is natural to question the future of hydro in California." [7]

The post-World War II era was a time of rapid growth in Southern California. Population and housing swelled along with business and industrial development. Fueled by wartime defense industries, southern California grew rapidly, spreading out into agricultural areas and creating suburbs outside the original city limits of the communities around Los Angeles and San Diego. The need to generate power was imperative, and SCE, Los Angeles Department of Water and Power (LADWP), and San Diego Gas & Electric Company (SDG&E) expanded their systems along with PG&E and the rest of California's energy industry. Since most of the more favorable hydroelectric sites in California had already been developed, and the cost of steam generating facilities had been reduced by technological developments in design and abundant natural gas resources, steam plants became the more favorable option. Steam turbine power plants were cheaper and quicker to build than hydroelectric plants, so utilities companies moved away from hydroelectricity, establishing steam turbine power as the generator of choice. Such plants conserved water and kept costs down for the business and the consumer. The "momentum for steam had been established by war, by drought, and," wrote Williams, "by a positive history of increased thermal power plant development."[8]

Dozens of new steam generation plants were built throughout California, chiefly by PG&E and SCE, although LADWP, California Electric Power Company (see below), and SDG&E built a few as well. The plants relied upon proven technologies but were assembled quickly and inexpensively, relative to earlier plants. In a detailed article in 1950 in *Civil Engineering*, I. C. Steele, Chief Engineer for PG&E, summarized the design criteria that went into construction of four

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4 Williams, *Energy and the Making of Modern California*, 278.
5 William Allan Myers, *Affairs of Power: Restructuring California's Electric Utility Industry 1968-1998* (University of California Riverside, Disertaion 1997) 58.
6 This plant still exists, although it was fitted with new units in the early 1950s, at the same time that the Kern Power Plant was being constructed. Coleman, 298.
7 "1928 Steam Plants Account for 45 Percent of New Generating Capacity," *Electrical West*, February 2, 1929, 80-81; R.W. Spencer, "Cooling Water For Steam Electric Stations in Tidewater, " *Transactions of the American Society of Civil Engineers* 126 (1961): 294, 300; Williams, *Energy and the Making of Modern California*, 279.
8 Myers, *Iron Men and Copper Wires*, 200; James C. Williams, *Energy and the Making of Modern California*, 277-78, 282-83.

major steam plants the company had under construction at that time, at Moss Landing, Contra Costa, Kern, and Hunters Point in San Francisco. These plants had much in common with each other, he argued, and with other steam plants under construction in the state. The design criteria were the same in all cases: build the facility close to load centers to reduce transmission costs; be close to fuel supplies; be near a water supply; and be on a site where land was cheap and could support a good foundation. In another article in *Transactions of the ASCE*, Walter Dickey, an engineer from Bechtel, detailed the reasons for the boom in steam plant building postponements due to World War II, lack of economical hydroelectric sites and needed support of peak load periods. He compared steam generation plant with hydroelectric plants and found steam favorable. Virtually all of the plants in the 1950s and 1960s were designed to be expanded if market conditions warranted; most of them were.[9]

The decades between 1950 and 1970 were the peak expansion of steam generating capacity for both the SCE and the PG&E, as well as for smaller utility companies. During this period, SCE built a series of very similar steam plants in the Los Angeles Basin and in San Bernardino County. In 1952, the company began work on Redondo No. 2, which was adjacent to an earlier plant at Redondo Beach. In 1953, the Etiwanda plant went online, followed in 1955 by El Segundo, Alamitos in 1956, and Huntington Beach and Mandalay in 1958. By 1960, all SCE plants either had multiple units or had additional units in the planning stages. In 1950, PG&E operated 15 steam electric plants in California, and during the following decade added several new plants and expanded older ones. Chief among these were the Kern plant (1948-50), Contra Costa (1951-53), Moss Landing (1950-52), Morro Bay (1955), Hunters Point (addition 1958), Humboldt Bay (1956-58), and Pittsburg (1959-60). The Pittsburg plant was at the time of its construction the largest steam station in the west, with a capacity of over 1,300,000 kW in 1960. The LADWP system was much smaller than those of SCE and PG&E, consisting of five steam plants by 1962. In addition to its Seal Beach Plant (1925-28), and Harbor Plant on Los Angeles Harbor (1943) these included the Valley Plant (San Fernando Valley, 1954), Scattergood (1958), and Haynes (1961). SDG&E had three steam-electric power plants, Silver Gate (1943), Encina (1954), and South Bay (1960). By the late 1970s, there were more than 20 fossil fuel thermal plants in California, clustered around San Francisco Bay, Santa Monica Bay, and in San Diego County, along with a few interior plants in San Bernardino County and Riverside and Imperial Counties, as well as a few plants on the Central Coast.[10]

Most of the oil- or gas-fired steam plants currently in use in California were installed in the period from about 1950 through 1970. After 1970, the major utilities began to look for alternative energy sources, ranging from nuclear power to wind, geothermal, and other "green" energy sources, other than hydroelectric. Despite these efforts, however, fossil fuel steam generation remains the backbone of electrical generating capacity in California. Information from the California Energy Commission (CEC) states that there are currently 34 steam turbine power plants in California of a variety of ages and locations.[11]

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[9] I. C. Steele, "Steam Power Gains on Hydro in California," *Civil Engineering* (January 1950): 17-21; Edgar J. Garbarini, "Design Saves Construction Dollars on Contra Costa Power Plant," *Civil Engineering* (May 1953): 31-33; Walter L. Dickey, "The Design of Two Steam Electric Plants," *ASCE Transactions* (1956): 253-273.

[10] Annual Reports of the Southern California Edison Company, various years. R.W. Spencer, "Cooling Water For Steam Electric Stations in Tidewater," *Transactions of the American Society of Civil Engineers* 126 (1961): 280-302; I. C. Steele, "Steam Power Gains on Hydro in California," 17-19; Dickey, "The Design of Two Steam Electric Plants," 253-255; *Southwest Builder and Contractor*, "Haynes Steam Plant Will Grow With Demand," *Southwest Builder and Contractor* (October 12, 1962): 24-27; Williams, *Energy and the Making of Modern California*, 257.

[11] The California Energy Commission retains figures on the fuel type for all electricity used in the state, even if the power is generated out of state. In 1999, natural gas-fired generators were responsible for 31% of all electricity used in the state, compared with 20% for hydroelectricity. Coal-fired steam plants, all of them out of state, accounted for 20% of the total. "Green" sources accounted for 12%. The percentage of in-state natural gas-fired steam electricity is much larger than 31%, since all of the coal and much of the hydroelectric power is generated out of state. See www.energy.ca.gov/electricity/system_power.

California Electric Power Company

The company that became California Electric Power Company had its origins in the southern Sierra Nevada. Organized as Nevada Power Mining and Milling Co. on December 31, 1904, the company planned to provide mines in the region with inexpensive electricity. Engineers sent to find a mine site had located a creek above Bishop, California in the Owens Valley and recognized it as an opportunity to generate hydroelectricity. The first line was completed eight months later supplying electricity to camps 125 miles away. Quickly the company developed four more plants along the creek. When mining began to decline the company searched for new markets in southern California. In 1912, it built a transmission line to San Bernardino. Over the next decades it purchased smaller companies in San Bernardino and Riverside counties and expanded into Mono, Inyo and Kern counties. The company also served three counties in Nevada. It was active in rural electrification and the development of Hoover Dam. By the 1950s the company had tapped all the hydropower sites in its service area.[12] As a result, the company began a program of building steam generating power plants. The first plant was Highgrove in 1951, followed by San Bernardino (1956), Norton Air Force Base (1957), Cool Water Steam Plant (1961), Barstow (1959) and a joint project in Yuma, Arizona.[13] California Electric Power Company merged with SCE on January 1, 1964. The complex merger retained many of California Electric's employees and the President of California Electric, Fred Oldendorf, became the Vice-President of the merged company.[14]

Highgrove Generating Station

Construction of Highgrove Generating Station began in 1950, as the first of California Electric Power Company's steam generation plants.[15] The plant was designed and built by Fluor Corporation of Los Angeles. The first phase of the plant consisted of Units 1 and 2 at the north end of the complex, each with a 30,000 kW General Electric generator and hydrogen cooled turbine. The design was distinctive at the time as it lacked an exterior shell and is considered an "outdoor" plant. In 1951, it was the first of such plants in the west although others were under construction or being designed. The first two units went into operation in 1952 and became the company's primary power source. The plant was operated by 25 employees and could use either fuel oil or natural gas. Even while the company was building the first two units, it had plans in development for Units 3 and 4. The generator for Unit 3 was delivered and placed on the generator deck in July of 1953.[16] The gantry crane at the north end was modified to lift the 94-ton generator and move it past the two generators already in place. It was larger than the previous two with the ability to generate 40,000 kW of power. The generator and its components were also the largest equipment expense for the company up until that point, costing $1,461,816.14.[17] Unit 4 was completed in 1955 and increased Highgrove's total generating capacity to 154,000 kW. The company director and former president A.B. West pointed out, "this Number Four Unit alone will have a generating capacity exceeding in kilowatt-hours the entire output of our existing eight hydro plants on Bishop Creek and in Mono Basin, and will represent more than our entire system load in 1931."[18] With all four units running the plant employed 65 people.[19] Similar and larger plants quickly followed Highgrove. When California Electric Power merged with SCE, Highgrove was merged into the system along with its other plants. Upon deregulation, SCE was required to sell one half of its plants. Instead, it decided to sell all of its gas and oil fueled generating plants valued at $700 million in 1996. They included the Etiwanda, Highgrove and San Bernardino plants. Together, these plants made up 20% of the power supplied to SCE consumers. Most of the

[12] "To Water Add Steam: Output Grows" *San Bernardino Daily Sun* (April 23, 1958).
[13] Laura L. Klure, *California Electric Power Company* (Riverside, CA: A to Z Printing, 2005) 76-77. "Calectric's Birth Came When Men Hunting for Gold Discovered Water," *San Bernardino Daily Sun* (April 23, 1958).
[14] "Official Midnight Merger Made by Edison-Calelectric" *San Bernardino Daily Sun* (January 1, 1964); http://www.sce.com/abntsce/history/historical+timeline1948-1978.html.
[15] "1st Unit of Calectric Steam Plant Nearing Completion," *Riverside Daily Press* (February 13, 1952) 9.
[16] "Calectric Begins Work on Third Unit at Highgrove" *San Bernardino Daily Sun* (July 22, 1953).
[17] Klure, *California Electric Power Company*, 74.
[18] Klure, *California Electric Power Company*, 75.
[19] "Highgrove Joins the Old and New" *Riverside Press* (May 25, 1959).

remaining power came from hydroelectric sources and the San Onofre nuclear plant. In order to meet the obligations to the 77 employees at these three plants, SCE and the buyer had to agree to operate the plant until 1998.[20] The plant has since been decommissioned and is now owned by AES.

Evaluation

The Highgrove Generation Station does not appear to be a historic resource for the purposes of CEQA. The generation station, built between 1951 and 1955, does not appear to be significant in the context of the history of California Electric Power Company, the history of steam generation of electricity or the history of post World War II steam generation plants. (Criterion A and 1)

As discussed above Highgrove was the first of several steam generating plants for California Electric Power Company. It was the first for the company, but part of a larger trend for all electric companies in California to build steam generation plants to keep up with growing demand from new development and higher customer usage. California Electric Power Company rapidly followed Highgrove's construction with the construction of plants at San Bernardino (1956), Norton Air Force Base (1957), Cool Water (1961) and Yuma. While Highgrove was being constructed, Southern California Edison was laying foundations for its Etiwanda plant and San Diego Gas &Electric was soliciting bids for its Encina plant.[21] Etiwanda was of the "outdoor" type, while SDG&E enclosed Encina for aesthetic reasons. The rapid construction of these plants, and similar plants by other companies, suggests that these plants were all being planned and designed at about the same time. The demand for these plants was a result of exhaustion of available hydroelectric sites at the same time that demand for electricity continued to grow. Highgrove being first for California Electric Power Company is more related to its specific requirements than any pioneering concept of steam generation plants of this era. Together, the plants supplied the majority of power for the California Electric Power Company, overshadowing the importance of any single plant. Each was important the community it served, providing power for the increasing demands of new technology and development in the area. Placed in the context of the time and other power plants and community services, Highgrove does not suggest any unique significance.

California Electric's employee magazine, and subsequent works on that company's history and on the history of SCE, have cited as the first "outdoor" generating plant in the west.[22] However, many plants of this type were built in southern California in the 1950s and 1960s, a number of which may have been in design at nearly the same time. Because of this, Highgrove could be seen as significant for being first in this trend (Criterion A or 1) or for its embodiment of this type (Criterion C and 3). However, before such a claim for significance can be made, the trend itself must be evaluated. An "outdoor" steam generation plant is one without a protective skin or roof structure. Most of the components, pipes, boilers and machinery are left exposed to the elements. Specific portions may be enclosed, such as control rooms or the shelters over half of each generator at Highgrove. Plants with this design are suitable for temperate climates like those in California, the south, and the southwest. However, the elimination of the protective structure did not alter the design or operation of the workings of the plants or change the engineering specifications to any extent. A review of engineering and building journals did not reveal any studies of the benefits of "outdoor" style plants. Advances in foundations, seismic stability, and transportation of parts and materials are frequently discussed; "outdoor" plants are mentioned as such without further comment. The lack of studies and articles on the subject suggest that it was not considered a significant change in the overall design of such plants. These plants cost less to build because they did not include exterior walls or enclosures for the equipment reducing initial construction cost and the expense of maintenance.[23] As a result, this design is an applied aesthetic, not a part of the overall requirement of the plant. In order to qualify as significant under Criterion C and 3, the

[20] Michael Diamond, "Edison to Sell Three Inland Empire Power Plants," *The Sun* (November 23, 1996).
[21] "Huge New Steam Electric Plant at Fontana," *Southwest Builder and Contractor* (November 9, 1951) 10; "Power Plants," *Southwest Builder and Contractor* (October 26, 1951) 20.
[22] Klure, *California Electric Power Company*, 74.
[23] Conversation with Joe Odahal, Engineering Manager, South Bay Power Plant, November 16, 2006.

structure's type, period and method of construction must be integrated with the building's overall plan. Highgrove's aesthetic "outdoor" plan is not significant under Criterion C and 3. The "outdoor" plan did not have any significant impact on plant operation, and it did not impact the development of electrical generation, distribution or use in the areas it was used. As a result, the "outdoor" type would not appear to have any significance under Criterion A and 1. It is interesting to observe that modern hydroelectric power plants, like PG&E's Belden Powerhouse on the Feather River, or the City of San Francisco's Moccasin Powerhouse, are of an outdoor type as well. Moccasin Powerhouse replaced an older, Mission Revival enclosed structure; the hydroelectric plants using the fall of the Feather River are a mixture of the two types (enclosed, like Caribou, and outdoor, like Belden).

Highgrove does not appear to be associated with the life of a historically significant person (Criterion B and 2), nor is it significant under Criterion D and 4, as a potential source of data on human history. This property is well-documented through company records and construction documents and does not appear to be a principal source of important information. The plant has had minor alterations, yet as a whole it retains integrity of location, design, setting, materials, workmanship, feeling and association.

ATTACHMENT CR-28B

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # ____________________
HRI # ____________________
Trinomial ____________________
NRHP Status Code 6Z

Other Listings ____________________
Review Code __________ Reviewer ____________________ Date __________

***Resource Name or #** (Assigned by recorder) Highgrove-Substation

P1. Other Identifier: Highgrove Substation

***P2. Location:** ☐ **Not for Publication** ☒ **Unrestricted** ***a. County** San Bernardino
and (P2b and P2c or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** San Bernardino South **Date** 1980 **T** 2S; **R** 4W; SE ¼ **of Sec** 6; MD **B.M.**

c. Address 12700 Taylor St. City Grand Terrace Zip 92313

d. UTM: (give more than one for large and/or linear resources) Zone ______; ______________mE/ ______________mN

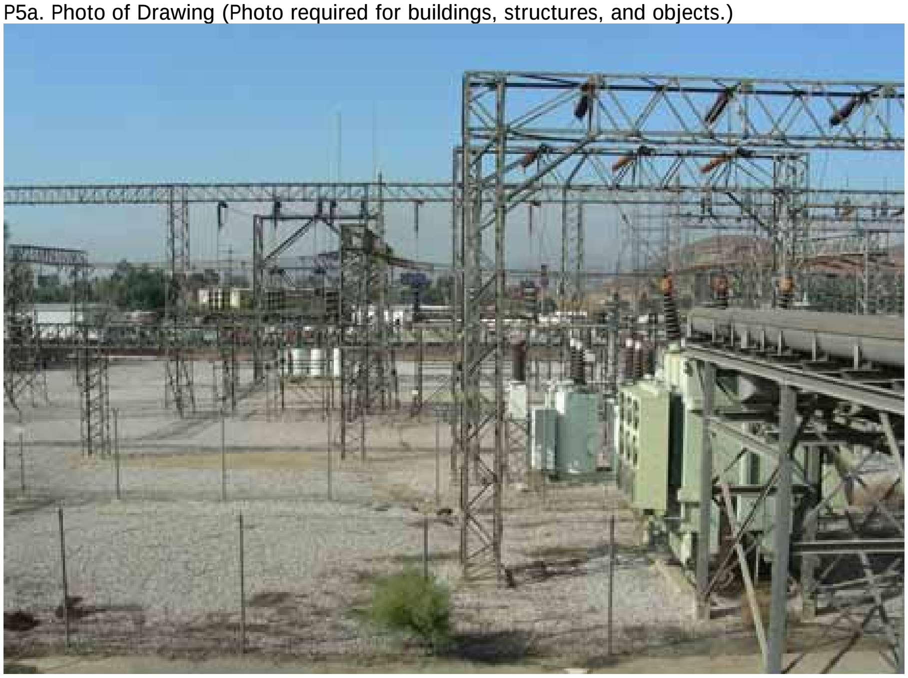
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
Highgrove Substation is connected to and serves the Highgrove Generating Station. Located west of the plant, the substation has four Westinghouse transformers, each attached to one of the plant's generators. Metal frameworks with long cylindrical ceramic or glass insulators suspend transmission wires as they connect to smaller transformers spaced throughout the gravel-covered yard.

***P3b. Resource Attributes:** (List attributes and codes) HP9 Public utility

***P4. Resources Present:** ☒ Building ☐ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5a. Photo of Drawing (Photo required for buildings, structures, and objects.)



P5b. Description of Photo: (View, date, **accession #)** Photograph 1. Substation, west, November 14, 2006.

***P6. Date Constructed/Age and Sources:**
☒ Historic ☐ Prehistoric ☐ Both
1951-1955

***P7. Owner and Address:**
Southern California Edison

***P8. Recorded by:** (Name, affiliation, address)
Rand Herbert/ Cheryl Brookshear
JRP Historical Consulting, LLC
1490 Drew Ave, Suite 110,
Davis, CA 95618

***P9. Date Recorded:** November 14, 2006

***P10. Survey Type:** (Describe)
Single Site

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") None

***Attachments:** ☐ None ☐ Location Map ☐ Sketch Map ☒ Continuation Sheet ☒ Building, Structure, and Object Record ☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record ☐ Artifact Record ☐ Photograph Record ☐ Other (list) ______________

***NRHP Status Code** 6z

***Resource Name or #** (Assigned by recorder) Highgrove Substation

B1. Historic Name: Highgrove Substation
B2. Common Name: Highgrove Substation
B3. Original Use: Substation B4. Present Use: Substation
***B5. Architectural Style:** Industrial
***B6. Construction History:** (Construction date, alteration, and date of alterations) Units 1 and 2 1951, Unit 3 1953, and Unit 4 1955.

***B7. Moved?** ☒ **No** ☐ **Yes** ☐ **Unknown** **Date:** ________ **Original Location:** ________
***B8. Related Features:** Highgrove Generating Plant

B9. Architect: Fluor Corporation Limited, Los Angeles b. Builder: Fluor Corporation Limited, Los Angeles
***B10. Significance: Theme** n/a **Area** n/a
Period of Significance n/a **Property Type** n/a **Applicable Criteria** n/a
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

The Highgrove Substation does not appear to be a historic resource for the purposes of CEQA. The substation built between 1951 and 1955, is not associated with events that have made a significant contribution to the history of the local area, region or state (Criterion A and 1). The property does not appear to have been associated with a person who made significant contributions to local, state or national history (Criterion B and 2). The structure does not embody characteristics of a type, period, region or method of construction. It is not the work of a master and does not have high engineering value (Criterion C and 3). Rarely structures can provide information about historical methods of construction (Criterion D and 4); however, information on this structure is recorded elsewhere and it does not appear to be a primary source in this regard. This property has been evaluated in accordance with Section 15064.5(a)(2)-(3) of the CEQA Guidelines, using the criteria outlined in Section 5024.1 of the California Public Resources Code, and does appear to be a historical resource for the purposes of CEQA. (See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)
***B12. References:** See footnotes in B10. Significance.

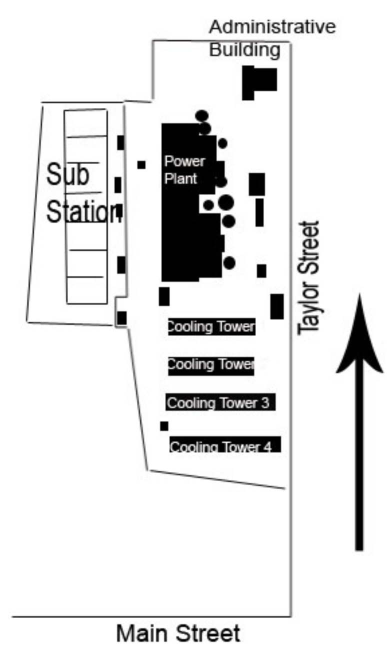
B13. Remarks:

***B14. Evaluator:** Rand Herbert/ Cheryl Brookshear

***Date of Evaluation:** November 2006

(This space reserved for official comments.)

(Sketch Map with north arrow



B10. Significance (continued):

General History of Electrical Transmission in California

California's rugged terrain and often scattered settlement made the transmission of power and important factor in development. Mining settlements and cities quickly used up all the available combustibles for steam power. Bringing in more from other sources was expensive and difficult. Mining communities discovered that nearby water sources could produce electricity that was easily transmitted to rugged isolated sites.[1] The problem was that first electrical systems popularized by Edison were direct current (DC) and had a limited transmission distance. Most mining communities could find a hydroelectric site within transmission distance, but cities and agricultural settlements often could not.

The nature of this problem and its solution led to the great electrical battle between Westinghouse, building systems around high voltage alternating current (AC), and Edison, building systems around DC electricity. Westinghouse acquired patents for transformers from other inventors and very important patents for poly-phase alternating current generators and motors from Tesla. The system his engineers devised used transformers to increase or "step up" the voltage. At this higher voltage, electricity could be transmitted longer distances with less loss. At the receiving end, another transformer would decrease or "step down" the voltage to a level suitable for use. Edison countered that the high voltages were unsafe and took the battle to the public with demonstrations of electrocutions. The two firms battled it out in public and academic press and contract bids for the Columbia Exposition in Chicago and engineering and equipment bids for the proposed plant at Niagara Falls. While in the east the battle raged over safety, in the west there was no question of suitability.

California was introduced to AC by former Brush Electric Company engineer Almerian Decker. Decker came to California in 1891 for his health and became involved in a southern California electrical project. Decker and his partners, Cyrus G. Baldwin and Henry Harbison Sinclair, opened the San Antonio Light and Power Company in 1892 using Westinghouse technology to transmit power over 14 miles to Panoma. Decker then went on to design Mill Creek, the first commercial American three-phase power plant.[2] In 1895, the Folsom power plant, designed by James Lighthipe of General Electric, supplied power to Sacramento 22 miles away. These projects were all completed before the eastern states recognized the value of long distance transmission demonstrated by the Niagara project.[3]

California electrical companies, especially Eugene J. de Sabla and John Martin's companies, continued to increase transmission voltages and distances. Bay Counties Power Company, owned by de Sabla and Martin, broke records in 1901 when they transmitted power generated in the Sierra-Nevada to San Francisco. Throughout the early 20th century California companies developed the hydropower resources of the mountains and transmitted the power across the state.

The shortage of oil and increasing demands for electricity during World War I challenged electrical companies to make more energy available without building more plants. The California State Railroad Commission and the Committee on Petroleum of the State Council on Defense suggested in 1917 that the companies integrate their transmission lines. These integrated lines would allow unused power from one source to be used where the generating capacity was not as large. This idea of interconnected generating pools was adapted in the northeast and neighboring states following the California model.[4]

The post-World War II era was a time of rapid growth in Southern California. Housing and populations swelled along with the business and industrial concerns. Fueled by wartime defense industries, southern California grew rapidly, spreading out into suburbs and into areas outside the original city limits of the communities around Los Angeles and San Diego. Steam

[1] James C. Williams, *Energy and the Making of Modern California* (Akron, Ohio: University of Akron Press, 1997) p.173.
[2] James C. Williams, *Energy and the Making of Modern California*, 175.
[3] James C. Williams, *Energy and the Making of Modern California*, 176-7.
[4] James C. Williams, *Energy and the Making of Modern California*, 245.

turbine power plants were cheaper and quicker to build than hydroelectric plants and utilities companies moved away from hydroelectricity, establishing steam turbine power as the generator of choice. Such plants conserved water and kept costs down for the business and the consumer.[5] The design criteria were the same in all cases: to build the facility close to load centers to reduce transmission costs; to be close to fuel supplies; to be near a water supply; and to be on a site where land was cheap and could support a good foundation. Despite being closer to population centers, steam plants still needed transmission facilities.[6]

California Electric Power Company

California Electric Power Company began in the southern Sierra Nevada range. Organized as Nevada Power Mining and Milling Co. on December 31, 1904, the company planned to provide mines in the region with inexpensive electricity. Engineers sent to find a mine site had located a creek above Bishop, California in the Owens Valley and recognized it as an opportunity to generate hydroelectricity. The first transmission line was completed 8 months later supplying electricity to camps 125 miles away. Quickly the company developed four more plants along the creek. When mining began to decline the company searched for new markets in southern California. In 1912, it built a transmission line to San Bernardino. Over the next decades it purchased smaller companies in San Bernardino and Riverside counties and expanded into Mono, Inyo and Kern counties. The company also served three counties in Nevada. It was active in rural electrification and the development of Hoover Dam. By the 1950s, the company had tapped all the hydropower sites in their service area.[7] As a result, the company began a program of building steam generating power plants. The first plant was Highgrove in 1951, followed by San Bernardino, Norton Air Force Base (1957), Cool Water Steam Plant (1961), Barstow (1959) and a joint project in Yuma, Arizona.[8] California Electric Power Company was merged with Southern California Edison on January 1, 1964. The complex merger retained many of California Electric's employees and the President of California Electric, Fred Oldendorf, became the Vice-President of the merged company.[9]

Highgrove Substation

Highgrove Substation was constructed in conjunction with Highgrove generating station. The station needed facilities to increase the voltage to levels necessary for transmission. Construction of Highgrove began in 1950 as the first of California Electric Power Company's steam generation plants. The plant and substation were designed and built by Fluor Corporation of Los Angeles. The first phase of the plant consisted of units 1 and 2 at the north end. Each of these units attached to a Westinghouse transformer in the substation. The first two units went into operation in 1952 and became the company's primary power source. Even while the first two units were being built plans were being made for units 3 and 4. The generator for Unit 3 was delivered and placed on the generator deck in July of 1953.[10] The generator and its components were also the largest equipment expense for the company up until that point, $1,461,816.14.[11] This unit was connected to a new Westinghouse transformer in the substation. Unit 4 was completed in 1955 and increased the total generating capacity to 154,000 kW. This power was "stepped up" by its own transformer. The substations were built according to current practices. When California Electric Power merged with Southern California Edison, Highgrove was merged into the system along with all the other transmission lines and substations. Upon deregulation the process of separating generation,

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[5] Myers, *Iron Men and Copper Wires*, 200; James C. Williams, *Energy and the Making of Modern California*, 277-78, 282-83.
[6] James C. Williams, *Energy and the Making of Modern California*, 284, 374.
[7] "To Water Add Steam: Output Grows" *San Bernardino Daily Sun* (April 23, 1958)
[8] Laura L. Klure, *California Electric Power Company* (Riverside, CA: A to Z Printing, 2005) p. 76-77. "Calectric's Birth Came When Men Hunting for Gold Discovered Water," *San Bernardino Daily Sun* (April 23, 1958)
[9] "Official Midnight Merger Made by Edison-Calelectric" *San Bernardino Daily Sun* (January 1, 1964); http://www.sce.com/abntsce/history/historical+timeline1948-1978.html
[10] "Calectric Begins Work on Third Unit at Highgrove" *San Bernardino Daily Sun* (July 22, 1953).
[11] Klure, p. 74.

transmission and customer service began. Southern California Edison was required to sell one half of its plants and associated substations. Instead, in 1996, it decided to sell all of its gas and oil fueled generating plants, valued at $700 million. They included the Etiwanda, Highgrove and San Bernardino plants. In order to meet the obligations to the 77-employees at these three plants and substations, Southern California Edison and the buyer had to agree to operate them until 1998.[12] The plant has been decommissioned but the substation remains in operation.

Evaluation

The Highgrove Substation does not appear to be a historic resource for the purposes of CEQA. The substation built between 1951 and 1955 does not appear to be significant in the context of the history of California Electric Power Company, the history of electric transmission or the history of post World War II electrical transmission. (Criterion A and 1) Highgrove was the first of several steam generating plants for California Electric Power Company, but the transmission systems for these plants were no different than the systems for the earlier hydroelectric plants. As a part of the electrical transmission system following World War II it is a line serving the local community and connecting to the larger electrical grid established by interconnectivity. Highgrove Substation does not appear to be associated with the life of a historically significant person (Criterion B and 2). Highgrove Substation does not embody characteristics of a type or period of construction. (Criteria C and3). It consists of standard substation components arranged in a typical fashion. Nor is it significant under Criterion D and 4, as a potential source of data on human history. This property is well-documented through company records and construction documents and does not appear to be a principal source of important information.

[12] Michael Diamond, "Edison to Sell Three Inland Empire Power Plants," *The Sun* (November 23, 1996)

ATTACHMENT CR-31A

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # ____________
HRI # ____________
Trinomial ____________
NRHP Status Code 6Z

Other Listings ____________
Review Code ________ Reviewer ____________ Date ________

***Resource Name or #** (Assigned by recorder) Sadeo's Market

P1. Other Identifier: ________

***P2. Location:** ☐ **Not for Publication** ☒ **Unrestricted** ***a. County** Riverside
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad** San Bernardino South **Date** 1980 **T**___; **R** ___; ___ ¼ **of Sec** ___; ______ **B.M.**
c. Address 451 Iowa Avenue City Riverside Zip 92507
d. UTM: (give more than one for large and/or linear resources) Zone _____; ____________mE/ ____________mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
247-082-001

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

Sadeo's Market is a side-gabled rectangular building facing Villa Street. The medium pitched roof has exposed eaves with a shallow overhang. A trapezoidal shed roof awning is supported by 4x4 posts. The building is clad in stucco and a composite shingle roof. Metal sash windows are evenly spaced across the façade. A louvered vent is in the top of the gable. The building appears to be a converted house.

***P3b. Resource Attributes:** (List attributes and codes) HP6 1-3 story commercial building

***P4. Resources Present:** ☒ Building ☐ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5a. Photo of Drawing (Photo required for buildings, structures, and objects.)

P5b. Description of Photo: (View, date, accession #) Camera facing west, November 14, 2006.

***P6. Date Constructed/Age and Sources:**
☒ Historic ☐ Prehistoric ☐ Both
Unknown

***P7. Owner and Address:**
Zariatul M Khan
451 Iowa Ave.
Riverside, CA 92507

***P8. Recorded by:** (Name, affiliation, address)
Rand Herbert/Cheryl Brookshear
JRP Historical Consulting, LLC
1490 Drew Ave, Suite 110,
Davis, CA 95618

***P9. Date Recorded:** November 14, 2006

***P10. Survey Type:** (Describe)
Single Site

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") None

***Attachments:** ☐ None ☐ Location Map ☐ Sketch Map ☒ Continuation Sheet ☒ Building, Structure, and Object Record ☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record ☐ Artifact Record ☐ Photograph Record ☐ Other (list) ____________

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
Primary # ______________________
HRI # ______________________

BUILDING, STRUCTURE, AND OBJECT RECORD

***NRHP Status Code** 6Z

***Resource Name or #** (Assigned by recorder) Sadeo's Market

B1. Historic Name: ______________

B2. Common Name: Sadeo's Market

B3. Original Use: Residence B4. Present Use: Market

***B5. Architectural Style:** Minimal Traditional

***B6. Construction History:** (Construction date, alteration, and date of alterations) unknown

***B7. Moved?** ☒ No ☐ Yes ☐ Unknown **Date:** ________ **Original Location:** ____________

***B8. Related Features:** ________

B9. Architect: unknown b. Builder: unknown

***B10. Significance: Theme** n/a **Area** n/a

Period of Significance n/a **Property Type** n/a **Applicable Criteria** n/a

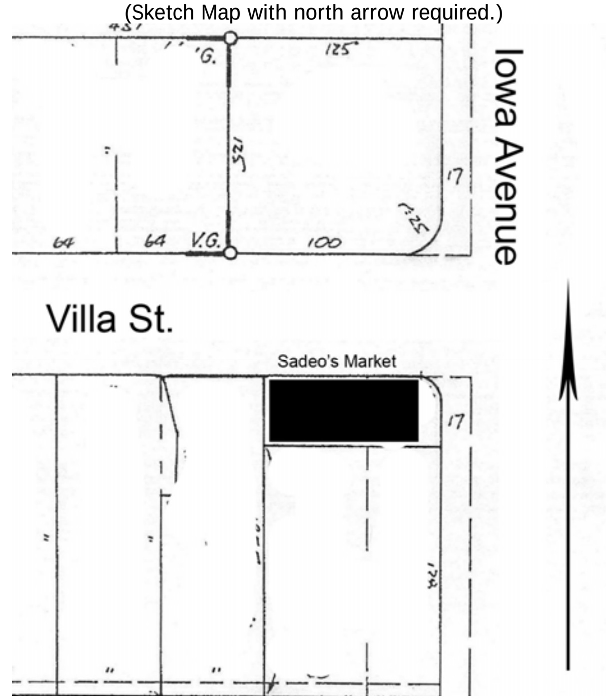
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

The property at Villa Street and Iowa Avenue does not appear to be a historic resource for the purposes of CEQA. The house, built about 1930, is not associated with events that have made a significant contribution to the history of the local area, region or state (Criterion A and 1). The property does not appear to have been associated with a person who made significant contributions to local, state or national history (Criterion B and 2). The building does not embody characteristics of a type, period, region or method of construction. It is not the work of a master and does not have high artistic value (Criterion C and 3). Rarely buildings can provide information about historical methods of construction (Criterion D and 4); however, information on this building is recorded elsewhere and it does not appear to be a primary source in this regard. This property has been evaluated in accordance with Section 15064.5(a)(2)-(3) of the CEQA Guidelines, using the criteria outlined in Section 5024.1 of the California Public Resources Code, and does appear to be a historical resource for the purposes of CEQA. (See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes) __________

***B12. References:** See Footnotes.

(Sketch Map with north arrow required.)



B13. Remarks:

***B14. Evaluator:** Rand Herbert/ Cheryl Brookshear

***Date of Evaluation:** November 2006

(This space reserved for official comments.)

B10. Significance (continued):

Historic Context

The area around Highgrove was originally developed as orchards. The first navel orange had been imported to California in the 1870s and by the 1890s the southern California was covered in orange groves. L.M. Holt had marketed Riverside and San Bernardino counties as a Mediterranean health sanitarium full of orange, lemon and olive trees.[1] Highgrove began as an independent development sometimes referred to as East Riverside. By 1901 a building had been constructed at the southwest corner of Iowa Avenue and Villa Streets. Highgrove was not a densely populated area, the closest neighbor to this building was the Highgrove Hydroelectric Plant.[2] By the 1950s the hydroelectric power plant was gone (it burned in 1915), but the block had residences along all three sides accessible by road. Highgrove as a whole had not built out its layout between Iowa Avenue and the tracks of the Southern Pacific Railroad, but was more densely populated than in 1901. As Riverside and the entire Inland Empire urbanized following World War II, Highgrove's independence was threatened. The *Riverside Press* reported in 1959 that those living east of Iowa Avenue considered themselves Highgrove, while those west of Iowa Avenue viewed annexation by Riverside favorably.[3] Iowa Avenue developed as the main commercial street in Highgrove with many small independent businesses. Between 1966 and 1973, the area was completely urbanized, although Highgrove retained its independence as an unincorporated area of the county.[4]

Evaluation

The property at Villa Street and Iowa Avenue does not appear to be a historic resource for the purposes of CEQA. The house, built about 1930, is not associated with events that have made a significant contribution to the history of the local area, region or state (Criterion A and 1). Research did not locate any information on the owners suggesting they did not make significant contributions to local, state or national history (Criterion B and 2). The building does not embody characteristics of a type, period, region or method of construction. It is not the work of a master and does not have high artistic value (Criterion C and 3). The utilitarian nature of the construction and form of the building is common and it does not embody any distinctive characteristics. Many sources exist on basic construction this property does not contain any primary source material (Criterion D and 4). In addition, the change in use has altered the integrity of the building in relation to design, materials, feeling and association. Thus, even if the building was considered significant, the lack of integrity would render the building ineligible.

[1] Kevin Starr, *Material Dreams Southern California Through the 1920s* (New York: Oxford University Press, 1990) p. 26-27.
[2] USGS, *San Bernardino* 1901 reprinted 1938.
[3] T.E. Foreman, "Highgrove Joins the Old and New" *Riverside Press* (May 25, 1959).
[4] USGS, *San Bernardino South Quadrangle* 1967 (revised 1973)

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # ________
HRI # ________
Trinomial ________
NRHP Status Code 6Z

Other Listings ________
Review Code ________ Reviewer ________ Date ________

 ***Resource Name or #** (Assigned by recorder) Riverside Welding

P1. Other Identifier: ________

***P2. Location:** ☐ **Not for Publication** ☒ **Unrestricted** ***a. County** Riverside
and (P2b and P2c or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** San Bernardino South **Date** 1980 **T**___; **R** ___; ___ ¼ **of Sec** ___; ______ **B.M.**

c. Address 725 Iowa Avenue City Riverside Zip 92507

d. UTM: (give more than one for large and/or linear resources) Zone ______; ________mE/ ________mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
APN 247-140-008

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

Riverside Welding consists of two joined buildings; a small stuccoed square and a large irregular metal building. The stucco-covered cube has a flat roof and rounded corners. A five-panel door is on the east side, and cracks in the stucco reveal where a window was once located on that side. The stucco also exhibits marks where a canopy once protected the door, and where a band went around the upper edge. The irregular addition has a metal frame, vertical corrugated metal siding and a decorative horizontal band along the upper edge. This portion has two doors; a sliding garage door on the west, and a swing garage door on the east. A metal overhang protects the east doorway. Two windows are on the north side.

***P3b. Resource Attributes:** (List attributes and codes) HP8 Industrial

***P4. Resources Present:** ☒ Building ☐ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5a. Photo or Drawing (Photo required for buildings, structures, and objects.)

P5b. Description of Photo: (View, date, accession #) Camera facing south, November 14, 2006

***P6. Date Constructed/Age and Sources:**
☒ Historic ☐ Prehistoric ☐ Both
1930s per owner

***P7. Owner and Address:**
Steven C. Fagliasso
725 Iowa Avenue
Riverside, CA 92507

***P8. Recorded by:** (Name, affiliation, address)
Rand Herbert/ Cheryl Brookshear
JRP Historical Consulting, LLC
1490 Drew Ave, Suite 110,
Davis, CA 95618

***P9. Date Recorded:** November 14, 2006

***P10. Survey Type:** (Describe)
Intensive

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") None

***Attachments:** ☐ None ☐ Location Map ☐ Sketch Map ☒ Continuation Sheet ☒ Building, Structure, and Object Record ☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record ☐ Artifact Record ☐ Photograph Record ☐ Other (list) ________

BUILDING, STRUCTURE, AND OBJECT RECORD

***NRHP Status Code** 6Z

***Resource Name or #** (Assigned by recorder) Riverside Welding

B1. Historic Name: ____________

B2. Common Name: Riverside Welding

B3. Original Use: Gas station (never went into use) B4. Present Use: Welding shop

***B5. Architectural Style:** Utilitarian

***B6. Construction History:** (Construction date, alteration, and date of alterations) The frame and stucco portion was moved to the site in the 1930s and the metal frame addition was added in the 1940s.

***B7. Moved?** ☐ **No** ☒ **Yes** ☐ **Unknown** **Date:** 1930s **Original Location:** unknown

***B8. Related Features:** ____________

B9. Architect: unknown b. Builder: unknown

***B10. Significance: Theme** n/a **Area** n/a

Period of Significance n/a **Property Type** n/a **Applicable Criteria** n/a

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

The property at 725 Iowa Avenue does not appear to be a historic resource for the purposes of CEQA. The building moved onto the site in the 1930s, is not associated with events that have made a significant contribution to the history of the local area, region or state (Criterion A and 1). The property does not appear to have been associated with a person who made significant contributions to local, state or national history (Criterion B and 2). The buildings do not embody characteristics of a type, period, region or method of construction. They are not works of a master and do not have high artistic value (Criterion C and 3). Rarely buildings can provide information about historical methods of construction (Criterion D and 4); however, information on this building is recorded elsewhere and it does not appear to be a primary source in this regard. This property has been evaluated in accordance with Section 15064.5(a)(2)-(3) of the CEQA Guidelines, using the criteria outlined in Section 5024.1 of the California Public Resources Code, and does appear to be a historical resource for the purposes of CEQA. (See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes) ____________

***B12. References:** See Footnotes.

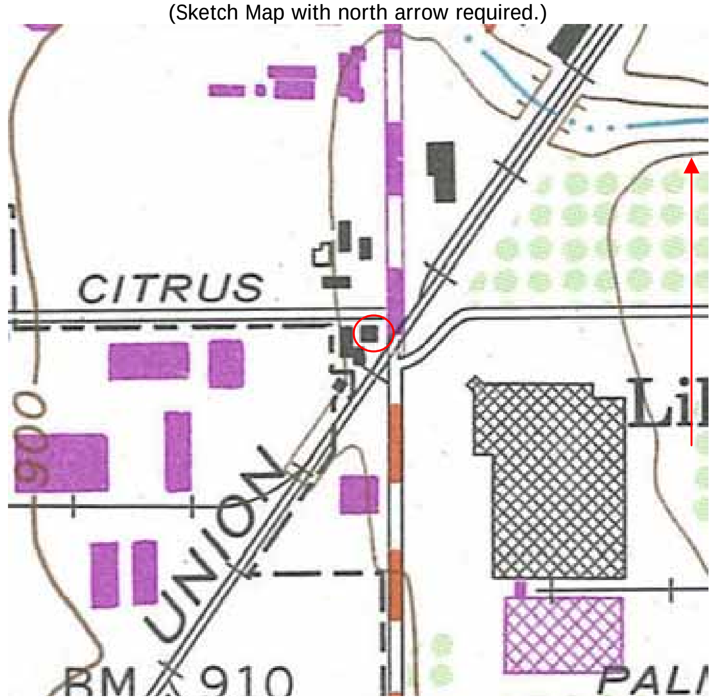
B13. Remarks:

***B14. Evaluator:** Rand Herbert/ Cheryl Brookshear

***Date of Evaluation:** November 2006

(This space reserved for official comments.)

(Sketch Map with north arrow required.)



***Resource Name or #** (Assigned by recorder) Riverside Welding

***Recorded by** Cheryl Brookshear *Date November 14, 2006 ☒ Continuation ☐ Update

B10. Significance (continued):

Historic Context

The area between Riverside and Highgrove was originally developed as orchards. The first navel orange had been imported to California in the 1870s and by the 1890s the counties were covered in orange groves. L.M. Holt had marketed Riverside and San Bernardino counties as a Mediterranean health sanitarium full of orange, lemon and olive trees.[1] The small central cube of the building at 725 Iowa Avenue was brought to the site in the 1930s, while the area was still primarily used for orange groves. While the building was originally constructed as a gas station it was never used as such at this site. Instead, the building was used for sandblasting. In the 1940s the original owner sold the building and the new owner began operations as a welding shop. The business again changed hands in 1972 when it became Riverside Welding.[2]

Evaluation

The property at 725 Iowa Avenue does not appear to be a historic resource for the purposes of CEQA. The building moved to the site in the 1930s, is not associated with events that have made a significant contribution to the history of the local area, region or state (Criterion A and 1). Research did not reveal any information about the owners of the building indicating they did not make significant contributions to local, state or national history (Criterion B and 2). The building does not embody characteristics of a type, period, region or method of construction. It is not the work of a master and does not have high artistic value (Criterion C and 3). The utilitarian nature of the construction and form of this building is common and it does not embody any distinctive characteristics. Many sources exist on basic construction and this property does not contain any new material (Criterion D and 4). In addition, the fact that it was moved, and the addition metal of unknown date have altered the integrity of the building in relation to design, workmanship, materials, feeling and association. Its original setting in orange groves has been significantly altered to an industrial-commercial area; even if the building was significant, the lack of integrity would render the building ineligible.

[1] Kevin Starr, *Material Dreams Southern California Through the 1920s* (New York: Oxford University Press, 1990) 26-27.
[2] Conversation with owner/operator of Riverside Welding, November 14, 2006.

Photographs (cont):

Photograph 2. Camera facing northwest.

AES HIGHGROVE PROJECT
(06-AFC-2)
DATA RESPONSES, SET 1B

Technical Area: Soil and Water Resources
Author: Michael Stephens

BACKGROUND

Development of the site would change the general slope, and drainage would be conveyed to an onsite detention basin. The detention basin will be configured and sized to retain onsite drainage for a 10-year, 48-hour storm; this will be confirmed during the detailed, final design stage of the HP. No analysis is presented to assess if onsite retention is a viable means of stormwater management for this site, or whether the alternative of offsite stormwater flow is appropriate.

DATA REQUEST

64. Please conduct an analysis of proposed onsite retention parameters including dimensions of the proposed detention basin, percolation rate, rainfall intensity and duration for the design.

    Response: As described in Data Response Set 1A, AES has revised the site layout based upon new detention basin sizing and improved access for fire protection. The new General Arrangement was attached as Figure 2.2-1R. The modifications resulted in a relocation of the detention basin from the south side of the Project Site to the north side, optimizing drainage patterns for the site. The calculations for the detention basin and information addressing Data Requests 64 through 67, is provided in Attachment S&W-64.

65. Please provide an analysis of the potential impacts on drainage as it relates to 20 year, 50 year, and 100 year storms.

    Response: Please refer to Data Response #64.

BACKGROUND

Stormwater at the HP flows towards a detention basin located at the southern end. Figure 8.14-4 presents a site drawing of the proposed facility drainage. From the drawing, it is uncertain how stormwater from off-site will be prevented from flowing into the facility. In addition, the stormwater holding capacity of the proposed basin may be inadequate to hold a major storm event. In the event that stormwater flowing into the detention basin exceeds the holding capacity of the basin, a mechanism for offsite overflow relief could mitigate potential onsite flooding.

DATA REQUEST

66. Please provide an updated figure depicting how offsite runoff is prevented from entering the site.

    Response: A preliminary Grading and Drainage Plan is attached as Figures S&W66-1A and S&W66-1B. To facilitate staff's analysis, 5 D-sized copies of the drawings are also being submitted.

67. If it is anticipated that offsite runoff will enter the site, please provide revised analyses that includes offsite runoff.

Response: Please refer to Data Response #64 and #66.

ATTACHMENT S&W-64

WorleyParsons
resources & energy

CALCULATION COVER SHEET

CLIENT	AES
PROJECT	Highgrove Project, San Bernardino County, California
SUBJECT	Preliminary Stormwater Management Design
JOB NUMBER	52000101 WBS NUMBER 024
CALCULATION NO.:	HIGH-1-DC-024-CE-001 PAGE 1 OF 10

DESCRIPTION/PURPOSE

Perform preliminary design of a stormwater system to collect site runoff and convey the runoff to an existing drainage system (MH-#6) located at the northwest corner of the project site. The stormwater system will consist of inlet and pipe systems and swales and will be designed in accordance with the requirements of the San Bernardino County, California, Hydrology manual and additional requirements provided by the City of Grand Terrace. Design a detention basin to attenuate the increase in peak runoff caused by less pervious ground cover after development.

METHOD OF ANALYSIS

Use the Rational Method to estimate peak runoff for the collection system design as modified by the San Bernardino County, Hydrology Manual. Use Haestad methods, "StormCAD", "Culvertmaster", and "Flowmaster" as required to design the storm drain and culvert system. Use Haestad PondPack to size the detention pond after converting the storm drainage system flows into hydrographs consistent with the methods outlined in the County Hydrology Manual.

CODES AND STANDARDS

None applicable.

INFORMATION SOURCES

1. County/City Stormwater Meeting, directives summarized in June 12, 2006 email from Geoffrey Baxter to Julie Way (AES)
2. San Bernardino County, Hydrology Manual, August 1986
3. "Detention Basin Design Criteria for San Bernardino County", and associated County of San Bernardino interoffice memo date Sep. 4, 1987
4. USDA, Soil Conservation Service, "Soil Survey of San Bernardino County Southwestern Part, California," 1972
5. "Precipitation-Frequency Atlas of the United States, NOAA Atlas 14, Volume 1, Version 3, 2003
6. Bentley Systems, "StormCAD", Service Pack 2
7. Haestad Methods, "PondPack", Version 9.0
8. FHWA, HEC-15, April 1983, pgs. 17 and 37
9. TR-55, Urban Hydrology for Small Watersheds, USDA, NRCS, June 1986

REV	DATE	DESCRIPTION	PAGES REVISED	PAGES ADDED	PAGES DELETED	BY/DATE	REV/DATE	LDE/DATE
D								
C								
B								
A	11-8-06	ORIGINAL ISSUE	NA	NA	NA	JAWinterhalter 10-25-06	DSheth 11-8-06	JAWinterhalter 10-25-06

WorleyParsons
resources & energy

CALCULATION COVER SHEET

CLIENT	AES
PROJECT	Highgrove Project, San Bernardino County, California
SUBJECT	Preliminary Stormwater Management Design
JOB NUMBER	52000101 — WBS NUMBER 024
CALCULATION NO.:	HIGH-1-DC-024-CE-001 — PAGE 2 OF 10

ASSUMPTIONS

Contained in body of calculation.

CONCLUSIONS OR RESULTS

The stormwater management meets the requirements of the City of Grand Terrace and San Bernardino County. The Stormwater Detention Basin is designed to attenuate the increase in peak runoff from the site after development.

LIST OF ATTACHMENTS

A. Baxter to Way email 6-12-06
B. Preliminary Grading and Drainage, Overall Plan, HIGH-0-DW-112-735-001
C. Preliminary Grading and Drainage, Site Plan, HIGH-0-DW-112-735-001
D. Pre-Development Site Plan – Drainage Areas
E. Post-Development Site Plan - Drainage Areas
F. Stormwater System Design Work Sheet
G. Site Soils Map
H. Project Area Intensity-Duration Curves and Point Precipitation Frequency Estimates From NOAA Atlas 14
I. Time of Concentration Calculation Work Sheets
J. StormCAD Summary Reports
K. Detention Basin Design Criteria for San Bernardino County", and associated County of San Bernardino interoffice memo date Sep. 4, 1987
L. Runoff Hydrographs – Section J, Small Area Runoff Hydrograph Development
M. PondPack Report Summary, Detention Basin Routing

I. PROJECT DESIGN CRITERIA FOR STORMWATER MANAGEMENT

1. General:

The site for the proposed AES Highgrove Project is located in San Bernardino County, California, and east of Interstate Highway 215 with the main entrance opposite the intersection of Taylor and Pico Streets. A general arrangement of the proposed plant area is shown On Attachments B and C.

The finished floor for all structures of the Highgrove project will be set at elevation +939.0 ft. and the site will be graded at a minimum slope of 0.5%, where appropriate. The main plant perimeter roadway will have a centerline elevation of 938.5 ft. The main plant driveway entrance is from the southeast corner from Taylor Street and Pico Street intersection which is approximately at elevation 949 ft. Another driveway will be constructed at the north side of the site from the proposed Adventure Way at an approximate elevation of 944 ft.

The site currently drains toward the northwest to existing MH #6 and to an east-west, concrete lined channel at the north side of the project boundary. Design the proposed plant site grading and drainage in accordance with the directives received during the County/City Stormwater meeting (including the San Bernardino Hydrology Manual). The existing concrete lined channel will be replaced with a buried 24-inch diameter culvert to convey water east of Taylor St. to MH#6 until the city installs a proposed stormwater detention basin in conjunction with construction of the new school.

2. Design Criteria

Detention Basin Design Criteria – from "Detention Basin Design Criteria for San Bernardino County" and San Bernardino County, "Hydrology Manual"

Volume and Flows:

A. Analyze for 2, 10, 25, and 100-yr rainfall events.
B. Predevelopment runoff shall be determined by:
   1. $Qp_{2\text{-}yr}$ = 2-yr, AMC I
   2. $Qp_{10\text{-}yr}$ = 5-yr, AMC I
   3. $Qp_{25\text{-}yr}$ = 10-yr, AMC II
   4. $Qp_{100\text{-}yr}$ = 25-yr, AMC = II
C. Q_{nn} Peak Post Development discharge from basin < 0.9 Q_{nn} Peak Predevelopment
D. Determine post-development Q_p using AMC II
E. Emergency spillway shall pass Q1000-yr
F. Emergency Spillway Capacity > Q1000 = 1.35 Q100
G. Basin shall drain within 24-hrs of reaching 100-yr volume
H. Use of County hydrology software is not required per June 2006 meeting with city and county (6-13-06 email from Baxter)

Basin Construction Requirements:

A. 100-yr design water level should be at or below existing ground surface
B. Inlet pipe minimum 24" dia RCP
C. Outlet pipe minimum 24" dia RCP
D. Maximum water depth 6'
E. 2' of freeboard above 100-yr volume or 1-foot of freeboard above the 1000-year HWL on the emergency spillway, whichever is greater
F. Interior slopes 3:1 (H:V) max. use 1:1, exterior slopes 2:1 (H:V) max.

G. Top width of embankment = 15'
H. Bottom slope 0.5% minimum to spillway structure
I. Access road around top of basin shall be 15' wide with min inside radius of 35'
J. Access ramp into basin shall be 15' wide with 10% max grade

Hydrology Calculations:

A. Use Rational method to determine peak runoff from the site area since it is less than 1 square mile per Section D, Hydrology Manual.
B. Use Section J, "Small Area Runoff Hydrograph Development" method to determine the inflow hydrograph from the site area since it is used when small areas have a time of concentration of less than 25 minutes.
C. Size inlet and piping system to convey the 25-year rainfall runoff to the detention basin with the hydraulic grade line at or below the tops of the inlets. Check that the 100-year rainfall runoff does not leave the site if the hydraulic grade line is above grade.

II STORMWATER DRAINAGE CALCULATION

1. General Approach

Design the site grading to have a minimum slope of 0.5% with a target slope of 1%. Determine the peak runoff for the pre-development conditions to MH #6. The majority of the site runoff leaves the site through MH #6 in both the pre- and post-development conditions. Therefore it will be used as the point of interest.

Design the final grading and drainage collection system for the proposed plant. Determine the peak runoff for the site in the post-development condition. Compare the post-development peak runoff to the pre-development peak runoff. Provide a detention basin if post exceeds 0.9 x Qp pre-development per above criteria.

2. Site Soils

According to Soil Survey of San Bernardino County Southwestern Part, the soils within the limits of the project are MoC, Monserate sandy loam, 2 to 9% slopes and the hydrologic soil group (HSG) for this soil series is classified as HSG C per the Hydrology Manual. A site soils map is attached (Attachment G).

3. Drainage Areas

A. Pre-Development Study Area

See the Pre-Development Site Plan (Attachment D).

The point of interest is MH #6.

Subareas and cover conditions: CN values are from Figure C-3, Hydrology Manual

Grass, open area (CN=74) =	6.700 acres
Industrial, gravel (CN=91) =	1.510 acres
Industrial, impervious (CN=100) =	0.145 acre
Total=	8.355 acres

CN average = 78 See Attachment F, page 2

Other Areas Draining to MH #6 from Outside Project Area

Additional areas currently drain to MH-#6 from outside the project site. Future conditions will redirect significant areas away from MH-#6. Refer to drawing HIGH-1-DW-112-735-001, Attachment B. Runoff from the existing power plant site will be directed south to Cage Park. Drainage east of the proposed project will be collected by the proposed drainage system to be constructed in conjunction with Taylor Street extension and new school construction. Runoff to the north will be intercepted by future Adventure Way road construction

Temporarily, the runoff entering the site from the north and east will be intercepted in the new culvert and inlets to be installed in the location of the existing concrete-lined channel at the north of the site. After the city installs a detention basin they will intercept the flows that enter this pipe from the east side of Taylor Street.

The existing switchyard will remain. Runoff from the switchyard that currently flows onto the project site will be intercepted by two new catch basins CB-15 and CB-16 and piped directly to MH#6. Flows from this area will not increase due to project development.

CB-20 will be installed in the existing concrete-lined channel at the western end of the deep portion of the channel. This is where an existing drainage pipe directs low flows to MH#6. Overflows enter the channel to the west and discharges to the drainage canal. CB-20 will be configured to allow the low flows to continue to flow to MH#6 and overflows to discharge to the canal to the west. Flows from this area will not increase due to project development.

B. Post-Development Area = 8.041 acres

See the Post-Development Site Plan (Attachment D). The point of interest is MH #6.

4. Rainfall data

See attached NOAA Atlas 14 data and Intensity-Duration Curves (Attachment H)

5. Runoff Rate Determination

In Section C and D of the Hydrology Manual, a formula is given for the calculation of runoff which incorporates soil type and antecedent moisture condition (AMC).

For project areas less than one square mile (640 acres) use Rational method:

Pre-Development Runoff

Time of concentration, Tc = 25 minutes See Attachment I

A = 8.355 acres, Ap = fraction pervious = (6.7 + 1.51ac)/8.355 = 0.98

Return Period (years)	Intensity (in/hr) for Tc = 25 min	AMC	Fp per Figure C-6 for Cn = 78	Fm = ap x Fp	I-Fm	Qp = 0.9(I-Fm)A (CFS)	Reduced per Criteria, 0.9 x Qp	Compare to Qpost
2	0.91	I	0.66	0.65	0.26	1.96	**1.76**	2 yr
5	1.2	I	0.66	0.65	0.55	4.14	**3.73**	10 yr
10	1.44	I	0.66	0.65	0.79	5.94	**5.35**	25 yr
25	1.78	II	0.42	0.41	1.37	10.30	**9.27**	100 yr
100	2.38	II	0.42	0.41	1.97	14.81		

For Spillway Design:

$Q_{1000} = 1.35Q_{100},$ Q_{1000} = 1.35 x 14.8 = **20.0** cfs

Post-Development Runoff

Time of concentration, Tc = varies See Attachments I and J

Q_{peak} = CIA, (Equation D-3), where CI = 0.90(I-F_m)

Determine catchment maximum loss rate, F_m.

$F_m = a_pF_p$ Determine F_m

Attachment F was prepared to determine the pervious and impervious area fractions of each subarea contributing to drainage system inlets as well as the values for a_p, and F_m.

The StormCAD program uses the standard Rational formula (Q = CIA). Since, in our case, Q = 0.9 (I-Fm)A, the input will have to modified to suit. Once the F_p and F_m values were determined for each subarea, the value for an averaged Fm was calculated to be 0.15 inches/hour. The C value in Q = CIA will be entered a 1.0 since the losses will be already subtracted from the rainfall intensity values. The I (from NOAA Atlas 14) values will be entered after determining 0.9(I-Fm) values to allow the pipes to be sized.

The total system T_c will also be determined by the program. Several inlet subarea times of were determined and it was found that all were 5 minutes or less. The minimum T_c used is 5 minutes.

Determine system flow characteristics for the 25-yr and 100-yr return period rainfall events.

III STORMWATER COLLECTION SYSTEM

1. Storm Drain Inlet System Design

Flow to Detention Basin

Main Plant Inlet and Piping System,

Smooth-lined corrugated polyethylene pipe was used in system design. See Attachment J for pipe design data. By calculation or inspection, all subareas were found to have the minimum Tc = 5 minutes. See Attachment I.

CB-18 , and CB-19

These inlets discharge directly to the Detention Basin. For CB-18, Tc = 7 minutes. See Attachment I. For CB-19, Tc = 5 minutes. See Attachment J for pipe design data.

Switchyard Drainage – Flow to MH#6

See Attachment I for T_c calculations

CB-15

Fp = 0.18, ap = 1.00, Fm = 0.18, T_c = 0.17 hr = 10 minutes, AMC = II, I_{25} = 2.9 in/hr, A = 1.35 acres

Q25 = 0.9(2.9-0.18)1.35 = 3.30 cfs

CB-16

Fp = 0.18, ap = 1.00, Fm = 0.18, T_c = 0.083 hr = 5 minutes, AMC = II, I_{25} = 3.92 in/hr, A = 0.25 acres

Q25 = 0.9(3.92-0.18)0.25 = 0.84 cfs

See Attachment J for pipe design data

IV DETENTION BASIN

1. Pre-, Post-Development Peak Flow Comparison

Increased runoff peak flows from the proposed plant construction will be attenuated by the construction of a detention basin.

The total pre-development study area is 8.355 acres. Due to the site elevations, configuration, and easements only runoff from 8.041 acres of area can be directed to the detention basin after development. Because of this, the peak runoff from an equivalent post-developed area (8.355 acres) will be compared at MH #6. The pond will have to retain additional runoff from the immediate plant site to offset increases in other subareas not directed to the basin.

The maximum allowable post-development discharge from the detention basin is 0.9Qn per design criteria in I, 2, B above:

$Qp_{post\ 2\text{-}yr} \leq Q_{p\ pre,\ 2\text{-}yr}$, AMC I = 1.96 cfs
$Qp_{post\ 10\text{-}yr} \leq Q_{p\ pre,\ 5\text{-}yr}$, AMC I = 4.14 cfs
$Qp_{post\ 25\text{-}yr} \leq Q_{p\ pre,\ 10\text{-}yr}$, AMC II = 5.94 cfs
$Qp_{post\ 100\text{-}yr} \leq Q_{p\ pre,\ 25\text{-}yr}$, AMC = II = 10.30 cfs

Qp post 2-yr < 0.9 x 1.96 = 1.76 cfs   from II-5 above

Qp post 10-yr < 0.9 x 4.14 = 3.73 cfs
Qp post 25-yr < 0.9 x 5.94 = 5.35 cfs
Qp post 100-yr < 0.9 x 10.30 = 9.27 cfs

Pre-Development Qpeak VS. Allowable Post-Development Discharge from Attachment F

Basin Inflow	10.96	18.47	23.54	31.38
Allowable Basin Outflow	1.76	3.73	5.35	9.27

2. Inflow Hydrographs

Use Section J, "Small Area Runoff Hydrograph Development" method to determine the inflow hydrograph from the site area since it is used when small areas have a time of concentration of less than 25 minutes. See Attachment L for the hydrographs that were generated. The maximum Tc is 8 minutes. The hydrographs generated by Section J resulted in peak flows different than those shown in the table above.

3. Detention Basin

Approximate L/W ratio = 2:1

Basin Volume versus elevation is shown in Attachment M.

Spillway Capacity

The spillway will be designed to serve as both the service and emergency spillway. The emergency spillway capacity shall be the Q_{1000} rate which is $1.35Q_{100}$ = 1.35 x 31.38 = 42.4 cfs.

The spillway used in this preliminary analysis consists of 3-foot diameter riser with a crest elevation at 934 feet. The Q1000 discharge requires a pond elevation of approximately 935.6 feet. A 3-inch diameter dewatering orifice is at invert elevation 929 feet to allow the basin to drain after the rainfall event.

The riser will be fitted with an anti-vortex device and a trash rack.

Pond Routing

The pond routing calculations were performed using Haestad Method's "PondPack" program. See Attachment M for routing results for the 100, 25, 10, and 2-year storm events.

Routing Summary:

Return Period	Max Q IN (cfs) from generated hydrograph	Max. WL (elev ft)	Max Volume in Basin (ac-ft)	Q OUT from Basin (cfs)	Q OUT Allowable (cfs)
2	7.62	930.44	0.165	0.27	1.78
10	12.0	930.93	0.324	0.32	3.74
25	14.8	931.23	0.483	0.34	5.37
100	36.33	932.90	0.871	0.46	9.26

The pond is sufficiently sized to attenuate the peak inflow values well below the allowable outflow. There is sufficient margin in the pond to account for changes that may occur during final design. The discharge structure will have to be optimized in final design to insure that the basin will dewater within 24 hours.

V CONCLUSIONS

The stormwater management for the site meets the requirements of the City of Grand Terrace, and the San Bernardino County. The detention basin is sized to attenuate the increased peak runoff flows resulting from development.

Winterhalter, Jon A. (Reading)

From: Baxter, Geoffrey (Roseville)
Sent: Tuesday, June 13, 2006 7:11 PM
To: Winterhalter, Jon A. (Reading)
Subject: FW: AES Highgrove - County/City storm water meeting

Draft notes from the meeting last week re storm water.

Geoff

Geoffrey Baxter, PE
Engineering Project Manager
WorleyParsons, Sacramento
Work: 916-797-7283 x226
Cell: 916-812-6178

From: Baxter, Geoffrey (Roseville)
Sent: Monday, June 12, 2006 4:28 PM
To: 'Julie Way'
Subject: AES Highgrove - County/City storm water meeting

Julie – below are the notes from last week's meeting. Please review and advise any comments.

Geoff

Project: AES Highgrove Project

Attendees:

Ken Eke, San Bernardino County
Sameh Basta, San Bernardino County
Marty Mish, San Bernardino County
Gary Koontz, City of Grand Terrace
Rich Shields, City of Grand Terrace
Julie Way, AES
Geoff Baxter, WorleyParsons

Location:

San Bernardino County Public Works Building

Meeting Notes:

1. Reviewed project status and location with County and City staff.
2. During the meeting the county researched and confirmed they do not own or control the concrete drainage ditch on the north side of the tank farm property which conveys surface water from east of Taylor to Cadena Creek via plant man-hole #6.
3. A/I - AES to review parcel descriptions for right of way or easement for ditch.
    a. Post meeting note: Julie Way confirmed per drawings from the SEC asset sale agreement the ditch and the culvert from the ditch to man-hole #6 belongs to the tank farm property (City). The plant (AES) owns the plant storm water conveyance pipe to man-hole #6 and man-hole #6.
4. Since the property is within the City limits and the County has no other flow control conveyances in the

area, the County will not be involved in the permitting.

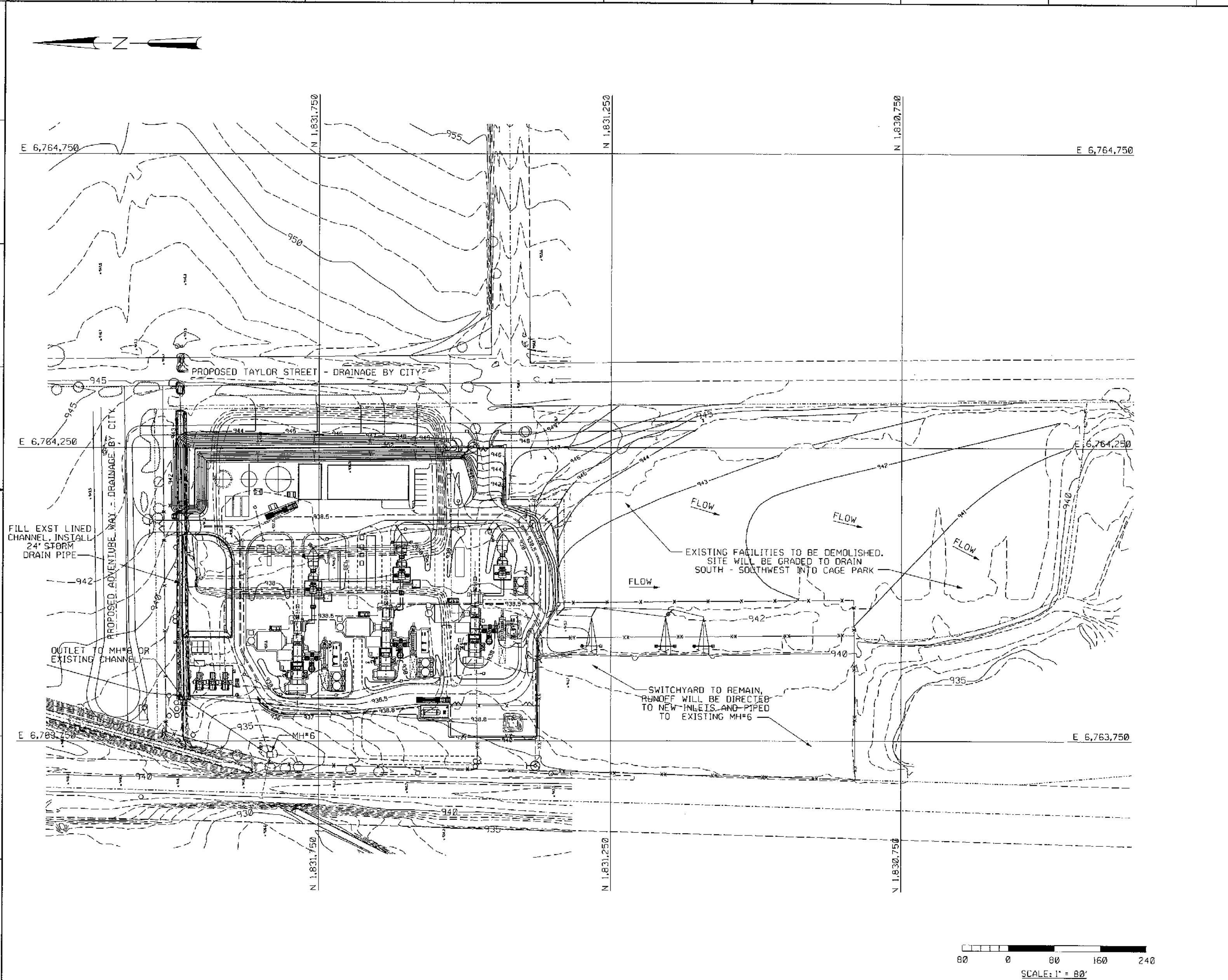
5. After development of the new high school all storm flow east of Taylor will be controlled by the City of Grand Terrace.
6. Keysac completed master storm water plan and flows for the City.
7. The City is adding a 48" storm pipe under Pico St to pick up all flows east of Taylor and detain them in a new pond on the NE corner of Pico and Taylor.
8. 48" storm pipe and new detention basin are part of the school development which is planned to start construction in 2007.
9. The city has approval responsibility for storm water management for the new site.
10. The city follows the county storm water requirements
11. The city will hire a 3rd party engineer for plan checking
12. County storm water detention basin design requirements are per memo dated 9/4/87.
13. Engineer shall submit design criteria with plans when submitted for plan check.
14. the City agreed that the engineer may use 3rd party software to calculate storm water (surface and culvert) flows. Engineer is not required to use the county's software (Advanced Engineering Software).

County staffed exited the meeting.

15. Existing plant will be graded to prevent surface flow reaching the new plant property. Existing plant site will drain to Cage Park or to Taylor.
16. The new plant property will only include inflow from the west side of the crown on Taylor St. The city will control flow on the north side and south side and development and demo is complete.
17. The ditch on the north end may be replaced by a ~24" culvert temporarily until the school is built.

Geoffrey Baxter, PE
Engineering Project Manager
WorleyParsons, Sacramento
Work: 916-797-7283 x226
Cell: 916-812-6178

Attachment B



LEGEND:

- 940 — EXISTING GRADE CONTOURS
- 940 — FINAL GRADE CONTOURS

REV	DATE	DESCRIPTION	DRAWN	CHECKED	LEAD DESIGNER	ENGINEER/TECH SPEC.	LEAD DISC ENGINEER	PROJ. ENGR MANAGER	PROJECT MANAGER
A	11-08-06	ISSUED FOR PERMITTING	JKW	ALM	KJF	JAW	JAW	GB	GB

PRELIMINARY STATUS — DATE — REPRESENTS GENERAL DESIGN CONCEPTS BASED ON ASSUMPTIONS. REVIEWED NOT CHECKED.
LOE JA WINTERHALTER 11-08-06

APPROVED STATUS — DATE — REPRESENTS REVIEWED AND APPROVED DESIGN. ANY PORTION MARKED "HOLD" RETAINS PRELIMINARY STATUS.
LOE

ORIGINATING PERSONNEL — PROFESSIONAL ENGINEER'S SEAL

DRAWN BY: JKW
CHECKED BY: AL MERKEL
LEAD DESIGNER: KJ FRITZ
ENGINEER/TECH SPECIALIST: JA WINTERHALTER
PROJECT ENGINEERING MANAGER: G BAXTER
PROJECT MANAGER: G BAXTER

Zero Harm — Leadership, No Incidents, Safe Behavior

ORIGINALLY PREPARED UNDER THE RESPONSIBLE SUPERVISION OF PE: ___ STATE: ___ LIC. NO.: ___ DATE: ___

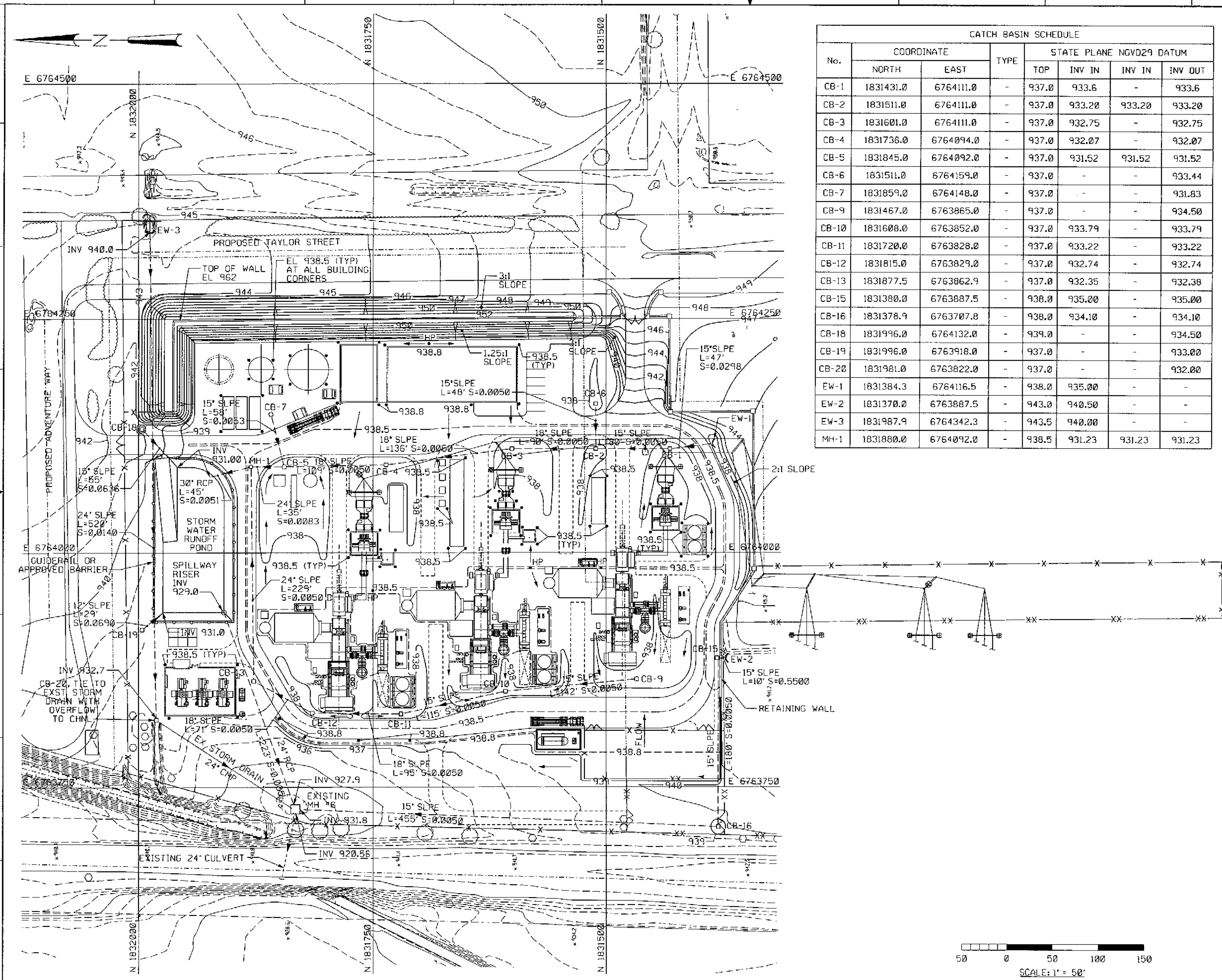
WorleyParsons resources & energy

CLIENT/PROJECT TITLE: AES/HIGHGROVE

PRELIMINARY GRADING AND DRAINAGE OVERALL PLAN

SCALE: 1"=80'
DRAWING SIZE: ANSI D (22" x 34")
WORLEYPARSONS DWG. NO.: HIGH-0-DW-112-735-001
REV: A

DWG-FILE: high-0-dw-112-735-001.dgn
DWG-DATE: 08-Nov-06 06:50



No.	COORDINATE		TYPE	STATE PLANE NGVD29 DATUM			
	NORTH	EAST		TOP	INV IN	INV IN	INV OUT
CB-1	1831431.0	6764111.0	-	937.0	933.6	-	933.6
CB-2	1831511.0	6764111.0	-	937.0	933.20	933.20	933.20
CB-3	1831601.0	6764111.0	-	937.0	932.75	-	932.75
CB-4	1831736.0	6764094.0	-	937.0	932.07	-	932.07
CB-5	1831845.0	6764092.0	-	937.0	931.52	931.52	931.52
CB-6	1831511.0	6764159.0	-	937.0	-	-	933.44
CB-7	1831859.0	6764148.0	-	937.0	-	-	931.83
CB-9	1831467.0	6763865.0	-	937.0	-	-	934.50
CB-10	1831608.0	6763852.0	-	937.0	933.79	-	933.79
CB-11	1831720.0	6763828.0	-	937.0	933.22	-	933.22
CB-12	1831815.0	6763829.0	-	937.0	932.74	-	932.74
CB-13	1831877.5	6763862.9	-	937.0	932.35	-	932.38
CB-15	1831380.0	6763887.5	-	938.0	935.00	-	935.00
CB-16	1831378.9	6763707.8	-	938.0	934.10	-	934.10
CB-18	1831996.0	6764132.0	-	939.0	-	-	934.50
CB-19	1831996.0	6763918.0	-	937.0	-	-	933.00
CB-20	1831981.0	6763822.0	-	937.0	-	-	932.00
EW-1	1831384.3	6764116.5	-	938.0	935.00	-	-
EW-2	1831370.0	6763887.5	-	943.0	940.50	-	-
EW-3	1831987.9	6764342.3	-	943.5	940.00	-	-
MH-1	1831880.0	6764092.0	-	938.5	931.23	931.23	931.23

CATCH BASIN SCHEDULE

LEGEND

- 940 — EXISTING GRADE CONTOURS
- 940 — FINAL GRADE CONTOURS
- 938.5 — HALF CONTOURS
- •938.5 FINAL GRADE SPOT ELEVATION
- □CB-5 NEW CATCH BASIN
- NEW STORM DRAIN PIPE
- —x— NEW FENCE
- —XX— EXISTING FENCE

Attachment C

REV	DATE	DESCRIPTION	DRAWN	CHECKED	LEAD DESIGNER	ENGINEER/TECH SPEC	LEAD DISC ENGINEER	PROJ ENGR MANAGER	PROJECT MANAGER
A	11-08-06	ISSUED FOR PERMITTING	JKW	ALM	KJF	JAW	JAW	GB	GB

PRELIMINARY STATUS — LDE JA WINTERHALTER — DATE 11-08-06 — REPRESENTS GENERAL DESIGN CONCEPTS BASED ON ASSUMPTIONS. REVIEWED NOT CHECKED.

APPROVED STATUS — LDE — DATE — REPRESENTS REVIEWED AND APPROVED DESIGN. ANY PORTION MARKED "HOLD" RETAINS PRELIMINARY STATUS.

ORIGINATING PERSONNEL — PROFESSIONAL ENGINEER'S SEAL

DRAWN BY: JKW
CHECKED BY: AL MERKEL
LEAD DESIGNER: KJ FRITZ
ENGINEER/TECH SPECIALIST: JA WINTERHALTER
PROJECT ENGINEERING MANAGER: G BAXTER
PROJECT MANAGER: G BAXTER

Zero Harm — Leadership, No Incidents, Safe Behavior

ORIGINALLY PREPARED UNDER THE RESPONSIBLE SUPERVISION OF PE: STATE: LIC. NO.: DATE:

WorleyParsons resources & energy

CLIENT/PROJECT TITLE: AES/HIGHGROVE

PRELIMINARY GRADING AND DRAINAGE SITE PLAN

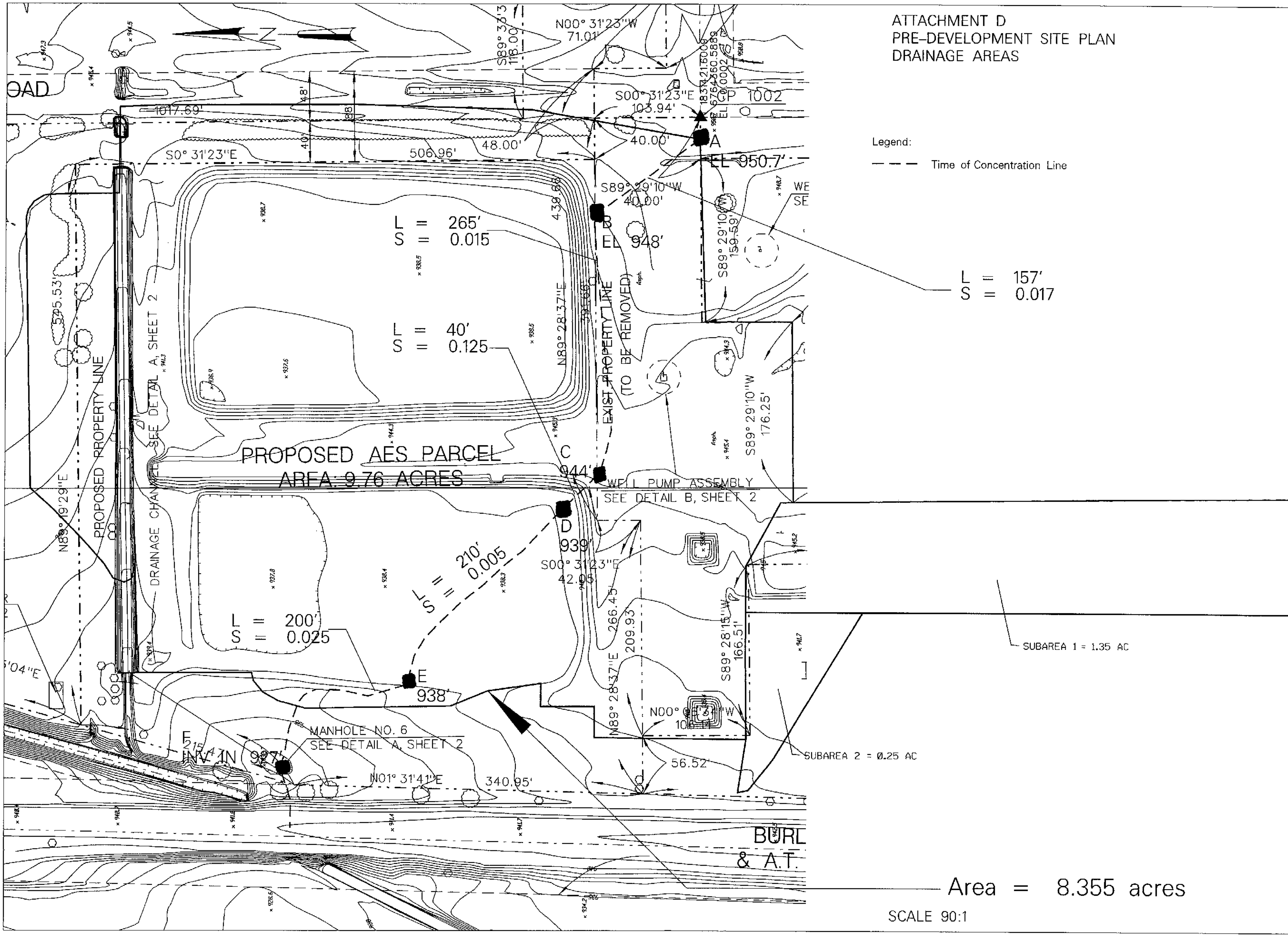
SCALE: 1"=50'
DRAWING SIZE: ANSI D (22" x 34")
WORLEYPARSONS DWG. NO.: HIGH-0-DW-112-735-002
REV: A

DWG-FILE: high-0-dw-112-735-002.dgn
DWG-DATE: 08-Nov-06 06:51

ATTACHMENT D
PRE-DEVELOPMENT SITE PLAN
DRAINAGE AREAS

Legend:

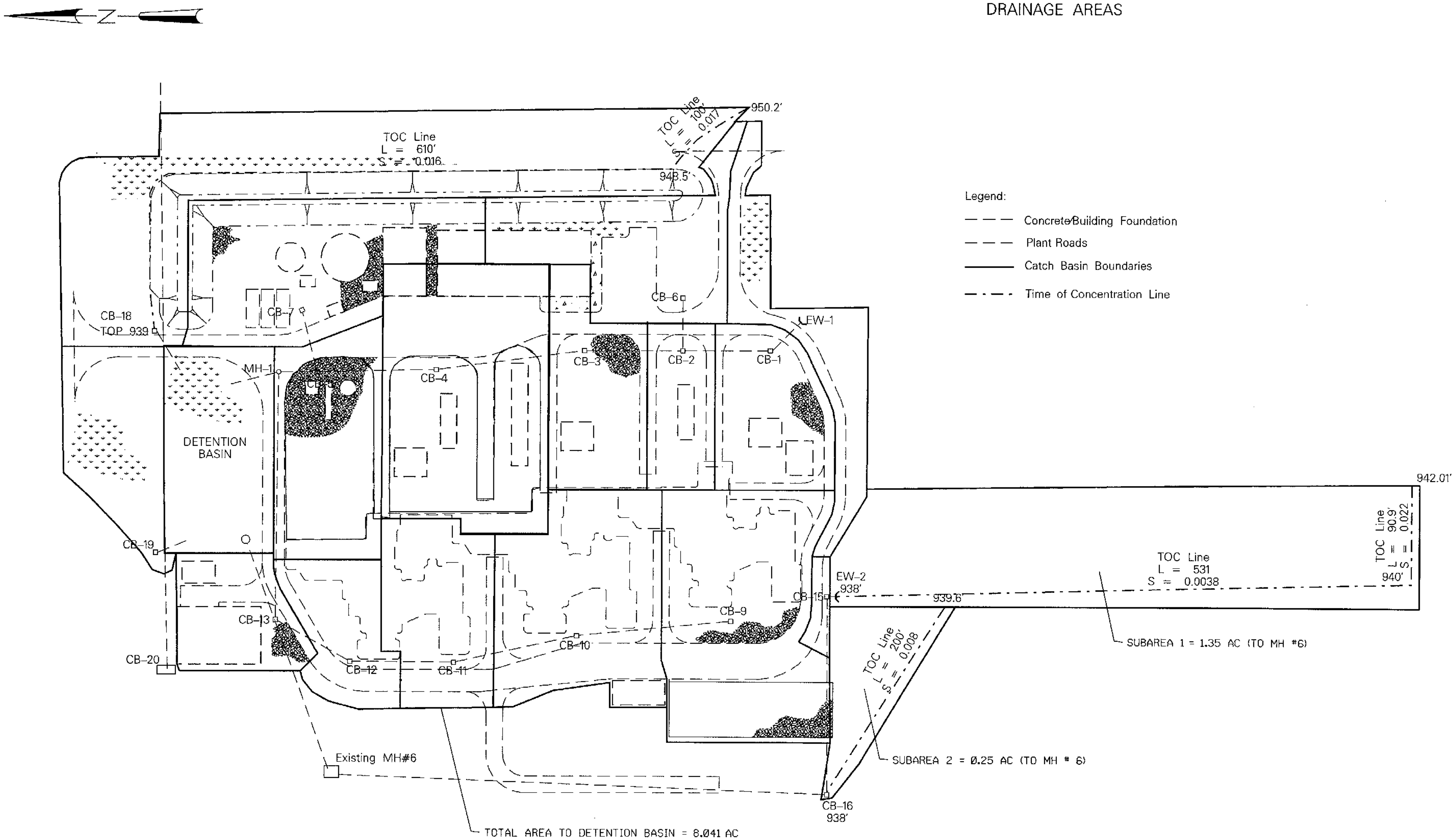
– – – Time of Concentration Line



Area = 8.355 acres

SCALE 90:1

ATTACHMENT E
POST-DEVELOPMENT SITE PLAN
DRAINAGE AREAS



SCALE 90:1

AES Highgrove Project

Attachment F
P 1/2

STORMWATER SYSTEM DESIGN WORKSHEET

Date 10/27/2006
Computed JAW
Reviewed DS

Sub-drainage No.	Areas Total (SF)	Subtracted (SF)	Drainage (SF)	Drainage (AC)	Impervious (SF)	Gravel (SF)	Grass (SF)	Average CN	Fraction Impervious	ap Fraction Pervious	Fp per Figure C-6 AMC II	Fm = ap x Fp	Fm * A
CB-1	14,905	0	14,905	0.342	5,617	9,288	0	94	0.38	0.62	0.12	0.07	0.026
CB-2	9,381	0	9,381	0.215	4,003	5,378	0	95	0.43	0.57	0.10	0.06	0.012
CB-3	15,724	0	15,724	0.361	6,017	9,706	0	94	0.38	0.62	0.12	0.07	0.027
CB-4	36,185	0	36,185	0.831	21,698	14,487	0	96	0.60	0.40	0.08	0.03	0.027
CB-5	20,082	0	20,082	0.461	7,855	12,228	0	95	0.39	0.61	0.10	0.06	0.028
CB-6	21,688	0	21,688	0.498	11,047	10,640	0	96	0.51	0.49	0.08	0.04	0.020
CB-7	28,424	0	28,424	0.653	8,913	11,211	8,299	89	0.31	0.69	0.22	0.15	0.099
CB-9	33,117	0	33,117	0.760	13,805	19,312	0	95	0.42	0.58	0.10	0.06	0.044
CB-10	26,292	0	26,292	0.604	17,377	8,915	0	97	0.66	0.34	0.06	0.02	0.012
CB-11	14,927	0	14,927	0.343	8,351	6,576	0	96	0.56	0.44	0.08	0.04	0.012
CB-12	9,510	0	9,510	0.218	6,170	3,340	0	97	0.65	0.35	0.06	0.02	0.005
CB-13	10,941	0	10,941	0.251	7,452	3,489	0	97	0.68	0.32	0.06	0.02	0.005
CB-14	1,623	0	1,623	0.037	887	736	0	96	0.55	0.45	0.08	0.04	0.001
CB-18E	40,297	0	40,297	0.925	118	0	40,179	74	0.00	1.00	0.52	0.52	0.480
CB-18	18,705	0	18,705	0.429	1,386	0	17,319	76	0.07	0.93	0.45	0.42	0.179
CB-19	14,921	0	14,921	0.343	1,386	0	13,535	76	0.09	0.91	0.45	0.41	0.140
Pond	18,741	0	18,741	0.430	3,200	15,541	0	93	0.17	0.83	0.14	0.12	0.050
EW-1	14,806	0	14,806	0.340	5,084	0	9,721	83	0.34	0.66	0.32	0.21	0.071
SUM (A)			350,267	8.041	130,363	130,849	89,055						1.237
			8.041 acres									Average =	0.154
													Use 0.15
Existing MH#6	87,279	0	87,279	2.004	13,520	8,512	65,248		0.15	0.85	0.40	0.34	
CB-20	11,876	0	11,876	0.273	0	0	11,876		0.00	1.00	0.48	0.48	0.131
Switchyard CB-15	59,200		59,200	1.359	0	59,200	0		0.00	1.00	0.18	0.18	0.245
Switchyard CB-16	12,800		12,800	0.294	0	12,800	0		0.00	1.00	0.18	0.18	0.053

Note:
1) The CN values used for the determination of fp are as follows:

Impervious: 100
Gravel: 91
Grass: 74

Pre-Development Conditions

			A	CN	A*CN	ap Fraction Pervious
Area = 8.3550 acres						0.98
Gravel/Industrial			1.51	91	137.41	
Impervious			0.145	100	14.5	
Grass =			6.7	74	495.8	
			8.355	Total	647.71	
			CN composite =		77.52	*Use 78*

Return Period (years)	Intensity (in/hr) for Tc = 25 min	AMC	Fp per Figure C-6 for Cn = 78	Fm = ap x Fp	I-Fm	Qp = 0.9(I-Fm)A (CFS)	Reduced per Criteria, 0.9 x Qp		Compare to Qpost
2	0.91	I	0.66	0.65	0.26	1.98	**1.78**		2 yr
5	1.2	I	0.66	0.65	0.55	4.16	**3.74**		10 yr
10	1.44	I	0.66	0.65	0.79	5.96	**5.37**		25 yr
25	1.78	II	0.42	0.41	1.37	10.29	**9.26**		100 yr
100	2.38	II	0.42	0.41	1.97	14.80			

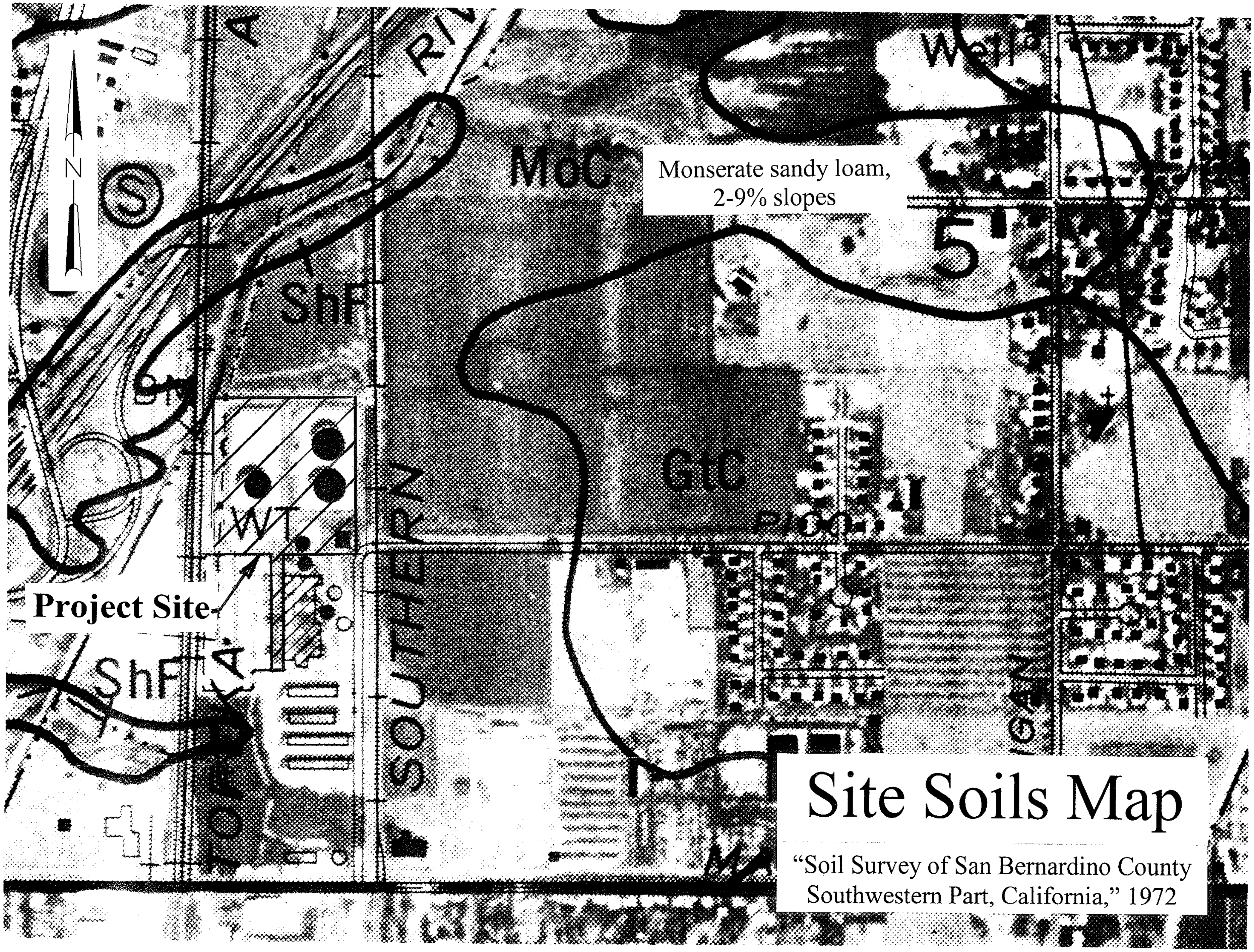
Post Development Qpeak

Flows to Basin CFS

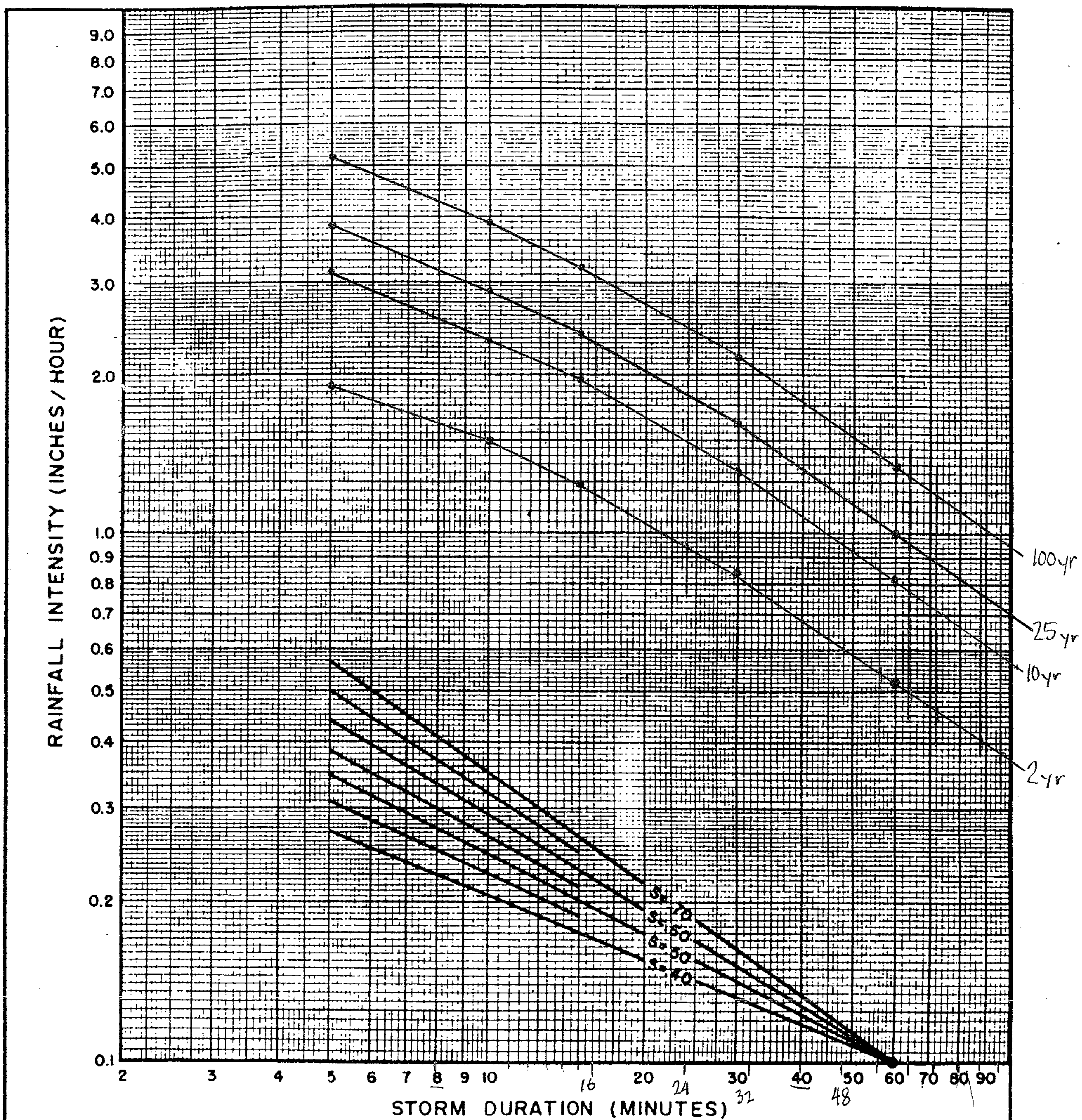
	Return Period					
Area	2	10	25	100	Total Tc	
Main Plant	8.44	14.27	18.32	24.27	8	min
CB-18	1.98	3.28	4.08	5.56	7	
CB-19	0.54	0.92	1.14	1.55	5	
Total to Basin	10.96	18.47	23.54	31.38		

Pre-Development Qpeak VS. Allowable Post-Development Discharge

Basin Inflow	10.96	18.47	23.54	31.38
Allowable	1.78	3.74	5.37	9.26



Attachment G



DESIGN STORM FREQUENCY = ______ YEARS

ONE HOUR POINT RAINFALL = ______ INCHES

LOG-LOG SLOPE = ______

PROJECT LOCATION = ____________________

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

INTENSITY - DURATION CURVES CALCULATION SHEET

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

California 34.03 N 117.32 W 1062 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 3
G.M. Bonnin, D. Todd, B. Lin, T. Parzybok, M. Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2003

Extracted: Thu May 4 2006

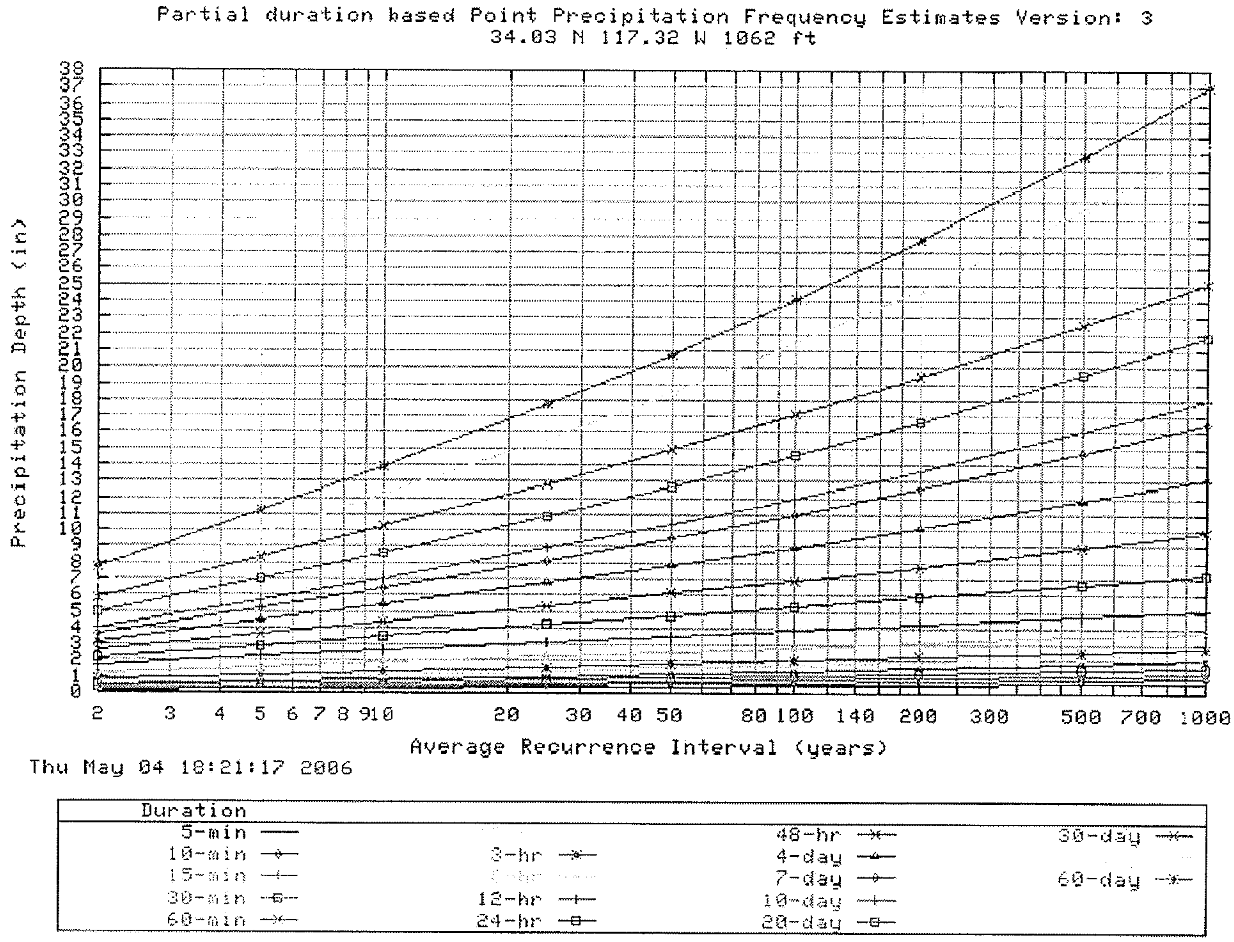
Confidence Limits | Seasonality | Location Maps | Other Info. | GIS data | Maps | Help | D

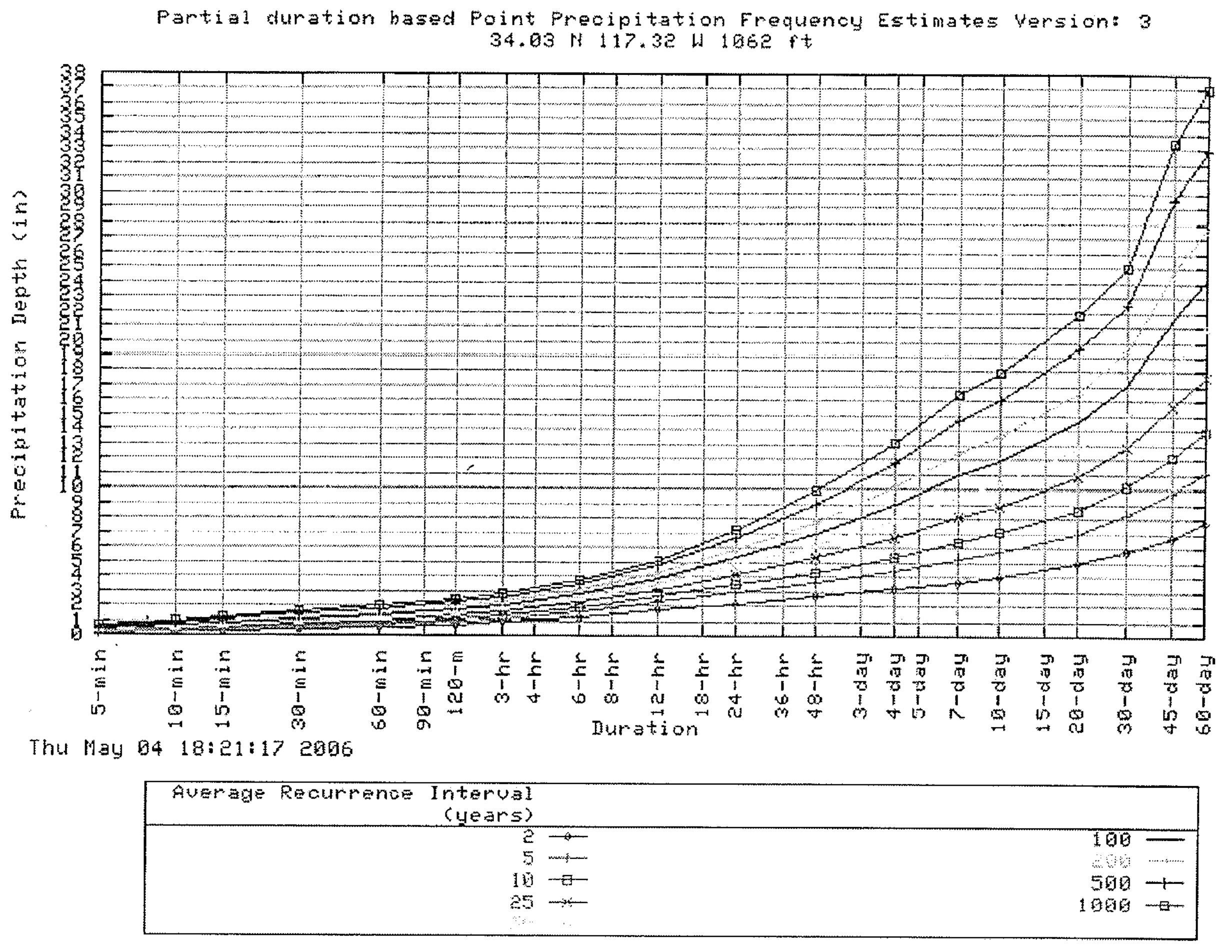
Precipitation Frequency Estimates (inches)

ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
2	0.16	0.25	0.31	0.42	0.52	0.72	0.88	1.26	1.73	2.21	2.61	3.15	3.64	4.03	4.91	5.82	6.73	7.74
5	0.22	0.33	0.41	0.55	0.68	0.93	1.12	1.61	2.24	2.94	3.58	4.43	5.19	5.72	6.99	8.31	9.77	11.17
10	0.26	0.39	0.49	0.66	0.81	1.09	1.32	1.89	2.62	3.48	4.31	5.41	6.40	7.04	8.60	10.21	12.18	13.87
25	0.32	0.48	0.60	0.81	1.00	1.32	1.59	2.25	3.13	4.21	5.32	6.75	8.10	8.89	10.86	12.83	15.62	17.70
50	0.37	0.56	0.70	0.94	1.16	1.51	1.81	2.52	3.50	4.76	6.11	7.83	9.47	10.38	12.68	14.91	18.44	20.81
100	0.43	0.65	0.80	1.08	1.34	1.71	2.03	2.81	3.88	5.33	6.93	8.95	10.94	11.96	14.60	17.09	21.49	24.16
200	0.48	0.74	0.91	1.23	1.52	1.92	2.26	3.09	4.26	5.89	7.78	10.13	12.50	13.64	16.63	19.37	24.78	27.74
500	0.57	0.86	1.07	1.44	1.79	2.21	2.58	3.48	4.75	6.65	8.94	11.78	14.71	16.02	19.50	22.54	29.51	32.85
1000	0.64	0.97	1.20	1.62	2.00	2.44	2.83	3.77	5.13	7.22	9.86	13.09	16.50	17.94	21.80	25.07	33.42	37.04

Text version of table

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval. Please refer to the documentation for more information. NOTE: Formatting forces estimates near zero to appear as zero.


Partial duration based Point Precipitation Frequency Estimates Version: 3
34.03 N 117.32 W 1062 ft
Precipitation Depth (in)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
2 3 4 5 6 7 8 9 10 20 30 40 50 80 100 140 200 300 500 700 1000
Average Recurrence Interval (years)
Thu May 04 18:21:17 2006
Duration
5-min
10-min
15-min
30-min
60-min
3-hr
12-hr
24-hr
48-hr
4-day
7-day
10-day
20-day
30-day
60-day



Confidence Limits -

* Upper bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
2	0.19	0.29	0.36	0.48	0.59	0.81	1.00	1.40	1.92	2.48	2.93	3.51	4.06	4.50	5.49	6.51	7.63	8.75
5	0.25	0.38	0.47	0.63	0.78	1.05	1.27	1.79	2.49	3.30	4.01	4.92	5.78	6.38	7.82	9.28	11.05	12.62
10	0.29	0.45	0.56	0.75	0.93	1.23	1.50	2.08	2.91	3.90	4.83	6.00	7.12	7.84	9.61	11.39	13.75	15.63
25	0.36	0.55	0.69	0.92	1.14	1.49	1.80	2.49	3.46	4.71	5.95	7.49	8.98	9.87	12.10	14.27	17.55	19.87
50	0.42	0.64	0.79	1.07	1.32	1.70	2.04	2.79	3.88	5.32	6.82	8.67	10.51	11.51	14.10	16.58	20.69	23.34
100	0.48	0.73	0.91	1.23	1.52	1.92	2.29	3.10	4.29	5.94	7.74	9.92	12.13	13.27	16.22	18.99	24.09	27.06
200	0.55	0.83	1.03	1.39	1.72	2.15	2.55	3.42	4.71	6.56	8.69	11.24	13.87	15.12	18.46	21.52	27.73	31.06
500	0.64	0.98	1.21	1.63	2.02	2.48	2.90	3.84	5.26	7.40	9.99	13.07	16.33	17.76	21.65	25.03	33.07	36.80
1000	0.72	1.10	1.36	1.83	2.26	2.74	3.19	4.17	5.67	8.04	11.03	14.54	18.35	19.93	24.25	27.89	37.48	41.50

* The upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.
** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

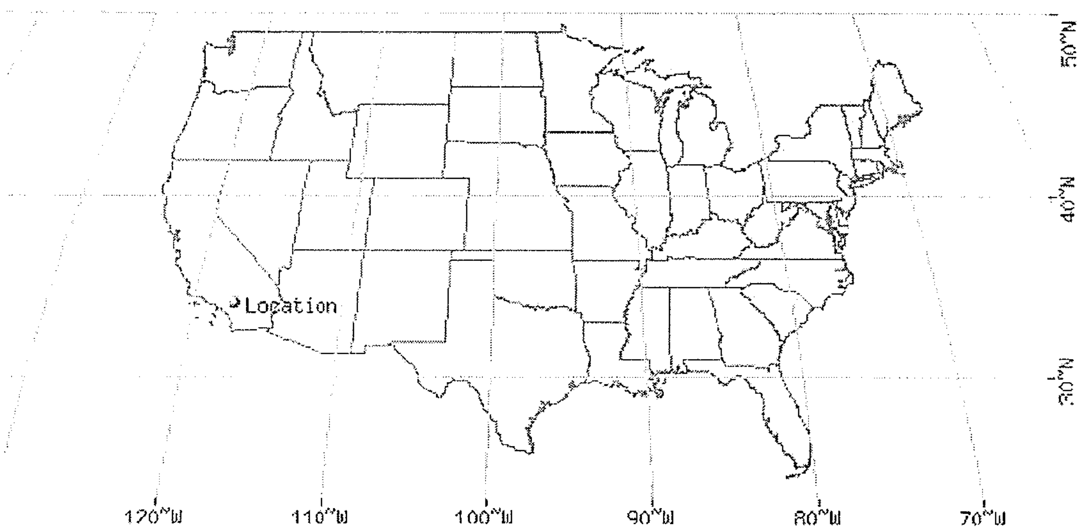
* Lower bound of the 90% confidence interval Precipitation Frequency Estimates (inches)

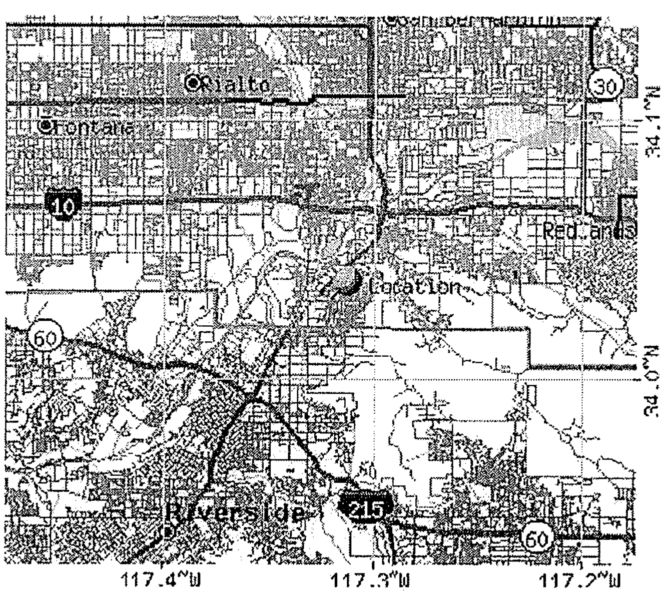
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
2	0.15	0.22	0.28	0.37	0.46	0.64	0.79	1.14	1.56	1.97	2.32	2.85	3.27	3.62	4.41	5.21	6.00	6.93
5	0.19	0.29	0.36	0.49	0.60	0.83	1.00	1.46	2.01	2.62	3.19	4.00	4.66	5.14	6.27	7.44	8.68	9.98
10	0.23	0.35	0.43	0.58	0.72	0.97	1.18	1.69	2.35	3.10	3.82	4.86	5.72	6.31	7.69	9.11	10.77	12.34
25	0.28	0.43	0.53	0.71	0.88	1.17	1.41	2.01	2.80	3.73	4.70	6.05	7.19	7.92	9.66	11.40	13.73	15.63
50	0.32	0.49	0.61	0.82	1.01	1.33	1.59	2.25	3.12	4.20	5.37	6.98	8.36	9.21	11.21	13.17	16.11	18.27
100	0.37	0.56	0.69	0.93	1.15	1.50	1.78	2.50	3.45	4.68	6.05	7.94	9.60	10.55	12.84	15.02	18.64	21.08
200	0.41	0.63	0.78	1.05	1.30	1.67	1.97	2.74	3.77	5.16	6.75	8.93	10.88	11.94	14.52	16.91	21.32	24.02
500	0.48	0.73	0.90	1.21	1.50	1.91	2.23	3.06	4.19	5.78	7.70	10.27	12.67	13.88	16.84	19.50	25.11	28.08
1000	0.53	0.81	1.00	1.35	1.67	2.09	2.42	3.30	4.49	6.25	8.43	11.32	14.10	15.41	18.66	21.53	28.14	31.39

* The lower bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are less than.
** These precipitation frequency estimates are based on a partial duration maxima series. ARI is the Average Recurrence Interval.

Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

Maps -





These maps were produced using a direct map request from the U.S. Census Bureau Mapping and Cartographic Resources Tiger Map Server.

Please read disclaimer for more information.

LEGEND

State
County
Indian Resv
Lake/Pond/Ocean
Street
Expressway
Highway
Connector
Stream
Military Area
National Park
Other Park
City
County

Scale 1:228583 0 2 4 6 8 mi / 0 2 4 6 8 10 km
*average--true scale depends on monitor resolution

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TIME OF CONCENTRATION CALCULATOR

PRE-DEVELOPMENT
TOTAL Tc
(SEE ATT. D FOR PLAN)

Segment #1: Tc: TR-55 Sheet

Mannings n	.1500	
Hydraulic Length	157.00	ft
2yr, 24hr P	2.2100	in
Slope	.017000	ft/ft
Avg.Velocity	.14	ft/sec

Segment #1 Time: .3008 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	265.00	ft
Slope	.015000	ft/ft
Unpaved		
Avg.Velocity	1.98	ft/sec

Segment #2 Time: .0373 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	40.00	ft
Slope	.125000	ft/ft
Unpaved		
Avg.Velocity	5.70	ft/sec

Segment #3 Time: .0019 hrs

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PREDEVELOPMENT TOTAL Tc

Segment #4: Tc: TR-55 Shallow

Hydraulic Length 210.00 ft
Slope .005000 ft/ft
Unpaved

Avg.Velocity 1.14 ft/sec

Segment #4 Time: .0511 hrs

Segment #5: Tc: TR-55 Shallow

Hydraulic Length 200.00 ft
Slope .025000 ft/ft
Unpaved

Avg.Velocity 2.55 ft/sec

Segment #5 Time: .0218 hrs

Total Tc: .4129 hrs X 60 = 24.8 MIN.

USE 25 MINUTES

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Tc Equations used...

==== SCS TR-55 Sheet Flow ====

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ====

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

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TIME OF CONCENTRATION CALCULATOR

SURFACE FLOW TO EW-1

Segment #1: Tc: TR-55 Shallow

Hydraulic Length 240.00 ft
Slope .006000 ft/ft
Unpaved

Avg.Velocity 1.25 ft/sec

Segment #1 Time: .0533 hrs

Total Tc: .0533 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs 5 MIN

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:::

TIME OF CONCENTRATION CALCULATOR

:::

CB-18

Segment #1: Tc: TR-55 Sheet

Mannings n	.0110	
Hydraulic Length	100.00	ft
2yr, 24hr P	2.2100	in
Slope	.017000	ft/ft
Avg.Velocity	1.07	ft/sec

Segment #1 Time: .0259 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	610.00	ft
Slope	.016000	ft/ft
Unpaved		
Avg.Velocity	2.04	ft/sec

Segment #2 Time: .0830 hrs

Total Tc: .1090 hrs = 6.54 MIN

USE 7 MINUTES

File.... Z:\SACR\SACR\Doc\AES Highgrove\Civil\Stormwater\Switchyard Tc.ppw

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TIME OF CONCENTRATION CALCULATOR

CB-15

Segment #1: Tc: TR-55 Sheet

Mannings n	.0110	
Hydraulic Length	91.00	ft
2yr, 24hr P	2.2100	in
Slope	.022000	ft/ft
Avg.Velocity	1.17	ft/sec

Segment #1 Time: .0217 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	531.00	ft
Slope	.003800	ft/ft
Unpaved		
Avg.Velocity	.99	ft/sec

Segment #2 Time: .1483 hrs

Total Tc: .1700 hrs

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TIME OF CONCENTRATION CALCULATOR

CB-16

Segment #1: Tc: TR-55 Sheet

Mannings n	.0110	
Hydraulic Length	200.00	ft
2yr, 24hr P	2.2100	in
Slope	.008400	ft/ft
Avg.Velocity	.93	ft/sec

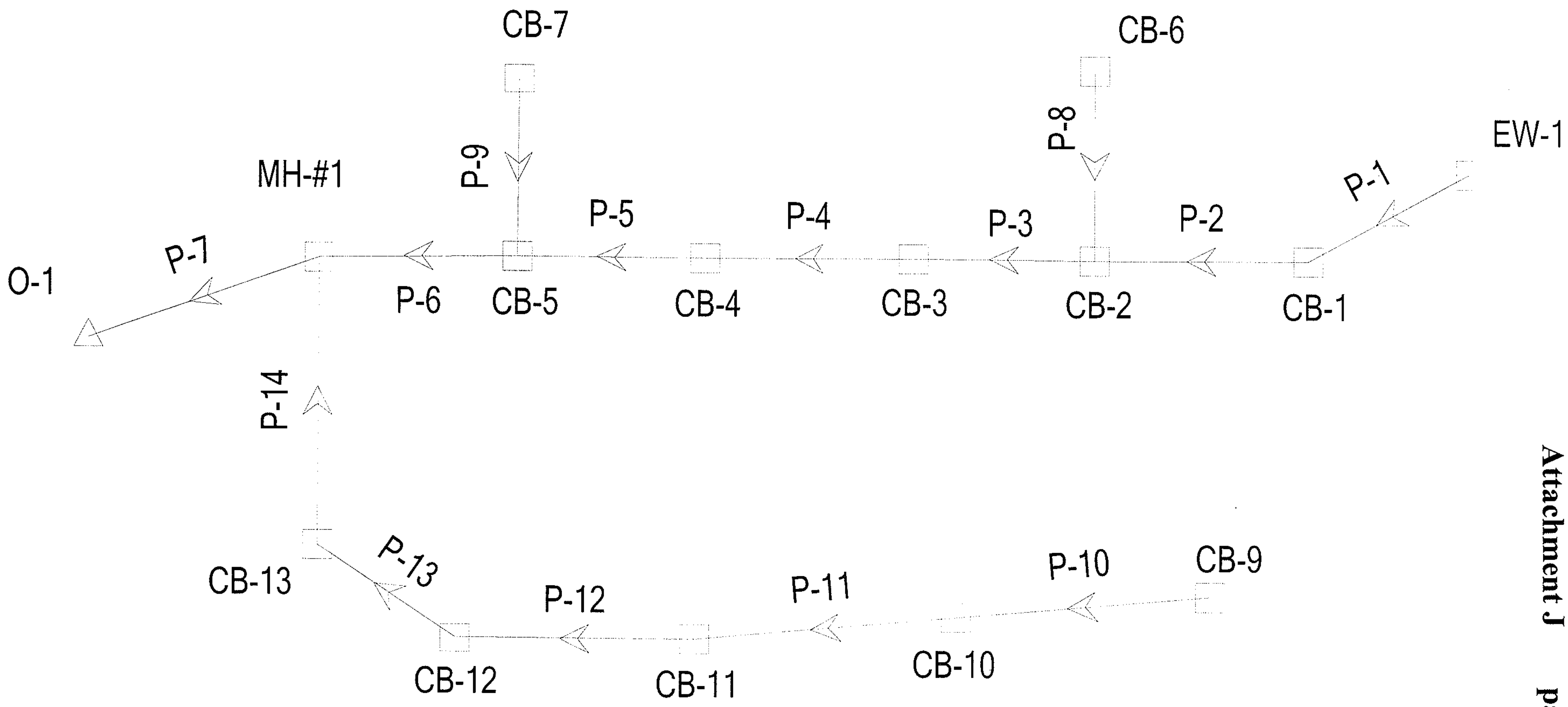
Segment #1 Time: .0599 hrs

Total Tc: .0599 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs

Scenario: Base

MAIN PLANT



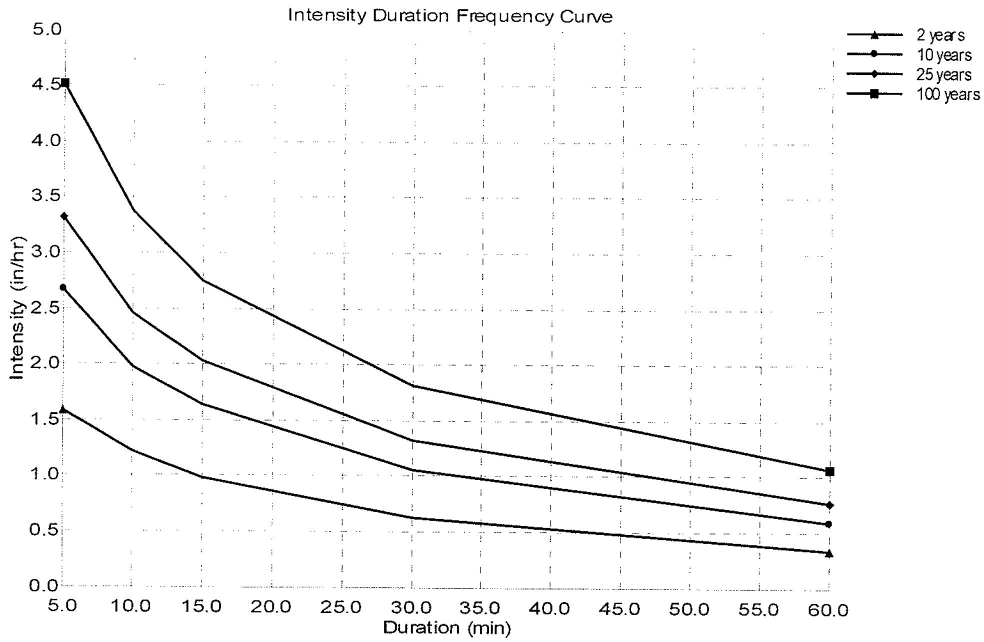
Rainfall Table

Return Periods				
Durations	2 year	10 year	25 year	100 year
5 min	1.59	2.67	3.32	4.51
10 min	1.22	1.97	2.46	3.38
15 min	0.98	1.63	2.03	2.75
30 min	0.62	1.05	1.32	1.81
60 min	0.33	0.59	0.77	1.07

Rainfall Intensities are in (in/hr)

ATT. J, p. 2/40

ATT. J, p. 3/40


Intensity Duration Frequency Curve
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Intensity (in/hr)
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
Duration (min)
2 years
10 years
25 years
100 years

Calculation Results Summary

ATT. J, p. 4/40

==

Scenario: Base

>>>> Info: Subsurface Network Rooted by: O-1
>>>> Info: Subsurface Analysis iterations: 3
>>>> Info: Convergence was achieved.

Q 100 POST

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
CB-9	Generic Inlet	Generic Default 100%	3.46	0.00	100.0	0.00	0.00
CB-10	Generic Inlet	Generic Default 100%	2.75	0.00	100.0	0.00	0.00
CB-11	Generic Inlet	Generic Default 100%	1.56	0.00	100.0	0.00	0.00
CB-12	Generic Inlet	Generic Default 100%	0.99	0.00	100.0	0.00	0.00
CB-13	Generic Inlet	Generic Default 100%	1.14	0.00	100.0	0.00	0.00
CB-5	Generic Inlet	Generic Default 100%	2.10	0.00	100.0	0.00	0.00
MH-#1	Generic Inlet	Generic Default 100%	1.95*	0.00	100.0	0.00	0.00
CB-7	Generic Inlet	Generic Default 100%	2.97	0.00	100.0	0.00	0.00
CB-4	Generic Inlet	Generic Default 100%	3.78	0.00	100.0	0.00	0.00
EW-1	Generic Inlet	Generic Default 100%	1.82	0.00	100.0	0.00	0.00
CB-1	Generic Inlet	Generic Default 100%	1.55	0.00	100.0	0.00	0.00
CB-2	Generic Inlet	Generic Default 100%	0.98	0.00	100.0	0.00	0.00
CB-3	Generic Inlet	Generic Default 100%	1.64	0.00	100.0	0.00	0.00
CB-6	Generic Inlet	Generic Default 100%	2.26	0.00	100.0	0.00	0.00

* RAINFALL DIRECTLY ON BASIN

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-7	1	30 inch	Circular	45.00	24.27	4.95	934.16	934.00
P-6	1	24 inch	Circular	58.00	15.26	4.86	934.38	934.16
P-14	1	24 inch	Circular	225.00	8.95	2.85	934.46	934.16
P-9	1	15 inch	Circular	58.00	2.97	2.42	934.49	934.38
P-5	1	18 inch	Circular	109.00	10.92	6.18	935.39	934.38
P-13	1	18 inch	Circular	78.00	8.04	4.55	934.85	934.46
P-4	1	18 inch	Circular	136.00	7.70	4.36	936.01	935.39
P-12	1	18 inch	Circular	95.00	7.28	4.12	935.24	934.85
P-3	1	18 inch	Circular	90.00	6.31	3.57	936.29	936.01
P-11	1	15 inch	Circular	115.00	5.94	4.84	936.06	935.24
P-2	1	15 inch	Circular	80.00	3.30	2.69	936.46	936.29
P-8	1	15 inch	Circular	48.00	2.26	1.84	936.34	936.29
P-10	1	15 inch	Circular	142.00	3.46	2.82	936.41	936.06
P-1	1	15 inch	Circular	37.00	1.82	1.48	936.49	936.46

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	24.05	931.00	934.00	934.00
MH-#1	24.27	938.50	934.16	934.16

Q100

CB-5	15.26	937.00	934.38	934.38
CB-13	8.95	937.00	934.46	934.46
CB-7	2.97	937.00	934.49	934.49
CB-4	10.92	937.00	935.39	935.39
CB-12	8.04	937.00	934.85	934.85
CB-3	7.70	937.00	936.01	936.01
CB-11	7.28	937.00	935.24	935.24
CB-2	6.31	937.00	936.29	936.29
CB-10	5.94	937.00	936.06	936.06
CB-1	3.30	937.00	936.46	936.46
CB-6	2.26	937.00	936.34	936.34
CB-9	3.46	937.00	936.41	936.41
EW-1	1.82	937.00	936.49	936.49

Completed: 11/05/2006 11:36:13 AM

ATT J., P. 6/40

Scenario: Base

DOT Report

Q100

Label	-Node- Upstream Downstream	Upstream Inlet Area (acres)	Upstream Inlet CA (acres)	Upstream Calculated System CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	Section Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-7	MH-#1	0.43	0.43	6.37	938.50	934.16	24.27	Circular	45.00	4.95	
	O-1				931.00	934.00	29.32	30 inch			
P-6	CB-5	0.46	0.46	3.76	937.00	934.38	15.26	Circular	58.00	4.86	
	MH-#1				938.50	934.16	17.33	24 inch			
P-9	CB-7	0.65	0.65	0.65	937.00	934.49	2.97	Circular	58.00	2.42	
	CB-5				937.00	934.38	5.12	15 inch			
P-3	CB-2	0.22	0.22	1.46	937.00	936.29	6.31	Circular	90.00	3.57	
	CB-3				937.00	936.01	8.05	18 inch			
P-2	CB-1	0.34	0.34	0.74	937.00	936.46	3.30	Circular	80.00	2.69	
	CB-2				937.00	936.29	4.95	15 inch			
P-1	EW-1	0.40	0.40	0.40	937.00	936.49	1.82	Circular	37.00	1.48	
	CB-1				937.00	936.46	13.61	15 inch			
P-8	CB-6	0.50	0.50	0.50	937.00	936.34	2.26	Circular	48.00	1.84	
	CB-2				937.00	936.29	4.95	15 inch			
P-4	CB-3	0.36	0.36	1.82	937.00	936.01	7.70	Circular	136.00	4.36	
	CB-4				937.00	935.39	8.05	18 inch			
P-5	CB-4	0.83	0.83	2.65	937.00	935.39	10.92	Circular	109.00	6.18	
	CB-5				937.00	934.38	8.08	18 inch			
P-14	CB-13	0.25	0.25	2.18	937.00	934.46	8.95	Circular	225.00	2.85	
	MH-#1				938.50	934.16	17.29	24 inch			
P-13	CB-12	0.22	0.22	1.92	937.00	934.85	8.04	Circular	78.00	4.55	
	CB-13				937.00	934.46	8.05	18 inch			
P-12	CB-11	0.34	0.34	1.71	937.00	935.24	7.28	Circular	95.00	4.12	
	CB-12				937.00	934.85	8.09	18 inch			
P-11	CB-10	0.60	0.60	1.36	937.00	936.06	5.94	Circular	115.00	4.84	
	CB-11				937.00	935.24	4.93	15 inch			
P-10	CB-9	0.76	0.76	0.76	937.00	936.41	3.46	Circular	142.00	2.82	
	CB-10				937.00	936.06	4.95	15 inch			

Scenario: Base

Node Report

Q100

Label	Area (acres)	Inlet C	Inlet CA (acres)	External CA (acres)	System CA (acres)	Time of Concentration (min)	External Time of Concentration (min)	Upstream Time Of Concentration (min)	System Flow Time (min)	System Intensity (in/hr)	System Rational Flow (cfs)	Additional Flow (cfs)	Additional Carryover (cfs)	Known Flow (cfs)	Upstream Additional Flow (cfs)	Total System Flow (cfs)	Ground Elevation (ft)	Rim Elevation (ft)	Hydraulic Grade Line In (ft)
CB-9	0.76	1.00	0.76	0.00	0.76	5.00	0.00	0.00	5.00	4.51	3.46	0.00	0.00	0.00	0.00	3.46	937.00	937.00	936.41
CB-10	0.60	1.00	0.60	0.00	1.36	5.00	0.00	5.84	5.84	4.32	5.94	0.00	0.00	0.00	0.00	5.94	937.00	937.00	936.06
CB-11	0.34	1.00	0.34	0.00	1.71	5.00	0.00	6.24	6.24	4.23	7.28	0.00	0.00	0.00	0.00	7.28	937.00	937.00	935.24
CB-12	0.22	1.00	0.22	0.00	1.92	5.00	0.00	6.62	6.62	4.14	8.04	0.00	0.00	0.00	0.00	8.04	937.00	937.00	934.85
CB-13	0.25	1.00	0.25	0.00	2.18	5.00	0.00	6.91	6.91	4.08	8.95	0.00	0.00	0.00	0.00	8.95	937.00	937.00	934.46
CB-5	0.46	1.00	0.46	0.00	3.76	5.00	0.00	7.15	7.15	4.03	15.26	0.00	0.00	0.00	0.00	15.26	937.00	937.00	934.38
MH-#1	0.43	1.00	0.43	0.00	6.37	5.00	0.00	8.22	8.22	3.78	24.27	0.00	0.00	0.00	0.00	24.27	938.50	938.50	934.16
O-1					6.37				8.38	3.75	24.05					24.05	931.00	931.00	934.00
CB-7	0.65	1.00	0.65	0.00	0.65	5.00	0.00	0.00	5.00	4.51	2.97	0.00	0.00	0.00	0.00	2.97	937.00	937.00	934.49
CB-4	0.83	1.00	0.83	0.00	2.65	5.00	0.00	6.85	6.85	4.09	10.92	0.00	0.00	0.00	0.00	10.92	937.00	937.00	935.39
EW-1	0.40	1.00	0.40	0.00	0.40	5.00	0.00	0.00	5.00	4.51	1.82	0.00	0.00	0.00	0.00	1.82	937.00	937.00	936.49
CB-1	0.34	1.00	0.34	0.00	0.74	5.00	0.00	5.42	5.42	4.42	3.30	0.00	0.00	0.00	0.00	3.30	937.00	937.00	936.46
CB-2	0.22	1.00	0.22	0.00	1.46	5.00	0.00	5.91	5.91	4.30	6.31	0.00	0.00	0.00	0.00	6.31	937.00	937.00	936.29
CB-3	0.36	1.00	0.36	0.00	1.82	5.00	0.00	6.33	6.33	4.21	7.70	0.00	0.00	0.00	0.00	7.70	937.00	937.00	936.01
CB-6	0.50	1.00	0.50	0.00	0.50	5.00	0.00	0.00	5.00	4.51	2.26	0.00	0.00	0.00	0.00	2.26	937.00	937.00	936.34

ATT. J, p. 7/40

Scenario: Base

Node Report

Q 100

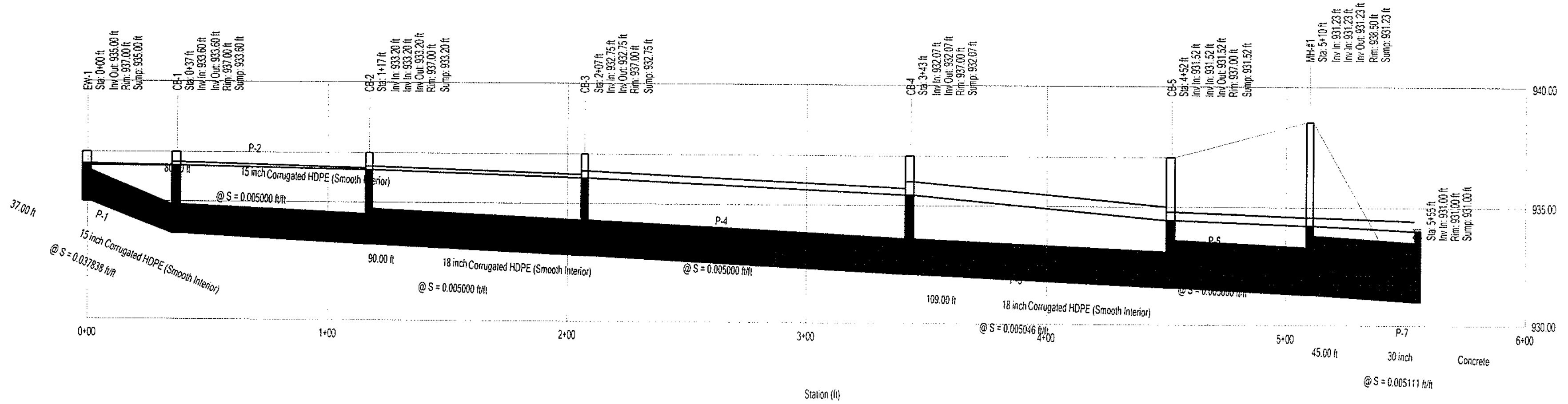
Hydraulic Grade Line Out (ft)	Local Intensity (in/hr)	Local Rational Flow (cfs)	Description
936.41	4.51	3.46	
936.06	4.51	2.75	
935.24	4.51	1.56	
934.85	4.51	0.99	
934.46	4.51	1.14	
934.38	4.51	2.10	
934.16	4.51	1.95	
934.00			
934.49	4.51	2.97	
935.39	4.51	3.78	
936.49	4.51	1.82	
936.46	4.51	1.55	
936.29	4.51	0.98	
936.01	4.51	1.64	
936.34	4.51	2.26	

ATT J., P. 8/40

Profile
Scenario: Base

Q 100

Profile: Profile - EW-1 to)-1
Scenario: Base

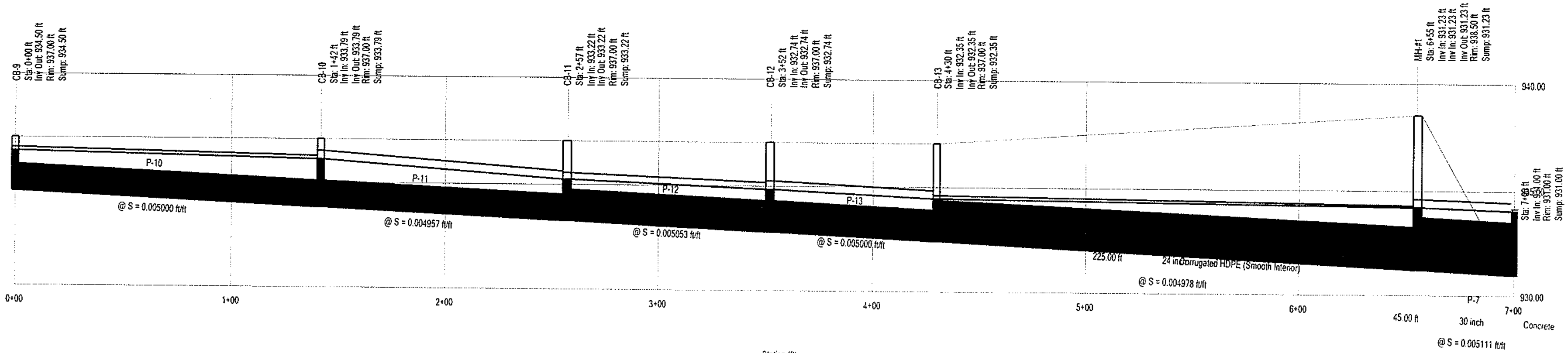


ATT J, p. 9/40

Profile
Scenario: Base

Q100

Profile: Profile - CB-9 to)-1
Scenario: Base



ATT J, p. 10/40

Title: AES High Grove
z:\...\stormwater\stormcad\main site to basin.stm
11/05/06 11:38:52 AM

Project Engineer: Jon A. Winterhalter
StormCAD v5.6 [05.06.012.00]

ATT. J, p. 11/40

Calculation Results Summary

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Scenario: Base

Q25

>>>> Info: Subsurface Network Rooted by: O-1
>>>> Info: Subsurface Analysis iterations: 3
>>>> Info: Convergence was achieved.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
CB-9	Generic Inlet	Generic Default 100%	2.54	0.00	100.0	0.00	0.00
CB-10	Generic Inlet	Generic Default 100%	2.02	0.00	100.0	0.00	0.00
CB-11	Generic Inlet	Generic Default 100%	1.15	0.00	100.0	0.00	0.00
CB-12	Generic Inlet	Generic Default 100%	0.73	0.00	100.0	0.00	0.00
CB-13	Generic Inlet	Generic Default 100%	0.84	0.00	100.0	0.00	0.00
CB-5	Generic Inlet	Generic Default 100%	1.54	0.00	100.0	0.00	0.00
MH-#1	Generic Inlet	Generic Default 100%	1.44	0.00	100.0	0.00	0.00
CB-7	Generic Inlet	Generic Default 100%	2.19	0.00	100.0	0.00	0.00
CB-4	Generic Inlet	Generic Default 100%	2.78	0.00	100.0	0.00	0.00
EW-1	Generic Inlet	Generic Default 100%	1.34	0.00	100.0	0.00	0.00
CB-1	Generic Inlet	Generic Default 100%	1.14	0.00	100.0	0.00	0.00
CB-2	Generic Inlet	Generic Default 100%	0.72	0.00	100.0	0.00	0.00
CB-3	Generic Inlet	Generic Default 100%	1.21	0.00	100.0	0.00	0.00
CB-6	Generic Inlet	Generic Default 100%	1.67	0.00	100.0	0.00	0.00

← RAINFALL DIRECTLY ON BASIN

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-7	1	30 inch	Circular	45.00	18.32	3.73	934.09	934.00
P-6	1	24 inch	Circular	58.00	11.00	3.50	934.21	934.09
P-14	1	24 inch	Circular	225.00	6.59	5.13	934.25	934.09
P-9	1	15 inch	Circular	58.00	2.19	1.78	934.26	934.21
P-5	1	18 inch	Circular	109.00	7.93	4.49	934.74	934.21
P-13	1	18 inch	Circular	78.00	5.96	3.37	934.46	934.25

Calculation Results Summary

Q25

P-4	1	18 inch	Circular	136.00	5.66	3.20	935.07	934.74
P-12	1	18 inch	Circular	95.00	5.38	4.90	934.67	934.46
P-3	1	18 inch	Circular	90.00	4.68	2.65	935.23	935.07
P-11	1	15 inch	Circular	115.00	4.43	3.61	935.13	934.67
P-2	1	15 inch	Circular	80.00	2.47	2.01	935.33	935.23
P-8	1	15 inch	Circular	48.00	1.67	1.36	935.25	935.23
P-10	1	15 inch	Circular	142.00	2.54	4.06	935.25	935.13
P-1	1	15 inch	Circular	37.00	1.34	7.06	935.46	935.33

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	18.10	931.00	934.00	934.00
MH-#1	18.32	938.50	934.09	934.09
CB-5	11.00	937.00	934.21	934.21
CB-13	6.59	937.00	934.25	934.25
CB-7	2.19	937.00	934.26	934.26
CB-4	7.93	937.00	934.74	934.74
CB-12	5.96	937.00	934.46	934.46
CB-3	5.66	937.00	935.07	935.07
CB-11	5.38	937.00	934.67	934.67
CB-2	4.68	937.00	935.23	935.23
CB-10	4.43	937.00	935.13	935.13
CB-1	2.47	937.00	935.33	935.33
CB-6	1.67	937.00	935.25	935.25
CB-9	2.54	937.00	935.25	935.25
EW-1	1.34	937.00	935.46	935.46

Completed: 11/05/2006 12:22:44 PM

ATT. J, p. 12/40

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Scenario: Base

Node Report Q25

Label	Area (acres)	Inlet C	Inlet CA (acres)	External CA (acres)	System CA (acres)	Time of Concentration (min)	External Time of Concentration (min)	Upstream Time Of Concentration (min)	System Flow Time (min)	System Intensity (in/hr)	System Rational Flow (cfs)	Additional Flow (cfs)	Additional Carryover (cfs)	Known Flow (cfs)	Upstream Additional Flow (cfs)	Total System Flow (cfs)	Ground Elevation (ft)	Rim Elevation (ft)	Hydraulic Grade Line In (ft)
CB-9	0.76	1.00	0.76	0.00	0.76	5.00	0.00	0.00	5.00	3.32	2.54	0.00	0.00	0.00	0.00	2.54	937.00	937.00	935.25
CB-10	0.60	1.00	0.60	0.00	1.36	5.00	0.00	5.58	5.58	3.22	4.43	0.00	0.00	0.00	0.00	4.43	937.00	937.00	935.13
CB-11	0.34	1.00	0.34	0.00	1.71	5.00	0.00	6.11	6.11	3.13	5.38	0.00	0.00	0.00	0.00	5.38	937.00	937.00	934.67
CB-12	0.22	1.00	0.22	0.00	1.92	5.00	0.00	6.44	6.44	3.07	5.96	0.00	0.00	0.00	0.00	5.96	937.00	937.00	934.46
CB-13	0.25	1.00	0.25	0.00	2.18	5.00	0.00	6.82	6.82	3.01	6.59	0.00	0.00	0.00	0.00	6.59	937.00	937.00	934.25
CB-5	0.46	1.00	0.46	0.00	3.76	5.00	0.00	7.43	7.43	2.90	11.00	0.00	0.00	0.00	0.00	11.00	937.00	937.00	934.21
MH-#1	0.43	1.00	0.43	0.00	6.37	5.00	0.00	7.70	7.70	2.85	18.32	0.00	0.00	0.00	0.00	18.32	938.50	938.50	934.09
O-1					6.37				7.90	2.82	18.10					18.10	931.00	931.00	934.00
CB-7	0.65	1.00	0.65	0.00	0.65	5.00	0.00	0.00	5.00	3.32	2.19	0.00	0.00	0.00	0.00	2.19	937.00	937.00	934.26
CB-4	0.83	1.00	0.83	0.00	2.65	5.00	0.00	7.02	7.02	2.97	7.93	0.00	0.00	0.00	0.00	7.93	937.00	937.00	934.74
EW-1	0.40	1.00	0.40	0.00	0.40	5.00	0.00	0.00	5.00	3.32	1.34	0.00	0.00	0.00	0.00	1.34	937.00	937.00	935.46
CB-1	0.34	1.00	0.34	0.00	0.74	5.00	0.00	5.09	5.09	3.30	2.47	0.00	0.00	0.00	0.00	2.47	937.00	937.00	935.33
CB-2	0.22	1.00	0.22	0.00	1.46	5.00	0.00	5.75	5.75	3.19	4.68	0.00	0.00	0.00	0.00	4.68	937.00	937.00	935.23
CB-3	0.36	1.00	0.36	0.00	1.82	5.00	0.00	6.32	6.32	3.09	5.66	0.00	0.00	0.00	0.00	5.66	937.00	937.00	935.07
CB-6	0.50	1.00	0.50	0.00	0.50	5.00	0.00	0.00	5.00	3.32	1.67	0.00	0.00	0.00	0.00	1.67	937.00	937.00	935.25

Node Report

Q25

Hydraulic Grade Line Out (ft)	Local Intensity (in/hr)	Local Rational Flow (cfs)	Description
935.25	3.32	2.54	
935.13	3.32	2.02	
934.67	3.32	1.15	
934.46	3.32	0.73	
934.25	3.32	0.84	
934.21	3.32	1.54	
934.09	3.32	1.44	
934.00			
934.26	3.32	2.19	
934.74	3.32	2.78	
935.46	3.32	1.34	
935.33	3.32	1.14	
935.23	3.32	0.72	
935.07	3.32	1.21	
935.25	3.32	1.67	

ATT. J, p. 14/40

Scenario: Base

Q25

DOT Report

Label	-Node- Upstream Downstream	Upstream Inlet Area (acres)	Upstream Inlet CA (acres)	Upstream Calculated System CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	Section Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-7	MH-#1	0.43	0.43	6.37	938.50	934.09	18.32	Circular	45.00	3.73	
	O-1				931.00	934.00	29.32	30 inch			
P-6	CB-5	0.46	0.46	3.76	937.00	934.21	11.00	Circular	58.00	3.50	
	MH-#1				938.50	934.09	17.33	24 inch			
P-9	CB-7	0.65	0.65	0.65	937.00	934.26	2.19	Circular	58.00	1.78	
	CB-5				937.00	934.21	5.12	15 inch			
P-3	CB-2	0.22	0.22	1.46	937.00	935.23	4.68	Circular	90.00	2.65	
	CB-3				937.00	935.07	8.05	18 inch			
P-2	CB-1	0.34	0.34	0.74	937.00	935.33	2.47	Circular	80.00	2.01	
	CB-2				937.00	935.23	4.95	15 inch			
P-1	EW-1	0.40	0.40	0.40	937.00	935.46	1.34	Circular	37.00	7.06	
	CB-1				937.00	935.33	13.61	15 inch			
P-8	CB-6	0.50	0.50	0.50	937.00	935.25	1.67	Circular	48.00	1.36	
	CB-2				937.00	935.23	4.95	15 inch			
P-4	CB-3	0.36	0.36	1.82	937.00	935.07	5.66	Circular	136.00	3.20	
	CB-4				937.00	934.74	8.05	18 inch			
P-5	CB-4	0.83	0.83	2.65	937.00	934.74	7.93	Circular	109.00	4.49	
	CB-5				937.00	934.21	8.08	18 inch			
P-14	CB-13	0.25	0.25	2.18	937.00	934.25	6.59	Circular	225.00	5.13	
	MH-#1				938.50	934.09	17.29	24 inch			
P-13	CB-12	0.22	0.22	1.92	937.00	934.46	5.96	Circular	78.00	3.37	
	CB-13				937.00	934.25	8.05	18 inch			
P-12	CB-11	0.34	0.34	1.71	937.00	934.67	5.38	Circular	95.00	4.90	
	CB-12				937.00	934.46	8.09	18 inch			
P-11	CB-10	0.60	0.60	1.36	937.00	935.13	4.43	Circular	115.00	3.61	
	CB-11				937.00	934.67	4.93	15 inch			
P-10	CB-9	0.76	0.76	0.76	937.00	935.25	2.54	Circular	142.00	4.06	
	CB-10				937.00	935.13	4.95	15 inch			

ATT. J, p. 15/40

Calculation Results Summary

ATT. J, p.16/40

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Scenario: Base

>>>> Info: Subsurface Network Rooted by: O-1
>>>> Info: Subsurface Analysis iterations: 4
>>>> Info: Convergence was achieved.

Q10

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
CB-9	Generic Inlet	Generic Default 100%	2.05	0.00	100.0	0.00	0.00
CB-10	Generic Inlet	Generic Default 100%	1.63	0.00	100.0	0.00	0.00
CB-11	Generic Inlet	Generic Default 100%	0.92	0.00	100.0	0.00	0.00
CB-12	Generic Inlet	Generic Default 100%	0.59	0.00	100.0	0.00	0.00
CB-13	Generic Inlet	Generic Default 100%	0.68	0.00	100.0	0.00	0.00
CB-5	Generic Inlet	Generic Default 100%	1.24	0.00	100.0	0.00	0.00
MH-#1	Generic Inlet	Generic Default 100%	1.16	0.00	100.0	0.00	0.00
CB-7	Generic Inlet	Generic Default 100%	1.76	0.00	100.0	0.00	0.00
CB-4	Generic Inlet	Generic Default 100%	2.24	0.00	100.0	0.00	0.00
EW-1	Generic Inlet	Generic Default 100%	1.08	0.00	100.0	0.00	0.00
CB-1	Generic Inlet	Generic Default 100%	0.92	0.00	100.0	0.00	0.00
CB-2	Generic Inlet	Generic Default 100%	0.58	0.00	100.0	0.00	0.00
CB-3	Generic Inlet	Generic Default 100%	0.97	0.00	100.0	0.00	0.00
CB-6	Generic Inlet	Generic Default 100%	1.34	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-7	1	30 inch	Circular	45.00	14.27	2.91	934.05	934.00
P-6	1	24 inch	Circular	58.00	8.62	2.74	934.13	934.05
P-14	1	24 inch	Circular	225.00	5.28	4.83	934.15	934.05
P-9	1	15 inch	Circular	58.00	1.76	1.43	934.16	934.13
P-5	1	18 inch	Circular	109.00	6.26	3.54	934.46	934.13
P-13	1	18 inch	Circular	78.00	4.80	2.72	934.29	934.15

Calculation Results Summary

P-4	1	18 inch	Circular	136.00	4.52	2.56	934.67	934.46
P-12	1	18 inch	Circular	95.00	4.34	4.66	934.38	934.29
P-3	1	18 inch	Circular	90.00	3.77	2.13	934.77	934.67
P-11	1	15 inch	Circular	115.00	3.55	4.37	934.59	934.38
P-2	1	15 inch	Circular	80.00	1.99	3.81	934.83	934.77
P-8	1	15 inch	Circular	48.00	1.34	1.09	934.79	934.77
P-10	1	15 inch	Circular	142.00	2.05	3.84	935.07	934.59
P-1	1	15 inch	Circular	37.00	1.08	6.62	935.41	934.83

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	14.04	931.00	934.00	934.00
MH-#1	14.27	938.50	934.05	934.05
CB-5	8.62	937.00	934.13	934.13
CB-13	5.28	937.00	934.15	934.15
CB-7	1.76	937.00	934.16	934.16
CB-4	6.26	937.00	934.46	934.46
CB-12	4.80	937.00	934.29	934.29
CB-3	4.52	937.00	934.67	934.67
CB-11	4.34	937.00	934.38	934.38
CB-2	3.77	937.00	934.77	934.77
CB-10	3.55	937.00	934.59	934.59
CB-1	1.99	937.00	934.83	934.83
CB-6	1.34	937.00	934.79	934.79
CB-9	2.05	937.00	935.07	935.07
EW-1	1.08	937.00	935.41	935.41

Q10

Completed: 11/05/2006 12:34:40 PM

Calculation Results Summary

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Scenario: Base

\>>>> Info: Subsurface Network Rooted by: O-1
\>>>> Info: Subsurface Analysis iterations: 5
\>>>> Problem: Convergence was NOT achieved.
\>>>> Info: Try increasing the number of network traversals (in calculation options)

Q z

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
CB-9	Generic Inlet	Generic Default 100%	1.22	0.00	100.0	0.00	0.00
CB-10	Generic Inlet	Generic Default 100%	0.97	0.00	100.0	0.00	0.00
CB-11	Generic Inlet	Generic Default 100%	0.55	0.00	100.0	0.00	0.00
CB-12	Generic Inlet	Generic Default 100%	0.35	0.00	100.0	0.00	0.00
CB-13	Generic Inlet	Generic Default 100%	0.40	0.00	100.0	0.00	0.00
CB-5	Generic Inlet	Generic Default 100%	0.74	0.00	100.0	0.00	0.00
MH-#1	Generic Inlet	Generic Default 100%	0.69	0.00	100.0	0.00	0.00
CB-7	Generic Inlet	Generic Default 100%	1.05	0.00	100.0	0.00	0.00
CB-4	Generic Inlet	Generic Default 100%	1.33	0.00	100.0	0.00	0.00
EW-1	Generic Inlet	Generic Default 100%	0.64	0.00	100.0	0.00	0.00
CB-1	Generic Inlet	Generic Default 100%	0.55	0.00	100.0	0.00	0.00
CB-2	Generic Inlet	Generic Default 100%	0.34	0.00	100.0	0.00	0.00
CB-3	Generic Inlet	Generic Default 100%	0.58	0.00	100.0	0.00	0.00
CB-6	Generic Inlet	Generic Default 100%	0.80	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-7	1	30 inch	Circular	45.00	8.44	1.80	934.02	934.00
P-6	1	24 inch	Circular	58.00	5.15	1.71	934.05	934.02
P-14	1	24 inch	Circular	225.00	3.18	4.20	934.05	934.02
P-9	1	15 inch	Circular	58.00	1.05	0.85	934.06	934.05

ATT. J, p. 18/40

ATT. J, p. 19/40

Calculation Results Summary

P-5	1	18 inch	Circular	109.00	3.78	2.24	934.18	934.05
P-13	1	18 inch	Circular	78.00	2.86	4.17	934.10	934.05
P-4	1	18 inch	Circular	136.00	2.79	1.58	934.26	934.18
P-12	1	18 inch	Circular	95.00	2.58	4.07	934.11	934.10
P-3	1	18 inch	Circular	90.00	2.28	3.92	934.28	934.26
P-11	1	15 inch	Circular	115.00	2.11	3.86	934.37	934.11
P-2	1	15 inch	Circular	80.00	1.18	3.31	934.29	934.28
P-8	1	15 inch	Circular	48.00	0.80	2.96	934.28	934.28
P-10	1	15 inch	Circular	142.00	1.22	3.34	934.94	934.37
P-1	1	15 inch	Circular	37.00	0.64	5.68	935.31	934.29

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	8.25	931.00	934.00	934.00
MH-#1	8.44	938.50	934.02	934.02
CB-5	5.15	937.00	934.05	934.05
CB-13	3.18	937.00	934.05	934.05
CB-7	1.05	937.00	934.06	934.06
CB-4	3.78	937.00	934.18	934.18
CB-12	2.86	937.00	934.10	934.10
CB-3	2.79	937.00	934.26	934.26
CB-11	2.58	937.00	934.11	934.11
CB-2	2.28	937.00	934.28	934.28
CB-10	2.11	937.00	934.37	934.37
CB-1	1.18	937.00	934.29	934.29
CB-6	0.80	937.00	934.28	934.28
CB-9	1.22	937.00	934.94	934.94
EW-1	0.64	937.00	935.31	935.31

Q2

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Completed: 11/05/2006 12:34:55 PM

Calculation Results Summary

ATT. J, p. 20/40

CB-15 & CB-16

Q100

15" DIA. IS MINIMUM SIZE USED FOR THIS LENGTH PIPE. MH MAY BE REQUIRED IN P-1

Scenario: Base

>>>> Info: Subsurface Network Rooted by: MH#6
>>>> Info: Subsurface Analysis iterations: 1
>>>> Info: Convergence was achieved.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
CB-16	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00
CB-15	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: MH#6

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-1	1	15 inch	Circular	455.00	4.14	4.54	934.97	932.62
P-2	1	15 inch	Circular	180.00	3.30	4.32	935.75	934.97

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
MH#6	4.14	933.00	931.80	931.80
CB-16	4.14	938.00	934.97	934.97
CB-15	3.30	938.00	935.75	935.75

Completed: 11/08/2006 12:59:43 PM

ATT. J, p. 21/40

Scenario: Base

Combined Pipe\Node Report

Label	Upstream Node	Downstream Node	Length (ft)	Section Size	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Description	System Intensity (in/hr)	System Flow Time (min)	Total Flow (cfs)	Total System Flow (cfs)	Upstream Inlet Area (acres)	Upstream Inlet Rational Flow (cfs)
P-1	CB-16	MH#6	455.00	15 inch	934.10	931.80	0.005055		0.00	0.69	4.14	4.14	0.00	0.00
P-2	CB-15	CB-16	180.00	15 inch	935.00	934.10	0.005000		0.00	0.00	3.30	3.30	0.00	0.00

ATT. J, p. 22/40

Scenario: Base

Node Report

Label	Area (acres)	Inlet C	Inlet CA (acres)	External CA (acres)	System CA (acres)	Time of Concentration (min)	External Time of Concentration (min)	Upstream Time Of Concentration (min)	System Flow Time (min)	System Intensity (in/hr)	System Rational Flow (cfs)	Additional Flow (cfs)	Additional Carryover (cfs)	Known Flow (cfs)	Upstream Additional Flow (cfs)	Total System Flow (cfs)	Ground Elevation (ft)	Rim Elevation (ft)	Hydraulic Grade Line In (ft)
CB-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.69	0.00	0.00	0.84	0.00	0.00	3.30	4.14	938.00	938.00	934.97
MH#6					0.00				2.37	0.00	0.00					4.14	933.00	933.00	931.80
CB-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.30	0.00	0.00	0.00	3.30	938.00	938.00	935.75

Scenario: Base

Node Report

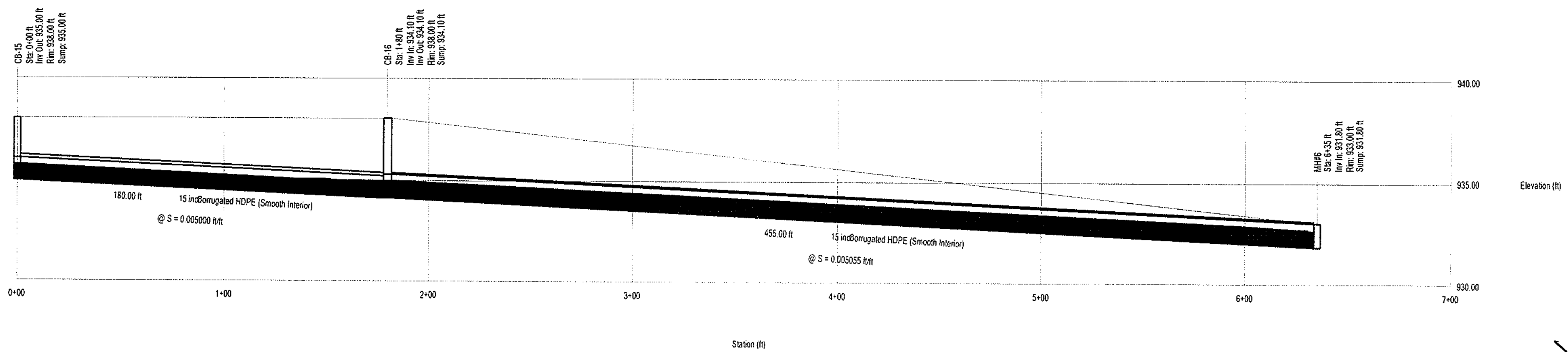
Hydraulic Grade Line Out (ft)	Local Intensity (in/hr)	Local Rational Flow (cfs)	Description
934.97	0.00	0.00	
931.80			
935.75	0.00	0.00	

ATT. J, p. 23/40

Profile
Scenario: Base

Profile: Profile - 1

Scenario: Base



ATT. J, p. 24/40

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11/08/06 01:03:47 PM

Project Engineer: WorleyParsons
StormCAD v5.6 [05.06.012.00]

Calculation Results Summary

ATT. J, p.25/40

Scenario: Base

\>>>> Info: Subsurface Network Rooted by: Basin
\>>>> Info: Subsurface Analysis iterations: 2
\>>>> Info: Convergence was achieved.

CB-18 Q100

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
CB-18	Generic Inlet	Generic Default 100%	5.56	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: Basin

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-1	1	15 inch	Circular	50.00	5.56	4.53	938.12	937.71

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
Basin	5.51	936.75	936.75	936.75
CB-18	5.56	940.00	938.12	938.12

Completed: 11/05/2006 12:21:24 PM

ATT. J, p. 26/40

Scenario: Base

Node Report

Label	Area (acres)	Inlet C	Inlet CA (acres)	External CA (acres)	System CA (acres)	Time of Concentration (min)	External Time of Concentration (min)	Upstream Time Of Concentration (min)	System Flow Time (min)	System Intensity (in/hr)	System Rational Flow (cfs)	Additional Flow (cfs)	Additional Carryover (cfs)	Known Flow (cfs)	Upstream Additional Flow (cfs)	Total System Flow (cfs)	Ground Elevation (ft)	Rim Elevation (ft)	Hydraulic Grade Line In (ft)
CB-18	1.36	1.00	1.36	0.00	1.36	7.00	0.00	0.00	7.00	4.06	5.56	0.00	0.00	0.00	0.00	5.56	940.00	940.00	938.12
Basin					1.36				7.18	4.02	5.51					5.51	936.75	936.75	936.75

CB-18 Q100

ATT. J, p.27/40

Scenario: Base

Node Report

Hydraulic Grade Line Out (ft)	Local Intensity (in/hr)	Local Rational Flow (cfs)	Description
938.12	4.06	5.56	
936.75			

Q_{100}

ATT. J, p. 28/40

Calculation Results Summary

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Scenario: Base

\>>>> Info: Subsurface Network Rooted by: Basin
\>>>> Info: Subsurface Analysis iterations: 2
\>>>> Info: Convergence was achieved.

CB-18 Q25

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
CB-18	Generic Inlet	Generic Default 100%	4.08	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: Basin

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-1	1	15 inch	Circular	50.00	4.08	4.50	937.86	937.57

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
Basin	4.04	936.75	936.75	936.75
CB-18	4.08	940.00	937.86	937.86

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Completed: 11/05/2006 12:21:36 PM

Scenario: Base

Node Report

Label	Area (acres)	Inlet C	Inlet CA (acres)	External CA (acres)	System CA (acres)	Time of Concentration (min)	External Time of Concentration (min)	Upstream Time Of Concentration (min)	System Flow Time (min)	System Intensity (in/hr)	System Rational Flow (cfs)	Additional Flow (cfs)	Additional Carryover (cfs)	Known Flow (cfs)	Upstream Additional Flow (cfs)	Total System Flow (cfs)	Ground Elevation (ft)	Rim Elevation (ft)	Hydraulic Grade Line In (ft)
CB-18	1.36	1.00	1.36	0.00	1.36	7.00	0.00	0.00	7.00	2.98	4.08	0.00	0.00	0.00	0.00	4.08	940.00	940.00	937.86
Basin					1.36				7.19	2.94	4.04					4.04	936.75	936.75	936.75

CB-18 Q25

ATT. J, p.29/40

Scenario: Base

Node Report

Hydraulic Grade Line Out (ft)	Local Intensity (in/hr)	Local Rational Flow (cfs)	Description
937.86 936.75	2.98	4.08	

Q25

ATT. J, p. 30/40

Calculation Results Summary

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Scenario: Base

\>>>> Info: Subsurface Network Rooted by: Basin
\>>>> Info: Subsurface Analysis iterations: 2
\>>>> Info: Convergence was achieved.

Q10

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
CB-18	Generic Inlet	Generic Default 100%	3.28	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: Basin

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-1	1	15 inch	Circular	50.00	3.28	4.31	937.74	937.48

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
Basin	3.24	936.75	936.75	936.75
CB-18	3.28	940.00	937.74	937.74

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Completed: 11/05/2006 12:35:19 PM

ATT. J, P-31/40

ATT. J, p-32/40

Calculation Results Summary

Scenario: Base

\>>>> Info: Subsurface Network Rooted by: Basin
\>>>> Info: Subsurface Analysis iterations: 2
\>>>> Info: Convergence was achieved.

Q2

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
CB-18	Generic Inlet	Generic Default 100%	1.98	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: Basin

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-1	1	15 inch	Circular	50.00	1.98	3.81	937.56	937.30

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
Basin	1.95	936.75	936.75	936.75
CB-18	1.98	940.00	937.56	937.56

Completed: 11/05/2006 12:35:31 PM

Calculation Results Summary

ATT. J, p. 33/40

Scenario: Base

\>>>> Info: Subsurface Network Rooted by: CB 19 to Basin
\>>>> Info: Subsurface Analysis iterations: 2
\>>>> Info: Convergence was achieved.

CB-19 Q 100

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
CB-19	Generic Inlet	Generic Default 100%	1.55	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: CB 19 to Basin

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-1	1	12 inch	Circular	25.00	1.55	4.64	935.53	935.19

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
CB 19 to Basin	1.54	934.75	934.75	934.75
CB-19	1.55	938.00	935.53	935.53

Completed: 11/05/2006 12:22:18 PM

Scenario: Base

Node Report

Label	Area (acres)	Inlet C	Inlet CA (acres)	External CA (acres)	System CA (acres)	Time of Concentration (min)	External Time of Concentration (min)	Upstream Time Of Concentration (min)	System Flow Time (min)	System Intensity (in/hr)	System Rational Flow (cfs)	Additional Flow (cfs)	Additional Carryover (cfs)	Known Flow (cfs)	Upstream Additional Flow (cfs)	Total System Flow (cfs)	Ground Elevation (ft)	Rim Elevation (ft)	Hydraulic Grade Line In (ft)
CB-19	0.34	1.00	0.34	0.00	0.34	5.00	0.00	0.00	5.00	4.51	1.55	0.00	0.00	0.00	0.00	1.55	938.00	938.00	935.53
CB 19 to Bas					0.34				5.09	4.49	1.54					1.54	934.75	934.75	934.75

CB-19 Q100

ATT. J, p. 34/40

Scenario: Base

Node Report

Q100

Hydraulic Grade Line Out (ft)	Local Intensity (in/hr)	Local Rational Flow (cfs)	Description
935.53	4.51	1.55	
934.75			

ATT. J, p. 35/40

Calculation Results Summary

Scenario: Base

>>>> Info: Subsurface Network Rooted by: CB 19 to Basin
>>>> Info: Subsurface Analysis iterations: 2
>>>> Info: Convergence was achieved.

CB-19 Q25

ATT. J, p. 36/40

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
CB-19	Generic Inlet	Generic Default 100%	1.14	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: CB 19 to Basin

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-1	1	12 inch	Circular	25.00	1.14	4.28	935.45	935.12

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
CB 19 to Basin	1.13	934.75	934.75	934.75
CB-19	1.14	938.00	935.45	935.45

Completed: 11/05/2006 12:22:05 PM

Scenario: Base

Node Report

Label	Area (acres)	Inlet C	Inlet CA (acres)	External CA (acres)	System CA (acres)	Time of Concentration (min)	External Time of Concentration (min)	Upstream Time Of Concentration (min)	System Flow Time (min)	System Intensity (in/hr)	System Rational Flow (cfs)	Additional Flow (cfs)	Additional Carryover (cfs)	Known Flow (cfs)	Upstream Additional Flow (cfs)	Total System Flow (cfs)	Ground Elevation (ft)	Rim Elevation (ft)	Hydraulic Grade Line In (ft)
CB-19	0.34	1.00	0.34	0.00	0.34	5.00	0.00	0.00	5.00	3.32	1.14	0.00	0.00	0.00	0.00	1.14	938.00	938.00	935.45
CB 19 to Bas					0.34				5.10	3.30	1.13					1.13	934.75	934.75	934.75

Q25

ATT. J, p. 37/40

Scenario: Base

Node Report

Hydraulic Grade Line Out (ft)	Local Intensity (in/hr)	Local Rational Flow (cfs)	Description
935.45	3.32	1.14	
934.75			

Q25

ATT. J, p. 38/40

ATT. J, p. 39/40

Calculation Results Summary

Scenario: Base

>>>> Info: Subsurface Network Rooted by: CB 19 to Basin
>>>> Info: Subsurface Analysis iterations: 2
>>>> Info: Convergence was achieved.

Q_{10}

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
CB-19	Generic Inlet	Generic Default 100%	0.92	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: CB 19 to Basin

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-1	1	12 inch	Circular	25.00	0.92	4.02	935.40	935.08

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
CB 19 to Basin	0.91	934.75	934.75	934.75
CB-19	0.92	938.00	935.40	935.40

Completed: 11/05/2006 12:35:49 PM

Calculation Results Summary

ATT. J, p. 40/40

Scenario: Base

>>>> Info: Subsurface Network Rooted by: CB 19 to Basin
>>>> Info: Subsurface Analysis iterations: 2
>>>> Info: Convergence was achieved.

Q2

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
CB-19	Generic Inlet	Generic Default 100%	0.54	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: CB 19 to Basin

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-1	1	12 inch	Circular	25.00	0.54	3.47	935.31	935.00

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
CB 19 to Basin	0.54	934.75	934.75	934.75
CB-19	0.54	938.00	935.31	935.31

Completed: 11/05/2006 12:36:03 PM

DETENTION BASIN DESIGN CRITERIA FOR SAN BERNARDINO COUNTY

The following design parameters and procedures are listed as guidelines to insure proper detention basin operation. When necessary, these guidelines may be modified if approved in writing by both the Flood Control District and Land Management Department.

I. Definitions

A. Regional Detention Basin

1. A basin which can be incorporated into the Flood Control District's existing or proposed drainage system,

2. Basin owned and operated by the Flood Control District, although it may be joint use, and

3. A basin which will reduce the downstream peak flow rate and the necessary downstream storm drain size.

B. Local Detention Basin

1. A basin which will not be incorporated into the Flood Control District's existing or proposed drainage system,

2. A basin owned by an individual or organization other than the Flood Control District, and

3. A basin which will reduce the downstream peak flow rate, but will not be considered in downsizing future downstream storm drains.

C. Joint Use Detention Basin: A regional or local detention basin which has an additional use such as football field, parking lot, golf course, lake or etc.

D. Temporary Detention Basin

1. A local detention basin used to reduce downstream peak flow rates until ultimate storm drain facilities can be constructed as part of a phased development, and

2. Generally the life of the basin shall not exceed 10 years.

II. Basin Capacity and Outlet Drain

A. When a basin (regional, local, temporary or joint use) is to be used to mitigate downstream impacts due to increased flows generated by a development, the basin capacity and outlet size shall be such that the post-development peak flow rate generated by the site shall be less than or equal to 90% of the pre-development peak flow rate from the site for all frequency storms up to and including 100-year (i.e. the peak 2 year post-development flow rate is equal to or less than 90% of the peak 2 year pre-development flow rate from the site and etc. for all frequency storm events through 100-year).

1. Only 2, 10, 25 and 100-year storms need to be analyzed.

2. Additional studies shall be submitted where there exists more than one basin in the drainage area under review. The studies shall address the timing of the peak flow rates from the basins to ensure downstream flow rates are not increased.

SEE CHANGE PER ATTACHED MEMO

B. When a basin (generally regional or regional joint use) is to be used to reduce the size of a master planned downstream drainage facility, the basin capacity and outlet size shall be such that the 100 year basin peak outflow rate is no greater than the downstream facility's <u>design</u> capacity.

1. Open channel design capacities shall be per the San Bernardino County Flood Control District Standard Plat 100 ("San Bernradino County Standards and Specifications"). A bulking factor is not necessary when the basin is designed to handle debris and the downstream channel is lined.

2. Pressure flow closed conduits shall be designed such that the hydraulic grade line is below the ground or street surface. In those reaches where no surface flow will be intercepted (now or in the future), a hydraulic grade line which encroaches on or is slightly higher than the ground or street surface will be acceptable.

3. Non-pressure flow closed conduit capacities shall be based on a flow depth no greater than 0.8 times the conduits diameter or height.

C. Where downstream erosion is a concern the duration of erosive flow velocities for all frequency storms shall not be substantially increased unless other forms of mitigation are provided. This can be accomplished by reducing the peak flowrate further than that required above. Refer to "Handbook of Hydraulics" by Horace Williams King and Earnest F. Brater, and "Open-Channel Hydraulics" by Ven Te Chow, Ph.d. for erosive flow velocities.

D. When there exists a potential for debris entering the basin, the basin capacity shall be increased or a desilting basin provided to accomodate the debris production generated from a 100-year storm four years after a burn (over the entire watershed), plus 20% due to maintenance uncertainties.

1. For all basins where a significant amount of debris accumulation is anticipated, a debris disposal area or areas shall be provided within a reasonable hauling distance.

2. "A New Method of Estimating Debris-Storage Requirements for Debris Basins" by Fred E. Tatum of the U.S. Army Corps of Engineers shall be used for determining the 100-year debris volume.

3. Local basins shall not be located in desert areas where there exists the potential for debris entering the basin (i.e., locations where flows are directed to the basin by natural drainage courses or earth graded channels which handle flows from undeveloped watersheds). It is recommended that the flows from the development be conducted to the basin in a hardlined facility (i.e. street or concrete channel), then outletted into the natural drainage course or earth channel.

4. Local detention basins shall not be fed by natural drainage courses or earth channels with undeveloped watersheds greater than 0.5 square mile.

5. The basin capacity for local detention basins fed by natural drainage courses or earth channels with undeveloped watershed less than 0.5 square mile, shall be enlarged to handle an additional 5 years of accumulated annual debris based on the attached figure 1.

6. Generally regional detention basins with undeveloped watersheds shall be flow-by basins or have a separate debris basin upstream of the detention basin.

7. The basin capacity for detention basins located in watersheds known to have a high risk of burning, shall be increased as determined by the Flood Control District.

E. Outlet Drain

1. The outlet pipe for all basins except temporary basins shall be a minimum 24" RCP (1350 D minimum) for local basins and a minimum 36" RCP (1350 D minimum) for regional basins. The outlet pipe or conduit shall be encased with cut-off collars per the "Los Angeles County Flood Control Design Manual - Debris Dams and Basins" or designed per "Section 242. Cut-and-Cover Conduit Detail" of the Bureau of Reclamation's publication "Design of Small Dams".

   a) Reinforced concrete collars generally from 2 to 3 feet high, 12 to 18 inches wide, and spaced from 7 to 10 times their height shall be provided.

   b) All joints for pipes not encased shall be rubber gasketed.

   c) The pipe shall be capable of withstanding H20 live loads plus the applicable dead loads.

   d) Erosion control measures shall be provided at the outlet of the basin outlet pipe.

   e) Temporary basin outlet pipes may be a minimum 24" C.M.P., 12 gauge with seep rings. Design considerations shall be as stated above.

2. A metered outlet structure may be necessary to provide the necessary flow attenuation for all frequency storms. "V"-shaped weirs and notched weirs are preferred over other alternates because they do not plug with debris and trash as easily as other designs.

3. All detention basin outlets should be sized so the basin will drain within 24 hours after the basin reaches its 100 year peak depth/volume. If the basin does not drain in 24 hours, further studies using longer duration storms will be necessary. The basin storage volume (capacity) may need to be increased to accomodate subsequent storms.

4. Trash racks shall be provided at the inlet to the basin outlet structure(s).

5. Anti-vortex devises shall be provided where warranted.

6. A depth gauge shall be provided on the basin outlet structure in order to monitor debris deposition and basin operation.

F. Analysis Methodology

1. Pre and post development peak flow rates shall be developed using the procedures outlined in the San Bernardino County's Hydrology Manual.

2. Basin inflow hydrographs shall be developed using the procedures outlined in the San Bernardino County's Hydrology Manual.

3. Basin outflow hydrographs shall be developed by the Modified Puls Method.

4. Channel hydrograph routing shall be calculated by the convex channel routing method or by moving the hydrograph utilizing travel time.

III. Water Surface Elevation and Depth

A. Local Basins

1. When feasible the 100 year design water surface elevation should be at or below existing natural ground. Generally no more than 50% of the basins 100 year storage depth should be above existing ground (i.e., 50% or more of the 100-year minimum storage depth must be below the lowest ground outside basin).

2. The necessary storage depth for debris plus the two year flow attenuation shall be below existing ground.

3. The basin's maximum water depth for 100-year design should be 6 feet or less.

4. When site conditions warrant and safety can be assured, the above depth requirements may be modified if the following conditions are met.

a) The detention basin is designed in accordance with the Los Angeles County Flood Control Distrit's "Design Manual - Debris Dams and Basins".

b) The basin embankment is constructed of material, or has a solid core, which does not allow seepage or piping to occur due to rodent holes.

B. Regional Basins

1. Depths shall be as approved by the Flood Control District.

2. Basins with heights greater than or equal to 25 feet and capacity greater than or equal to 15 Ac.ft., or a capacity greater than or equal to 50 ac. ft. and a height greater than or equal to 6 feet, shall be reviewed and approved by the State's Division of Safety of Dams. (See figure 2)

C. Joint Use Basins

1. Depths should be shallow and compatible with the secondary use.

2. Depths for parking lot, tennis court or other similar joint use basins should be no greater than 6 inches to 12 inches.

3. The allowable depth in most cases will be site specific and shall be approved by all agencies involved.

IV. Emergency Spillway

A. All detention basin spillways shall be designed to pass the fully developed 1000 year peak flow rate ($Q_{1000}=1.35\ Q_{100}$) or that peak flow rate required by the State's Division of Safety of Dams, whichever is greater.

B. Spillway outflows shall be adequately conveyed to a storm drain, drainage channel, street or an established watercourse.

C. Generally, all spillway structures shall be constructed of reinforced concrete. For temporary detention basins with an expected life less than 10 years the spillway may be constructed with grouted rock or other forms of approved protection designed to resist maximum design velocities.

D. When the spillway crest is more than 3 feet above the flowline of the facility the spillway outlets into, the spillway shall be constructed of reinforced concrete.

E. Generally the spillway crest shall be at, or above the basin's design 100 year high water line.

V. Freeboard to the Top of Embankment

A. Local and temporary basins shall have a minimum 1-foot of freeboard above the 1000-year HWL on the emergency spillway or 2-feet of freeboard above the 100-year HWL in the basin, whichever is more stringent.

B. Regional basins shall have a minimum 2-feet of freeboard above the 1000 year HWL on the emergency spillway. For basins with larger surface areas the freeboard shall be increased due to possible wave action. Also, a Seismic Seiche analysis shall be provided to determine necessary freeboard. Reference "Design of Small Dams" by the United States Department of Interior.

C. Joint use basins shall conform to the applicable local or regional freeboard requirements. For smaller basins such as parking lot and tennis court basins, the freeboard conditions may be reduced.

VI. Basin Embankment

A. Basin side slopes should be of 3H:1V or flatter on the wet side and 2H:1V or flatter on the dry side. Steeper slopes may be acceptable on a case by case basis if rock lined and recommended in the soils and geotechnical report. (See items C and D below for expanded requirements for report.)

B. Top Width of Levee

1. Regional and local basins - 15 feet minimum
2. Joint use - site specific
3. Refer to Section IX.C.

C. For design of the embankment abutments and adjacent slopes, a soils and geotechnical report shall be prepared by a soils and geotechnical engineer with a demonstrated expertise in earth fill dam design. The report shall be reviewed and approved by the Land Management Department <u>and</u> the San Bernardino County Flood Control District. The report shall include:

a) Site geology including bedding, foliation, fracture, joint, fault and land slide plane attitudes.

b) Seismic conditions including fault locations and potential seismic surface movements respective loadings and parameters of seismic shaking.

c) Potential impact of reservoir loading on geologic structure should be evaluated.

d) Detailed descriptions, locations, and logs of all field explorations.

e) Field and laboratory tests and analysis descriptions and results.

f) Ground water table elevation and analysis of near surface groundwater movement.

g) Recommended design parameters including, but not limited to the following for the dam and its natural abutments and slopes adjacent reservoir areas:

1. Lateral earth loadings
2. Shear strengths
3. Bearing capacities
4. Permeability
5. Slope stability analysis when saturated and during rapid drawdown conditions
6. Seive analysis
7. Sand equivalents
8. Liquefaction analysis and if appropriate; mitigation
9. Seismic Seiche analysis ___ 10. UBC Chapter 70

h) Special design and construction recommendations including, but not limited to the following;

1. Foundation preparation requirements

2. Suitability of materials for embankments (gradation, sand equivalent, etc.) and abutments

3. Compaction methods and minimum requirements

4. Seepage and piping control provisions

5. Potential for settlement

6. Seismic considerations

7. Minimum design factors of safety are:

	Without Seismic	With Seismic
Embankment, Abutment and Adjacent Slope Stability	1.5	1.1
Seepage - Piping	1.5	---

8. Necessity of impervious core or shear key

9. Erosion control of abutments.

D. Regional basins and local basins not meeting the depth and side slope requirements setforth previously shall be designed in accordance with the Los Angeles County Flood Control District's "Design Manual - Debris Dams and Basins".

VII. Basin Floor

A. A low flow channel shall be provided from the basin inlet(s) to the basin outlet.

1. Where basin slopes exceed 2% or produce erosive flow velocities the low flow channel should be protected from erosion with reinforced concrete, rock lining or other form of approved erosion protection.

2. Joint use basins

a) A low flow channel or conduit should be provided to conduct minor flows around the dual use facilities wherever possible. Low flow channels may not be necessary for parking lot basins or other similar joint uses.

b) Low flow channel may be grass lined if there exists a maintenance program which includes mowing and maintenance of turf in good condition and velocities of flow through the various stages of discharge are low enough to be nonerosive.

B. Earth basin floors shall slope at a minimum 0.5% grade to the low flow channel.

C. Earth basin floors shall have a minimum grade of 0.5% from the inlet to the outlet.

VIII. Inlet Structures

A. Where storm drains enter the basin, energy dissipators and/or erosion protection shall be provided. Plans must be approved by the San Bernardino County Flood Control District Permit Section before plan approval if the basin is to be operated and maintained by the Flood Control District.

B. Where natural drainage courses or channels enter the basin some form of invert stabilization such as a reinforced concrete spillway shall be provided.

C. Energy dissipators may be required when the inletting flow velocities exceed 5 fps.

D. Inletting storm drains shall be a minimum 24" RCP (1350 D).

IX. Access

A. Access to any type of detention basin area shall be provided by a roadway capable of handling two way traffic (from a public street or public access to the parcel upon which the basin is constructed).

B. Access shall be maintained under all weather conditions.

ATT. K, p.11/17

LONG-TERM EROSION RATES

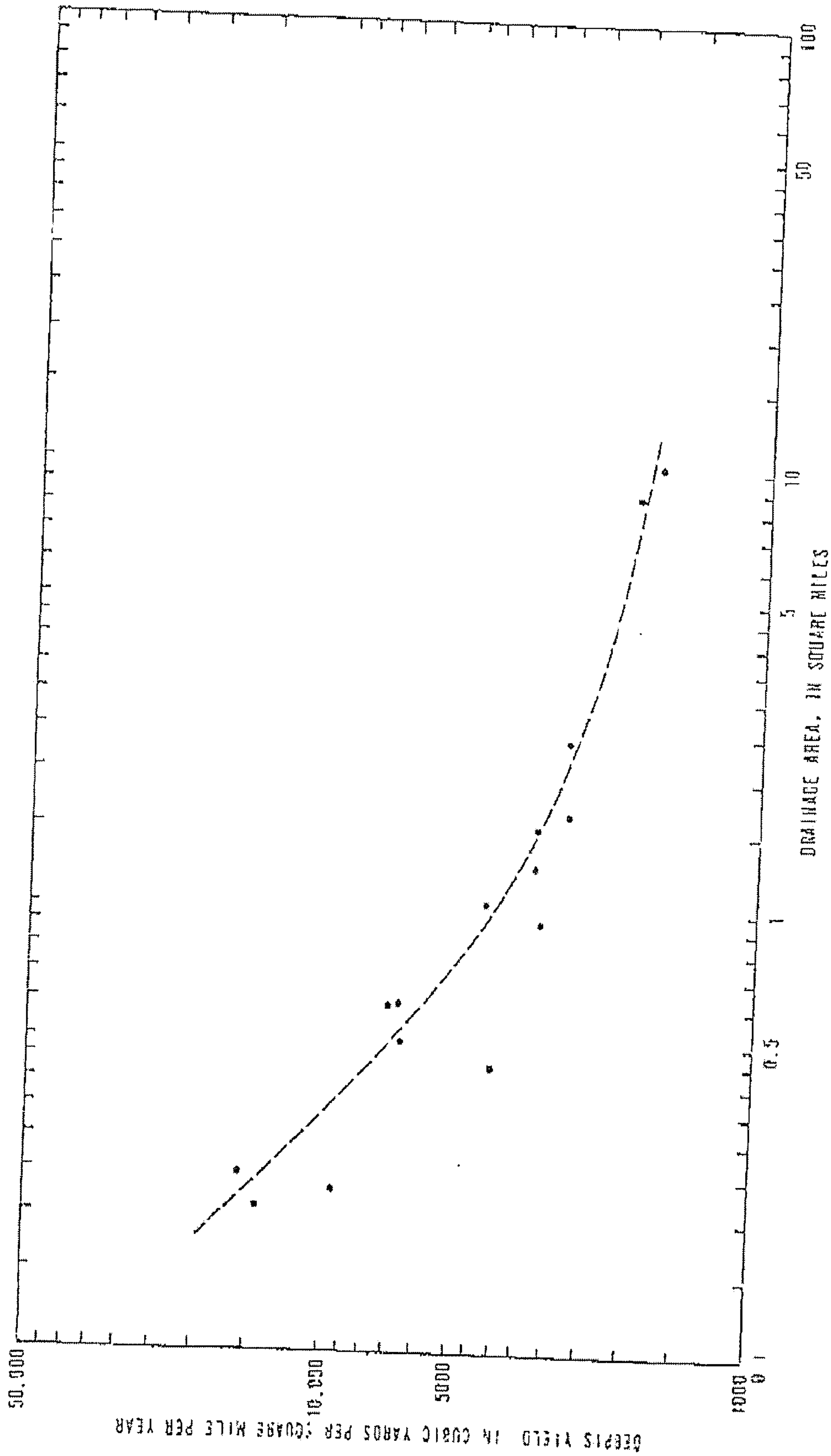


FIGURE 1.--Long-term sediment yields at selected sites in Los Angeles County, California.

C. A 15-foot wide roadway shall be provided along the top of embankment, across the spillway and around the basin. The intent of this criteria is to have continuous access around, and to, the basin for maintenance purposes. Under certain circumstances where it can be shown the recommended top width is not necessary for structural safety and maintenance, the criteria may be modified. Approval will be required by both the Land Management Department and the Flood Control District.

   1. If access across the spillway is not provided minimum 40' X 60' turn arounds shall be provided on both sides of the spillway.

   2. If there exists adequate access for maintenance, this requirement may be amended for local, temporary or joint use basins.

D. Access ramps shall be provided to the basin floor.

   1. Minimum of one - 15 foot wide ramp for local basins.
   2. Minimum of two - 15 foot wide ramps for regional basins.

E. The maximum roadway or access ramp slope shall be 10%.

F. The minimum access and roadway inside turning radius shall be 35 feet.

X. Fencing

A. All basins shall be fenced with 6-foot chain link fencing per Cal Trans standards or other approved barrier unless otherwise approved by the Land Management Department and the Flood Control District. Joint use basin fencing will be site specific and must meet the needs of all agencies utilizing the basin.

B. All regional basin chain link fencing shall have a 1 foot wide painted horizontal orange stripe at the mid height of the fence.

C. Access to the basins shall be gated and locked.

XI. Rights-of-Way

A. Sufficient rights-of-way shall be provided for the construction and economical maintenance of the basin(s), (including all fill and cut slopes) and shall include sufficient area to provide for an access road from a dedicated public street to the basin.

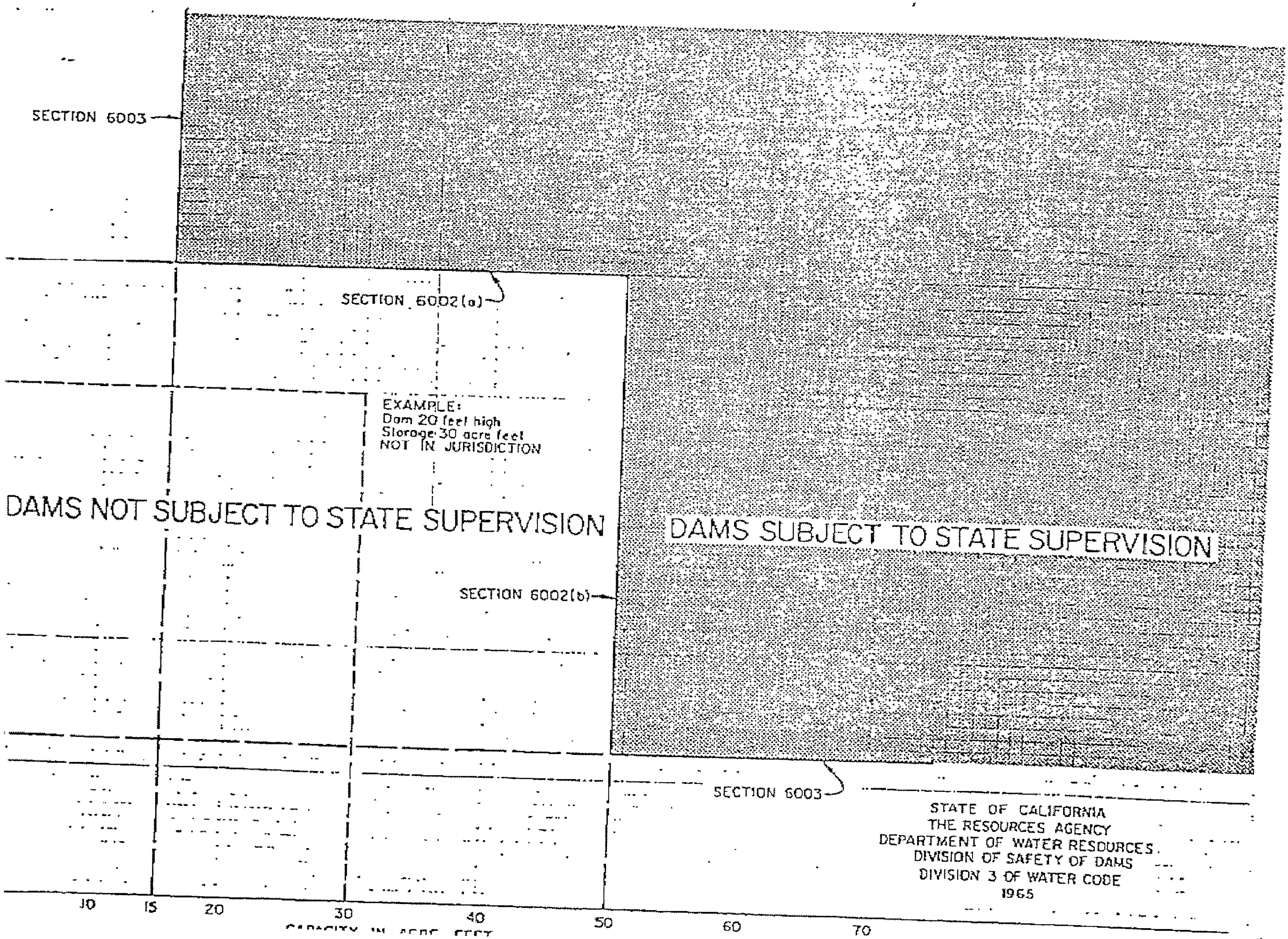

SECTION 6003
SECTION 6002(a)
EXAMPLE:
Dam 20 feet high
Storage 30 acre feet
NOT IN JURISDICTION
DAMS NOT SUBJECT TO STATE SUPERVISION
DAMS SUBJECT TO STATE SUPERVISION
SECTION 6002(b)
SECTION 6003
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF SAFETY OF DAMS
DIVISION 3 OF WATER CODE
1965
10
15
20
30
40
50
60
70

FIG. 2

B. Regional basins shall be dedicated to the District in fee title.

C. Local basins shall be covered by an adequate San Bernardino County Drainage Easement.

XII. References to be Used in Design.

"A New Method of Estimating Debris - Storage Requirements for Debris Basins," Tatum, U.S. Army Engineer District, Los Angeles, CA, 1963

"Design of Small Dams", U.S. Bureau of Reclamation, 1977

"Handbook of Hydraulics", King and Brater, McGraw Hill Book Company, 1954

"Los Angeles County Flood Control Manual - Debris Dams and Basin", Los Angeles County Flood Control District

"Open-Channel Hydraulics", Ven Te Chow, Ph.d., 1959

"San Bernardino County Hydrology Manual", San Bernardino County, May 1983

"San Bernardino County Standards and Specification", San Bernardino County Department of Transmportation/Flood Control/Airports

ATT. K, p.15/17

INTEROFFICE MEMO

DATE September 4, 1987 PHONE 2515

FROM ROBERT W. CORCHERO, Chief
Water Resources Division

TO CHARLES L. LAIRD, Acting Director
Transportation/Flood Control

File: 1(FC)-53

1853

County of San Bernardino

SUBJECT SAN BERNARDINO COUNTY DETENTION BASIN DESIGN CRITERIA

As requested the subject criteria was reviewed with respect to the determination of pre-development peak flow rates. According to the existing criteria the County can be 85% confident that the calculated peak flow rate will equal or exceed the peak flow rate at a given concentration point if adequate streamflow data was available. Therefore, the County can only be about 15% confident a detention basin outflow will not adversely affect downstream properties (not considering erosion).

The County should be at least 50% confident a detention basin outflow will not adversely impact properties downstream of the basin. Based on the calibration study of the county's hydrology method the input parameters (procedures) described in the Manual should be modified as follows:

a) 10 year peak flow rates should be calculated using 5-year rainfall,

b) 25-year peak flow rates should be calculated using 10-year rainfall, and

c) 100-year peak flow rates should be calculated using 25-year rainfall and AMC II.

If these design parameters are used for determining the pre-development peak flow rates, the basin outflow metered to 90% of these calculated pre-development peak flow rates and the post-development peak flow rates to the basin calculated in accordance with County Hydrology Manual, the County will be over 50% confident the resulting basin design will not adversely affect adjacent or downstream properties (not considering erosion).

The desired confidence level for detention basin outflow is a policy decision. Once the desired confidence level is determined the required input rainfall amounts can be developed to calculate the peak flow rate at the corresponding confidence level. I have discussed this policy issue with John Pederson of the U.S. Army Corps of Engineers, Ron Moore of the Soil Conservation Service and Al Nessinger of Orange County. Al Nessinger pointed out by using basin inflow hydrographs based on a 85% confidence level and by creating adequate storage to reduce the peak flow rate from the basin to 90% of pre-development condition based on a 50% confidence level, the resulting confidence level that downstream conditions have not changed will be greater than 50%. Also, the rainfall pattern used in the hydrograph method was chosen to be the most severe test on basin design. When these facts are combined with criteria of using multi-day storms, the resulting basin design should be adequate to ensure downstream properties will not be subject to increased peak flow rates. Ron Moore felt the revised criteria better fit the actual pre-development conditions in the field. John Pederson and Al Nessigner both felt the criteria should be tested against actual occurrences in gaged watershed. Attached is page 2 of the design criteria with the proposed changes shown in bold type.

Should you have any questions, please call.

RWC:mjs
Attachment

cc: Ken Miller

San Bernardino County

II. Basin Capacity and Outlet Drain

A. When a basin (regional, local, temporary or joint use) is to be used to mitigate downstream impacts due to increased flows generated by a development, the basin capacity and outlet size shall be such that the post-development peak flow rate generated by the site shall be less than or equal to 90% of the pre-development peak flow rate from the site for all frequency storms up to and including 100-year (i.e.) the peak 2 year post-development flow rate is equal to or less than 90% of the peak 2 year pre-development flow rate from the site and etc. for all frequency storm events through 100 year).

1. Only 2, 10, 25 and 100-year storms need to be analyzed.

2. Post-development peak flow rates shall be calculated in accordance with the "San Bernardino County Hydrology Manual".

3. Pre-development peak flow rates shall be calculated in accordance with the "San Bernardino County Hydrology Manual" with the following exceptions.

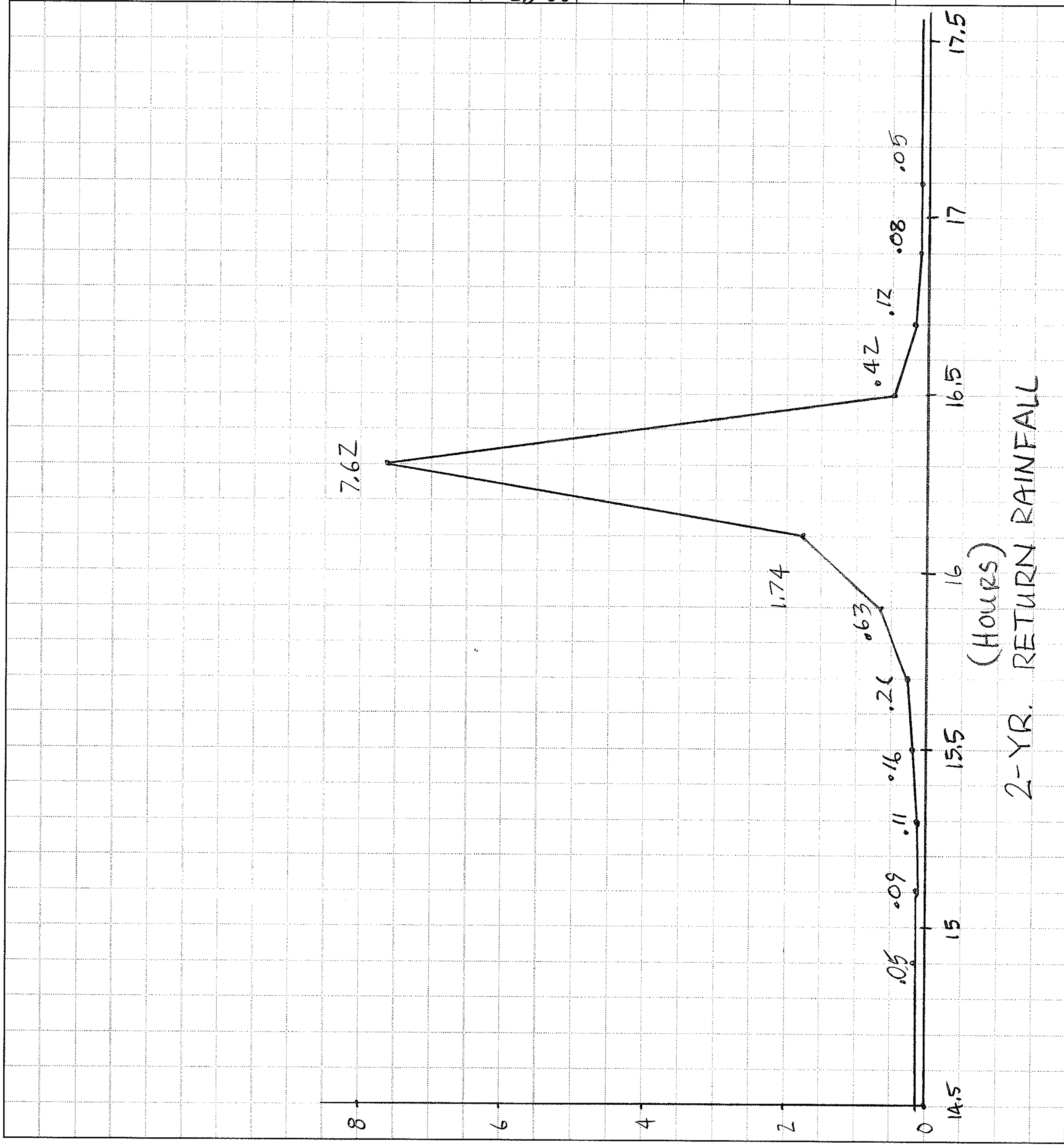
   a) 10-year peak flow rates shall be calculated using 5-year rainfall.

   b) 25-year peak flow rates shall be calculated using 10-year rainfall.

   c) 100-year peak flow rates shall be calculated using 25-year rainfall and AMC-II.

4. Additional studies shall be submitted where there exists more than one basin in the drainage area under review. The studies shall address the timing of the peak flow rates from the basins to ensure downstream flow rates are not increased.

WorleyParsons resources & energy	CLIENT NAME: AES PROJECT NAME: HIGHGROVE				Attachment L
STANDARD CALCULATION SHEET	SUBJECT: 2-YR HYDROGRAPH				CALC NO.: HIGH-0-DC-024-CE-001
	REVISION	A	1	2	3
	ORIGINATOR:	JAW			Page 1 of 8
	REVIEWER:				
	DATE:	10-28-06			



ATTACHMENT L
p. 2 / 8

RP	5	10	15	30	60	120	180	360	minutes
2-year	0.16	0.25	0.31	0.42	0.52	0.72	0.88	1.26	
10	0.26	0.39	0.49	0.66	0.81	1.09	1.32	1.89	
25	0.32	0.48	0.6	0.81	1	1.32	1.59	2.25	
100	0.43	0.65	0.8	1.08	1.34	1.71	2.03	2.81	

2-year Hydrograph **Tc = 8 minutes**

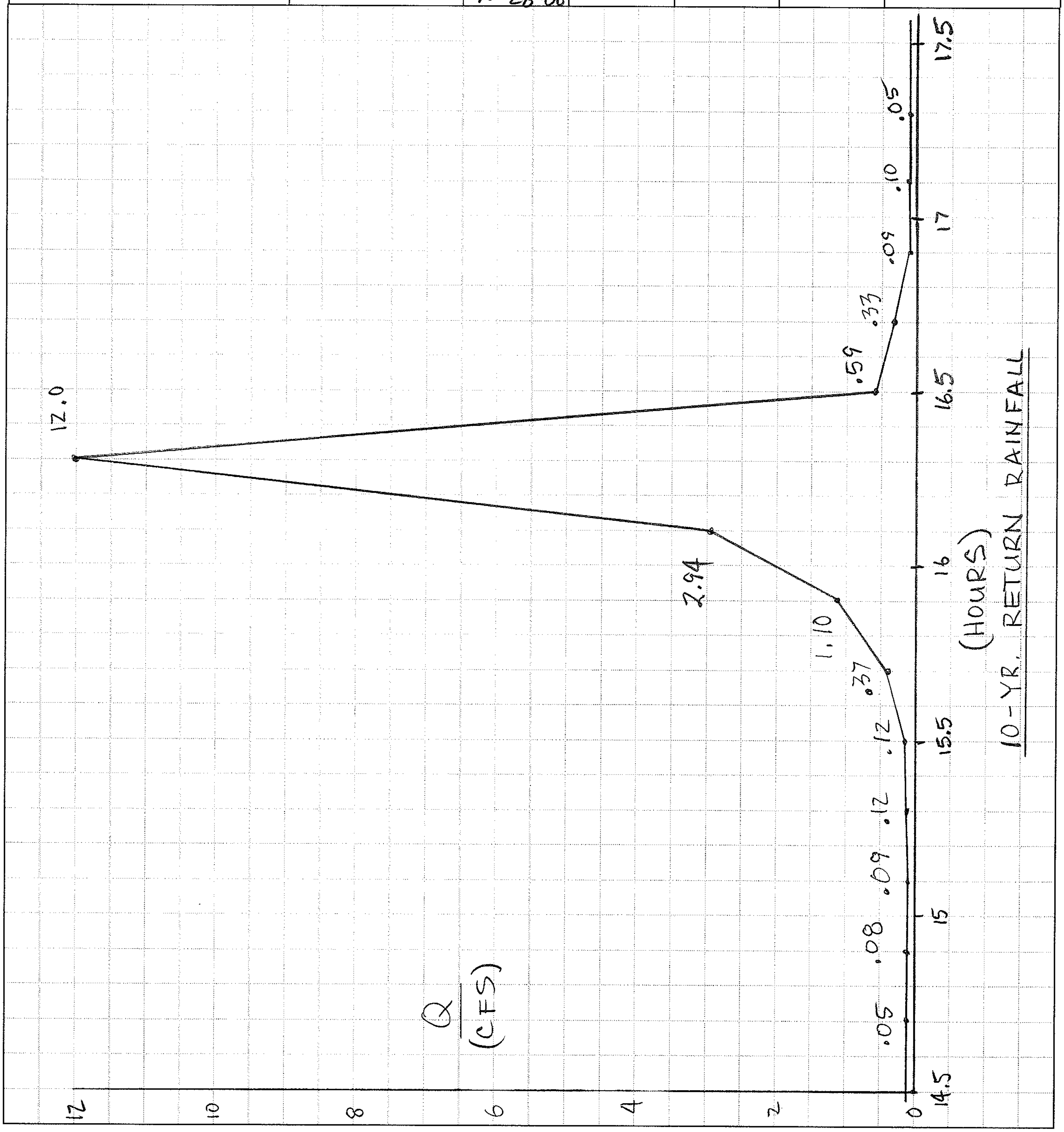
Tc Unit	Minutes	Intensity at time (in/hr)	Mass Rainfall (in)	Unit Rainfall (in)	Unit Loss (in)	Net Rainfall (in)	Effective Rainfall (in/hr)	Q (cfs)	.35 x unit rainfall
1	8	1.62	0.216	0.216	0.076	0.140	1.053	7.620	0.076
2	16	1.18	0.315	0.099	0.035	0.064	0.241	1.740 L	0.035
3	24	0.92	0.368	0.053	0.019	0.035	0.087	0.627 L	0.019
4	32	0.78	0.416	0.048	0.017	0.031	0.059	0.423 R	0.017
5	40	0.68	0.453	0.037	0.013	0.024	0.036	0.263 L	0.013
6	48	0.6	0.480	0.027	0.009	0.017	0.022	0.157 L	0.009
7	56	0.54	0.504	0.024	0.008	0.016	0.017	0.121 R	0.008
8	64	0.495	0.528	0.024	0.008	0.016	0.015	0.106 L	0.008
9	72	0.46	0.552	0.024	0.008	0.016	0.013	0.094 L	0.008
10	80	0.43	0.573	0.021	0.007	0.014	0.010	0.075 R	0.007
11	88	0.405	0.594	0.021	0.007	0.013	0.009	0.066 L	0.007
12	96	0.385	0.616	0.022	0.008	0.014	0.009	0.065 L	0.008
13	104			0.02	0.007	0.014	0.008	0.058 R	0.007
14	112			0.02	0.007	0.014	0.008	0.054 L	0.007
15	120			0.02	0.007	0.014	0.007	0.051	0.007
16	128			0.02	0.007	0.014	0.007	0.047	0.007
17	136			0.02	0.007	0.014	0.006	0.045	0.007
18	144			0.02	0.007	0.014	0.006	0.042	0.007
19	152			0.02	0.007	0.014	0.006	0.040	0.007
20	160			0.02	0.007	0.014	0.005	0.038	0.007

Fm (inches/hr)= 0.15
unit loss (inches) = 0.02
unit loss = smaller of 0.02 or 0.35*unit rainfall

Q=0.9 x eff rainfall x A
A = 8.041 acres

ATTACHMENT L

WorleyParsons resources & energy	CLIENT NAME: AES PROJECT NAME: HIGHGROVE				JOB NO.:
STANDARD CALCULATION SHEET	SUBJECT: 10-YR HYDROGRAPH				CALC NO.: HIGH-0-DC-024-CE-001
	REVISION	A	1	2	3
	ORIGINATOR:	JAW			Page 3 of 8
	REVIEWER:				
	DATE:	10-28-06			



THIS IS A DESIGN RECORD

ATTACHMENT L
p 4/8

10-year Hydrograph Tc = 8 minutes

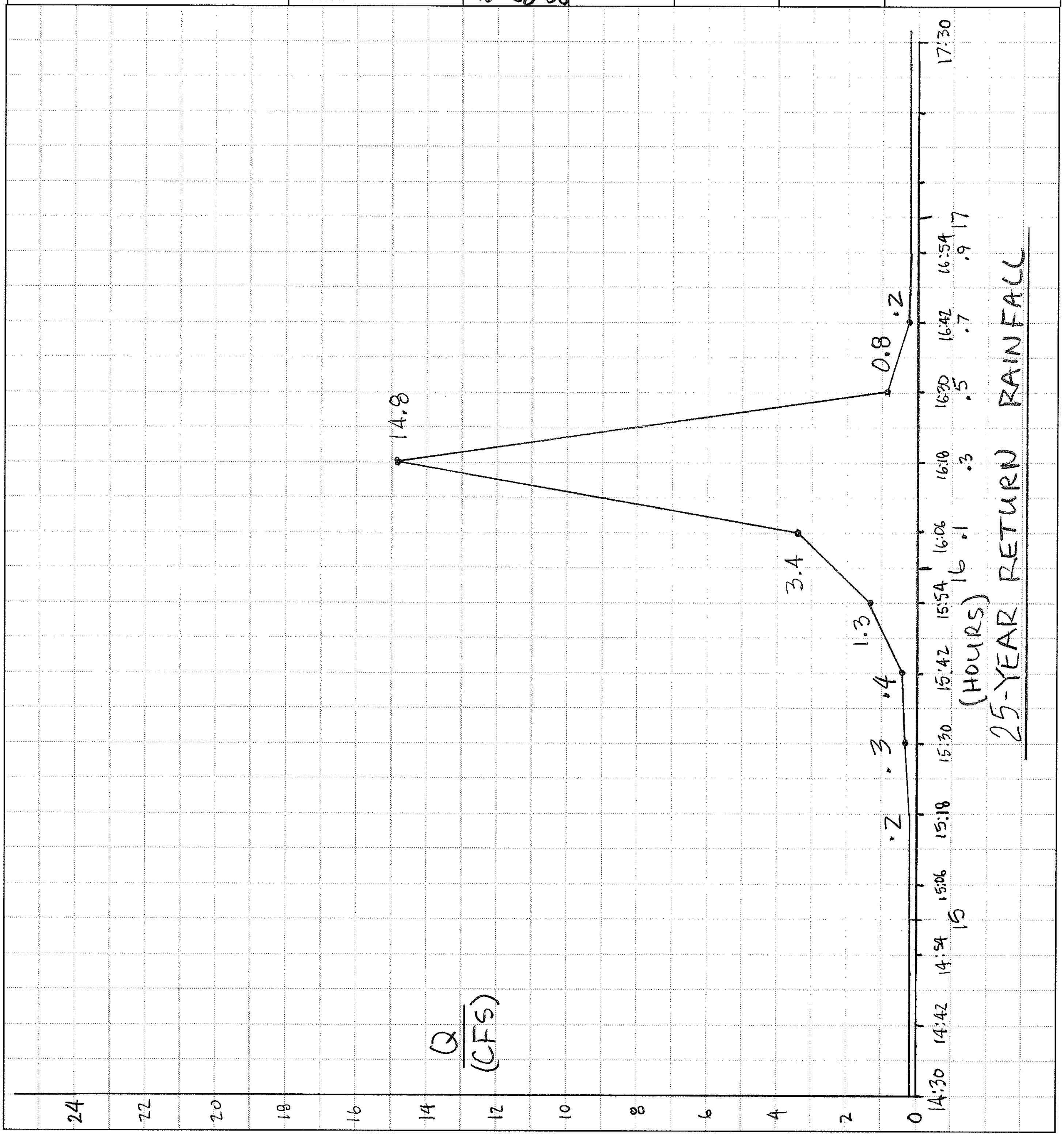
Tc Unit	Minutes	Intensity at time (in/hr)	Mass Rainfall (in)	Unit Rainfall (in)	Unit Loss (in)	Net Rainfall (in)	Effective Rainfall (in/hr)	Q (cfs)		.35 x unit rainfall
1	8	2.55	0.340	0.340	0.119	0.221	1.658	11.995		0.119
2	16	1.9	0.507	0.167	0.058	0.108	0.406	2.940		0.058
3	24	1.5	0.600	0.093	0.033	0.061	0.152	1.098		0.033
4	32	1.25	0.667	0.067	0.023	0.043	0.081	0.588		0.023
5	40	1.07	0.713	0.047	0.016	0.030	0.046	0.329		0.016
6	48	0.97	0.776	0.063	0.022	0.041	0.051	0.368		0.022
7	56	0.85	0.793	0.017	0.006	0.011	0.012	0.087		0.006
8	64	0.77	0.821	0.028	0.010	0.018	0.017	0.123		0.010
9	72	0.71	0.852	0.031	0.011	0.020	0.017	0.120		0.011
10	80	0.66	0.880	0.028	0.010	0.018	0.014	0.099		0.010
11	88	0.62	0.909	0.029	0.010	0.019	0.013	0.094		0.010
12	96	0.585	0.936	0.027	0.009	0.017	0.011	0.078		0.009
13	104	0.55	0.953	0.017	0.007	0.010	0.006	0.043	.05 ↓	0.006
14	112			0.02	0.007	0.013	0.007	0.050		0.007
15	120			0.02	0.007	0.013	0.007	0.047		0.007
16	128			0.02	0.007	0.013	0.006	0.044		0.007
17	136			0.02	0.007	0.013	0.006	0.042		0.007
18	144			0.02	0.007	0.013	0.005	0.039		0.007
19	152			0.02	0.007	0.013	0.005	0.037		0.007
20	160			0.02	0.007	0.013	0.005	0.035		0.007

Fm (inches/hr)= 0.15
unit loss (inches) = 0.02
unit loss = smaller of 0.02 or 0.35*unit rainfall

Q=0.9 x eff rainfall x A
A = 8.041 acres

ATTACHMENT L

WorleyParsons resources & energy	CLIENT NAME: AES PROJECT NAME: HIGHGROVE				JOB NO.:
STANDARD CALCULATION SHEET	SUBJECT: 25-YR HYDROGRAPH				CALC NO.: HIGH-0-DC-024-CE-001
	REVISION	A	1	2	3
	ORIGINATOR:	JAW			Page 5 of 8
	REVIEWER:				
	DATE:	10-28-06			



THIS IS A DESIGN RECORD

ATTACHMENT L
P 6/8

25-year Hydrograph Tc = 8 minutes

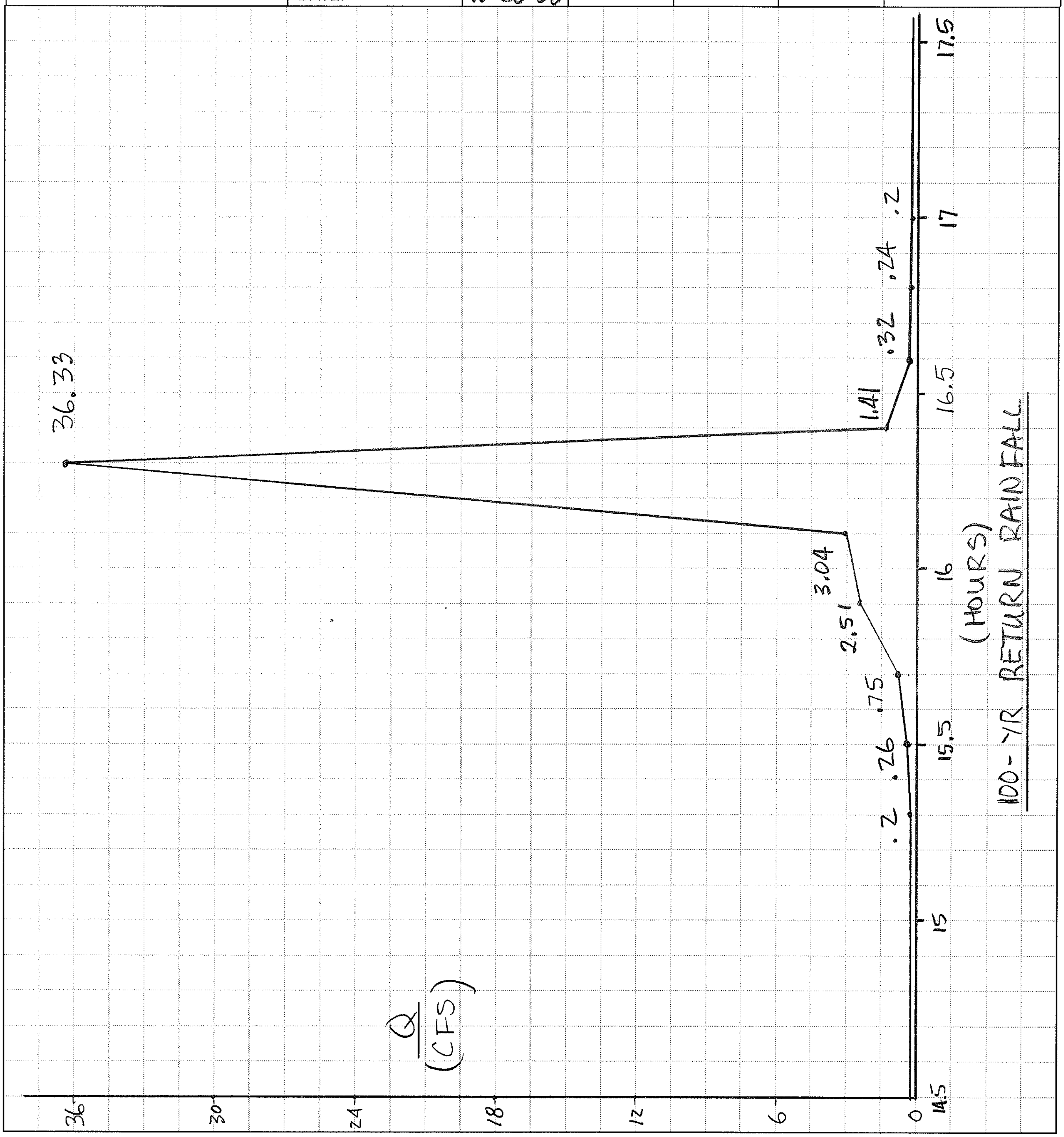
Tc Unit	Minutes	Intensity at time (in/hr)	Mass Rainfall (in)	Unit Rainfall (in)	Unit Loss (in)	Net Rainfall (in)	Effective Rainfall (in/hr)	Q (cfs)	.35 x unit rainfall
1	8	3.15	0.420	0.420	0.147	0.273	2.048	14.818	0.147
2	16	2.3	0.613	0.193	0.068	0.126	0.471	3.410	0.068
3	24	1.82	0.728	0.115	0.040	0.075	0.186	1.348	0.040
4	32	1.54	0.821	0.093	0.033	0.061	0.114	0.823	0.033
5	40	1.32	0.880	0.059	0.021	0.038	0.057	0.414	0.021
6	48	1.17	0.936	0.056	0.020	0.036	0.045	0.329	0.020
7	56	1.05	0.980	0.044	0.015	0.029	0.031	0.222	0.015
8	64	0.95	1.013	0.033	0.012	0.022	0.020	0.147	0.012
9	72	0.88	1.056	0.043	0.015	0.028	0.023	0.167	0.015
10	80	0.82	1.093	0.037	0.013	0.024	0.018	0.132	0.013
11	88	0.77	1.129	0.036	0.013	0.023	0.016	0.115	0.013
12	96	0.73	1.168	0.039	0.014	0.025	0.016	0.114	0.014
13	104			0.04	0.014	0.026	0.015	0.109	0.014
14	112			0.04	0.014	0.026	0.014	0.101	0.014
15	120			0.04	0.014	0.026	0.013	0.094	0.014
16	128			0.04	0.014	0.026	0.012	0.088	0.014
17	136			0.04	0.014	0.026	0.011	0.083	0.014
18	144			0.04	0.014	0.026	0.011	0.078	0.014
19	152			0.04	0.014	0.026	0.010	0.074	0.014
20	160			0.04	0.014	0.026	0.010	0.071	0.014

Fm (inches/hr)= 0.15
unit loss (inches) = 0.02
unit loss = smaller of 0.02 or 0.35*unit rainfall

Q=0.9 x eff rainfall x A
A = 8.041 acres

ATTACHMENT L

WorleyParsons resources & energy	CLIENT NAME: AES PROJECT NAME: HIGHGROVE				JOB NO.:
STANDARD CALCULATION SHEET	SUBJECT: 100-YR HYDROGRAPH				CALC NO.: HIGH-0-DC-024-CE-001
	REVISION	0	1	2	3
	ORIGINATOR:	JAW			Page 7 of 8
	REVIEWER:				
	DATE:	10-28-06			



100-year Hydrograph **Tc = 8 minutes**

Tc Unit	Minutes	Intensity at time (in/hr)	Mass Rainfall (in)	Unit Rainfall (in)	Unit Loss (in)	Net Rainfall (in)	Effective Rainfall (in/hr)	Q (cfs)		.35 x unit rainfall
1	8	5.17	0.689	0.689	0.020	0.669	5.020	36.329		0.241
2	16	3.08	0.821	0.132	0.020	0.112	0.420	3.039	L	0.046
3	24	2.45	0.980	0.159	0.020	0.139	0.347	2.509	L	0.056
4	32	2.07	1.104	0.124	0.020	0.104	0.195	1.411	R	0.043
5	40	1.73	1.153	0.049	0.020	0.029	0.044	0.318	R	0.017
6	48	1.57	1.256	0.103	0.020	0.083	0.103	0.748	L	0.036
7	56	1.4	1.307	0.051	0.020	0.031	0.033	0.238	R	0.018
8	64	1.28	1.365	0.059	0.020	0.039	0.036	0.262	L	0.021
9	72	1.18	1.416	0.051	0.018	0.033	0.027	0.199	.20 ↓	0.018
10	80	1.1	1.467	0.051	0.018	0.033	0.025	0.179		0.018
11	88	1.08	1.584	0.117	0.020	0.097	0.066	0.480		0.041
12	96	0.97	1.552	0.050	0.018	0.033	0.020	0.147		0.018
13	104			0.05	0.018	0.033	0.019	0.136		0.018
14	112			0.05	0.018	0.033	0.017	0.126		0.018
15	120			0.05	0.018	0.033	0.016	0.118		0.018
16	128			0.05	0.018	0.033	0.015	0.110		0.018
17	136			0.05	0.018	0.033	0.014	0.104		0.018
18	144			0.05	0.018	0.033	0.014	0.098		0.018
19	152			0.05	0.018	0.033	0.013	0.093		0.018
20	160			0.05	0.018	0.033	0.012	0.088		0.018

Fm (inches/hr)= 0.15
unit loss (inches) = 0.020
unit loss = smaller of 0.02 or 0.35 times unit rainfall

Q=0.9 x eff rainfall x A
A = 8.041 acres

Type.... Outlet Input Data
Name.... Discharge Struc

File.... Z:\SACR\SACR\Doc\AES Highgrove\Civil\Stormwater\PondPack\AES HG Rational Hyd 25.p

DISCHARGE STRUCTURE

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 929.00 ft
Increment = .20 ft
Max. Elev.= 939.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Stand Pipe	1	--->	TW	934.000	940.000
Orifice-Circular	2	--->	TW	929.000	940.000
TW SETUP, DS Channel					

```
OUTLET STRUCTURE INPUT DATA


Structure ID        = 1
Structure Type      = Stand Pipe
------------------------------------
# of Openings       =         1
Invert Elev.        =    934.00 ft
Diameter            =    3.0000 ft
Orifice Area        =    7.0686 sq.ft
Orifice Coeff.      =      .600
Weir Length         =      9.42 ft
Weir Coeff.         =     3.100
K, Reverse          =     1.000
Mannings n          =     .0000
Kev,Charged Riser   =      .000
Weir Submergence    = No
Orifice H to crest= Yes


Structure ID        = 2
Structure Type      = Orifice-Circular
------------------------------------
# of Openings       =         1
Invert Elev.        =    929.00 ft
Diameter            =     .2500 ft
Orifice Coeff.      =      .600


Structure ID        = TW
Structure Type      = TW SETUP, DS Channel
------------------------------------
FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations=    30
Min. TW tolerance =    .01 ft
Max. TW tolerance =    .01 ft
Min. HW tolerance =    .01 ft
Max. HW tolerance =    .01 ft
Min.  Q tolerance =    .10 cfs
Max.  Q tolerance =    .10 cfs
```

File.... Z:\SACR\SACR\Doc\AES Highgrove\Civil\Stormwater\PondPack\AES HG Rational Hyd 25.p

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
929.00	.00	Free Outfall		None contributing
929.20	.05	Free Outfall		2
929.40	.12	Free Outfall		2
929.60	.16	Free Outfall		2
929.80	.19	Free Outfall		2
930.00	.22	Free Outfall		2
930.20	.24	Free Outfall		2
930.40	.27	Free Outfall		2
930.60	.29	Free Outfall		2
930.80	.31	Free Outfall		2
931.00	.32	Free Outfall		2
931.20	.34	Free Outfall		2
931.40	.36	Free Outfall		2
931.60	.37	Free Outfall		2
931.80	.39	Free Outfall		2
932.00	.40	Free Outfall		2
932.20	.41	Free Outfall		2
932.40	.43	Free Outfall		2
932.60	.44	Free Outfall		2
932.80	.45	Free Outfall		2
933.00	.47	Free Outfall		2
933.20	.48	Free Outfall		2
933.40	.49	Free Outfall		2
933.60	.50	Free Outfall		2
933.80	.51	Free Outfall		2
934.00	.52	Free Outfall		1 +2
934.20	3.15	Free Outfall		1 +2
934.40	7.93	Free Outfall		1 +2
934.60	14.13	Free Outfall		1 +2
934.80	21.47	Free Outfall		1 +2
935.00	29.79	Free Outfall		1 +2
935.20	37.85	Free Outfall		1 +2
935.40	40.85	Free Outfall		1 +2
935.60	43.63	Free Outfall		1 +2
935.80	46.25	Free Outfall		1 +2
936.00	48.73	Free Outfall		1 +2
936.20	51.09	Free Outfall		1 +2
936.40	53.34	Free Outfall		1 +2

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Notes		
		-------- Converge		
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
936.60	55.50	Free Outfall		1 +2
936.80	57.58	Free Outfall		1 +2
937.00	59.59	Free Outfall		1 +2
937.20	61.53	Free Outfall		1 +2
937.40	63.41	Free Outfall		1 +2
937.60	65.24	Free Outfall		1 +2
937.80	67.02	Free Outfall		1 +2
938.00	68.75	Free Outfall		1 +2
938.20	70.43	Free Outfall		1 +2
938.40	72.08	Free Outfall		1 +2
938.60	73.69	Free Outfall		1 +2
938.80	75.27	Free Outfall		1 +2
939.00	76.82	Free Outfall		1 +2

POND VOLUME CALCULATIONS

Planimeter scale: 1.00 ft/in

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
929.00	126.000	.0029	.0000	.000	.000
930.00	8748.000	.2008	.2278	.076	.076
932.00	9920.000	.2277	.6424	.428	.504
934.00	11073.000	.2542	.7225	.482	.986
936.00	12251.000	.2812	.8028	.535	1.521
939.00	14278.000	.3278	.9126	.913	2.434

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

100-YR

```
HYG file = Z:\SACR\SACR\Doc\AES Highgrove\Civil\Stormwater\PondPack\work_pad.p
HYG ID   = 100-YR
HYG Tag  = 100 YR
-----------------------------------
Peak Discharge =       36.33 cfs
Time to Peak   =     16.3000 hrs
HYG Volume     =        .870 ac-ft
-----------------------------------
```

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .2000 hrs
Time on left represents time for first value in each row.

Time hrs					
14.5000	.20	.20	.20	.20	.20
15.5000	.26	.75	2.51	3.04	36.33
16.5000	1.41	.32	.24	.20	.20
17.5000	.20	.20	.20	.20	.20
18.5000	.20	.20	.20	.20	.20
19.5000	.20	.20	.20	.20	.20
20.5000	.20	.20	.20	.20	.20
21.5000	.20	.20	.20	.20	.20
22.5000	.20	.20	.20	.20	.20
23.5000	.20	.20	.20		

MASTER DESIGN STORM SUMMARY

Hydrograph Queue Only Network

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
Hydrograph File Import Option Used For 1 node(s)

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID		Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
HYD QUEUE 10		HYG	25	.870	LR	16.3000	36.33		
*INTO MH #6		JCT	25	.871		16.5000	.46		
PREL POND	IN	POND	25	.871	R	16.3000	36.33		
PREL POND	OUT	POND	25	.871		16.5000	.46	932.90	.715

TOTAL NODE INFLOW...
HYG file =
HYG ID = PREL POND IN
HYG Tag =

Peak Discharge = 36.33 cfs
Time to Peak = 16.3000 hrs
HYG Volume = .871 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
14.4500	.00	.20	.20	.20	.20
14.7000	.20	.20	.20	.20	.20
14.9500	.20	.20	.20	.20	.20
15.2000	.20	.20	.20	.22	.23
15.4500	.24	.26	.38	.51	.63
15.7000	.75	1.19	1.63	2.07	2.51
15.9500	2.64	2.77	2.91	3.04	11.36
16.2000	19.69	28.01	36.33	27.60	18.87
16.4500	10.14	1.41	1.14	.87	.59
16.7000	.32	.30	.28	.26	.24
16.9500	.23	.22	.21	.20	.20
17.2000	.20	.20	.20	.20	.20
17.4500	.20	.20	.20	.20	.20
17.7000	.20	.20	.20	.20	.20
17.9500	.20	.20	.20	.20	.20
18.2000	.20	.20	.20	.20	.20
18.4500	.20	.20	.20	.20	.20
18.7000	.20	.20	.20	.20	.20
18.9500	.20	.20	.20	.20	.20
19.2000	.20	.20	.20	.20	.20
19.4500	.20	.20	.20	.20	.20
19.7000	.20	.20	.20	.20	.20
19.9500	.20	.20	.20	.20	.20
20.2000	.20	.20	.20	.20	.20
20.4500	.20	.20	.20	.20	.20
20.7000	.20	.20	.20	.20	.20
20.9500	.20	.20	.20	.20	.20
21.2000	.20	.20	.20	.20	.20
21.4500	.20	.20	.20	.20	.20
21.7000	.20	.20	.20	.20	.20
21.9500	.20	.20	.20	.20	.20

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
22.2000	.20	.20	.20	.20	.20
22.4500	.20	.20	.20	.20	.20
22.7000	.20	.20	.20	.20	.20
22.9500	.20	.20	.20	.20	.20
23.2000	.20	.20	.20	.20	.20
23.4500	.20	.20	.20	.20	.20
23.7000	.20	.20	.20	.20	.20

LEVEL POOL ROUTING DATA

HYG Dir = Z:\SACR\SACR\Doc\AES Highgrove\Civil\Stormwater\PondPack\
Inflow HYG file = NONE STORED - PREL POND IN 100
Outflow HYG file = NONE STORED - PREL POND OUT 100

Pond Node Data = PREL POND
Pond Volume Data = PREL POND
Pond Outlet Data = Discharge Struc

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 929.00 ft
Starting Volume = .000 ac-ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = .0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
929.00	.00	.000	.0029	.00	.00	.00
929.20	.05	.002	.0176	.00	.05	.95
929.40	.12	.008	.0447	.00	.12	3.93
929.60	.16	.021	.0843	.00	.16	10.12
929.80	.19	.042	.1364	.00	.19	20.73
930.00	.22	.076	.2008	.00	.22	36.98
930.20	.24	.116	.2034	.00	.24	56.57
930.40	.27	.157	.2061	.00	.27	76.41
930.60	.29	.199	.2087	.00	.29	96.50
930.80	.31	.241	.2114	.00	.31	116.86
931.00	.32	.283	.2141	.00	.32	137.47
931.20	.34	.326	.2168	.00	.34	158.34
931.40	.36	.370	.2195	.00	.36	179.47
931.60	.37	.414	.2222	.00	.37	200.86
931.80	.39	.459	.2250	.00	.39	222.52
932.00	.40	.504	.2277	.00	.40	244.44
932.20	.41	.550	.2303	.00	.41	266.63
932.40	.43	.596	.2329	.00	.43	289.06
932.60	.44	.643	.2355	.00	.44	311.74
932.80	.45	.691	.2381	.00	.45	334.68

LEVEL POOL ROUTING DATA

HYG Dir = Z:\SACR\SACR\Doc\AES Highgrove\Civil\Stormwater\PondPack\
Inflow HYG file = NONE STORED - PREL POND IN 100
Outflow HYG file = NONE STORED - PREL POND OUT 100

Pond Node Data = PREL POND
Pond Volume Data = PREL POND
Pond Outlet Data = Discharge Struc

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 929.00 ft
Starting Volume = .000 ac-ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = .0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
933.00	.47	.738	.2408	.00	.47	357.87
933.20	.48	.787	.2434	.00	.48	381.32
933.40	.49	.836	.2461	.00	.49	405.03
933.60	.50	.885	.2488	.00	.50	428.99
933.80	.51	.935	.2515	.00	.51	453.21
934.00	.52	.986	.2542	.00	.52	477.70
934.20	3.15	1.037	.2568	.00	3.15	505.06
934.40	7.93	1.089	.2595	.00	7.93	534.84
934.60	14.13	1.141	.2622	.00	14.13	566.28
934.80	21.47	1.194	.2649	.00	21.47	599.13
935.00	29.79	1.247	.2676	.00	29.79	633.22
935.20	37.85	1.301	.2703	.00	37.85	667.31
935.40	40.85	1.355	.2730	.00	40.85	696.60
935.60	43.63	1.410	.2757	.00	43.63	725.94
935.80	46.25	1.465	.2785	.00	46.25	755.39
936.00	48.73	1.521	.2812	.00	48.73	784.96
936.20	51.09	1.578	.2842	.00	51.09	814.69
936.40	53.34	1.635	.2872	.00	53.34	844.60
936.60	55.50	1.693	.2903	.00	55.50	874.70
936.80	57.58	1.751	.2933	.00	57.58	905.03

LEVEL POOL ROUTING DATA

HYG Dir = Z:\SACR\SACR\Doc\AES Highgrove\Civil\Stormwater\PondPack\
Inflow HYG file = NONE STORED - PREL POND IN 100
Outflow HYG file = NONE STORED - PREL POND OUT 100

Pond Node Data = PREL POND
Pond Volume Data = PREL POND
Pond Outlet Data = Discharge Struc

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 929.00 ft
Starting Volume = .000 ac-ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = .0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
937.00	59.59	1.810	.2964	.00	59.59	935.58
937.20	61.53	1.869	.2994	.00	61.53	966.36
937.40	63.41	1.930	.3025	.00	63.41	997.37
937.60	65.24	1.990	.3056	.00	65.24	1028.63
937.80	67.02	2.052	.3087	.00	67.02	1060.14
938.00	68.75	2.114	.3119	.00	68.75	1091.91
938.20	70.43	2.177	.3150	.00	70.43	1123.94
938.40	72.08	2.240	.3182	.00	72.08	1156.24
938.60	73.69	2.304	.3214	.00	73.69	1188.80
938.80	75.27	2.369	.3246	.00	75.27	1221.64
939.00	76.82	2.434	.3278	.00	76.82	1254.76

HYG file = Z:\SACR\SACR\Doc\AES Highgrove\Civil\Stormwater\PondPack\work_pad.p
HYG ID = 025-YR
HYG Tag = 25 YR

Peak Discharge =	14.80	cfs
Time to Peak =	16.3000	hrs
HYG Volume =	.483	ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .2000 hrs
Time on left represents time for first value in each row.

Time hrs					
14.5000	.20	.20	.20	.20	.20
15.5000	.30	.40	1.30	3.40	14.80
16.5000	.80	.20	.20	.20	.20
17.5000	.20	.20	.20	.20	.20
18.5000	.20	.20	.20	.20	.20
19.5000	.20	.20	.20	.20	.20
20.5000	.20	.20	.20	.20	.20
21.5000	.20	.20	.20	.20	.20
22.5000	.20	.20	.20	.20	.20
23.5000	.20	.20	.20		

MASTER DESIGN STORM SUMMARY

Hydrograph Queue Only Network

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
Hydrograph File Import Option Used For 1 node(s)

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID		Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
HYD QUEUE 10		HYG	25	.483	LR	16.3000	14.80		
*INTO MH #6		JCT	25	.483		16.5000	.34		
PREL POND	IN	POND	25	.483	R	16.3000	14.80		
PREL POND	OUT	POND	25	.483		16.5000	.34	931.23	.334

TOTAL NODE INFLOW...
HYG file =
HYG ID = PREL POND IN
HYG Tag = 25

Peak Discharge =	14.80 cfs
Time to Peak =	16.3000 hrs
HYG Volume =	.483 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
14.4500	.00	.20	.20	.20	.20
14.7000	.20	.20	.20	.20	.20
14.9500	.20	.20	.20	.20	.20
15.2000	.20	.20	.20	.23	.25
15.4500	.27	.30	.33	.35	.38
15.7000	.40	.63	.85	1.08	1.30
15.9500	1.82	2.35	2.88	3.40	6.25
16.2000	9.10	11.95	14.80	11.30	7.80
16.4500	4.30	.80	.65	.50	.35
16.7000	.20	.20	.20	.20	.20
16.9500	.20	.20	.20	.20	.20
17.2000	.20	.20	.20	.20	.20
17.4500	.20	.20	.20	.20	.20
17.7000	.20	.20	.20	.20	.20
17.9500	.20	.20	.20	.20	.20
18.2000	.20	.20	.20	.20	.20
18.4500	.20	.20	.20	.20	.20
18.7000	.20	.20	.20	.20	.20
18.9500	.20	.20	.20	.20	.20
19.2000	.20	.20	.20	.20	.20
19.4500	.20	.20	.20	.20	.20
19.7000	.20	.20	.20	.20	.20
19.9500	.20	.20	.20	.20	.20
20.2000	.20	.20	.20	.20	.20
20.4500	.20	.20	.20	.20	.20
20.7000	.20	.20	.20	.20	.20
20.9500	.20	.20	.20	.20	.20
21.2000	.20	.20	.20	.20	.20
21.4500	.20	.20	.20	.20	.20
21.7000	.20	.20	.20	.20	.20
21.9500	.20	.20	.20	.20	.20

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
22.2000	.20	.20	.20	.20	.20
22.4500	.20	.20	.20	.20	.20
22.7000	.20	.20	.20	.20	.20
22.9500	.20	.20	.20	.20	.20
23.2000	.20	.20	.20	.20	.20
23.4500	.20	.20	.20	.20	.20
23.7000	.20	.20	.20	.20	.20

File.... Z:\SACR\SACR\Doc\AES Highgrove\Civil\Stormwater\PondPack\AES HG Rational Hyd

HYG file = Z:\SACR\SACR\Doc\AES Highgrove\Civil\Stormwater\PondPack\work_pad.p
HYG ID = 010-YR
HYG Tag = 10 YR

Peak Discharge = 12.00 cfs
Time to Peak = 16.3000 hrs
HYG Volume = .324 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .2000 hrs
Time on left represents time for first value in each row.

Time hrs					
14.5000	.05	.05	.08	.09	.12
15.5000	.12	.37	1.10	2.94	12.00
16.5000	.59	.33	.09	.10	.05
17.5000	.05	.05	.05	.05	.05
18.5000	.05	.00	.05	.05	.05
19.5000	.05	.05	.05	.05	.05
20.5000	.05	.05	.05	.05	.05
21.5000	.05	.05	.05	.05	.05
22.5000	.05	.05	.05	.05	.05
23.5000	.05	.05	.05		

MASTER DESIGN STORM SUMMARY

Hydrograph Queue Only Network

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
Hydrograph File Import Option Used For 1 node(s)

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
HYD QUEUE 10	HYG	100	.324		16.3000	12.00		
*INTO MH #6	JCT	100	.324		16.5500	.32		
PREL POND IN	POND	100	.325		16.3000	12.00		
PREL POND OUT	POND	100	.324		16.5500	.32	930.93	.268

TOTAL NODE INFLOW...
HYG file =
HYG ID = PREL POND IN
HYG Tag = 10

Peak Discharge = 12.00 cfs
Time to Peak = 16.3000 hrs
HYG Volume = .325 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
14.4500	.00	.05	.05	.05	.05
14.7000	.05	.06	.07	.07	.08
14.9500	.08	.08	.09	.09	.10
15.2000	.10	.11	.12	.12	.12
15.4500	.12	.12	.18	.25	.31
15.7000	.37	.55	.74	.92	1.10
15.9500	1.56	2.02	2.48	2.94	5.21
16.2000	7.47	9.74	12.00	9.15	6.30
16.4500	3.44	.59	.52	.46	.40
16.7000	.33	.27	.21	.15	.09
16.9500	.09	.10	.10	.10	.09
17.2000	.07	.06	.05	.05	.05
17.4500	.05	.05	.05	.05	.05
17.7000	.05	.05	.05	.05	.05
17.9500	.05	.05	.05	.05	.05
18.2000	.05	.05	.05	.05	.05
18.4500	.05	.05	.04	.03	.01
18.7000	.00	.01	.03	.04	.05
18.9500	.05	.05	.05	.05	.05
19.2000	.05	.05	.05	.05	.05
19.4500	.05	.05	.05	.05	.05
19.7000	.05	.05	.05	.05	.05
19.9500	.05	.05	.05	.05	.05
20.2000	.05	.05	.05	.05	.05
20.4500	.05	.05	.05	.05	.05
20.7000	.05	.05	.05	.05	.05
20.9500	.05	.05	.05	.05	.05
21.2000	.05	.05	.05	.05	.05
21.4500	.05	.05	.05	.05	.05
21.7000	.05	.05	.05	.05	.05
21.9500	.05	.05	.05	.05	.05

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
22.2000	.05	.05	.05	.05	.05
22.4500	.05	.05	.05	.05	.05
22.7000	.05	.05	.05	.05	.05
22.9500	.05	.05	.05	.05	.05
23.2000	.05	.05	.05	.05	.05
23.4500	.05	.05	.05	.05	.05
23.7000	.05	.05	.05	.05	.05

File.... Z:\SACR\SACR\Doc\AES Highgrove\Civil\Stormwater\PondPack\AES HG Rational Hyd

```
HYG file = Z:\SACR\SACR\Doc\AES Highgrove\Civil\Stormwater\PondPack\work_pad.p
HYG ID   = 002-YR
HYG Tag  = 2 YR
-----------------------------------
Peak Discharge =        7.62 cfs
Time to Peak   =     16.3000 hrs
HYG Volume     =        .216 ac-ft
-----------------------------------
```

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .2000 hrs
Time on left represents time for first value in each row.

Time hrs					
14.5000	.05	.05	.05	.09	.11
15.5000	.16	.26	.63	1.74	7.62
16.5000	.42	.12	.08	.05	.05
17.5000	.05	.05	.05	.05	.05
18.5000	.05	.05	.05	.05	.05
19.5000	.05	.05	.05	.05	.05
20.5000	.05	.05	.05	.05	.05
21.5000	.05	.05	.05	.05	.05
22.5000	.05	.05	.05	.05	.05
23.5000	.05	.05	.05		

MASTER DESIGN STORM SUMMARY

Hydrograph Queue Only Network

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
Hydrograph File Import Option Used For 1 node(s)

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID		Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
HYD QUEUE		HYG	2	.216		16.3000	7.62		
*INTO MH #6		JCT	2	.216		16.4500	.27		
PREL POND	IN	POND	2	.216		16.3000	7.62		
PREL POND	OUT	POND	2	.216		16.4500	.27	930.44	.165

TOTAL NODE INFLOW...
HYG file =
HYG ID = PREL POND IN
HYG Tag = 2

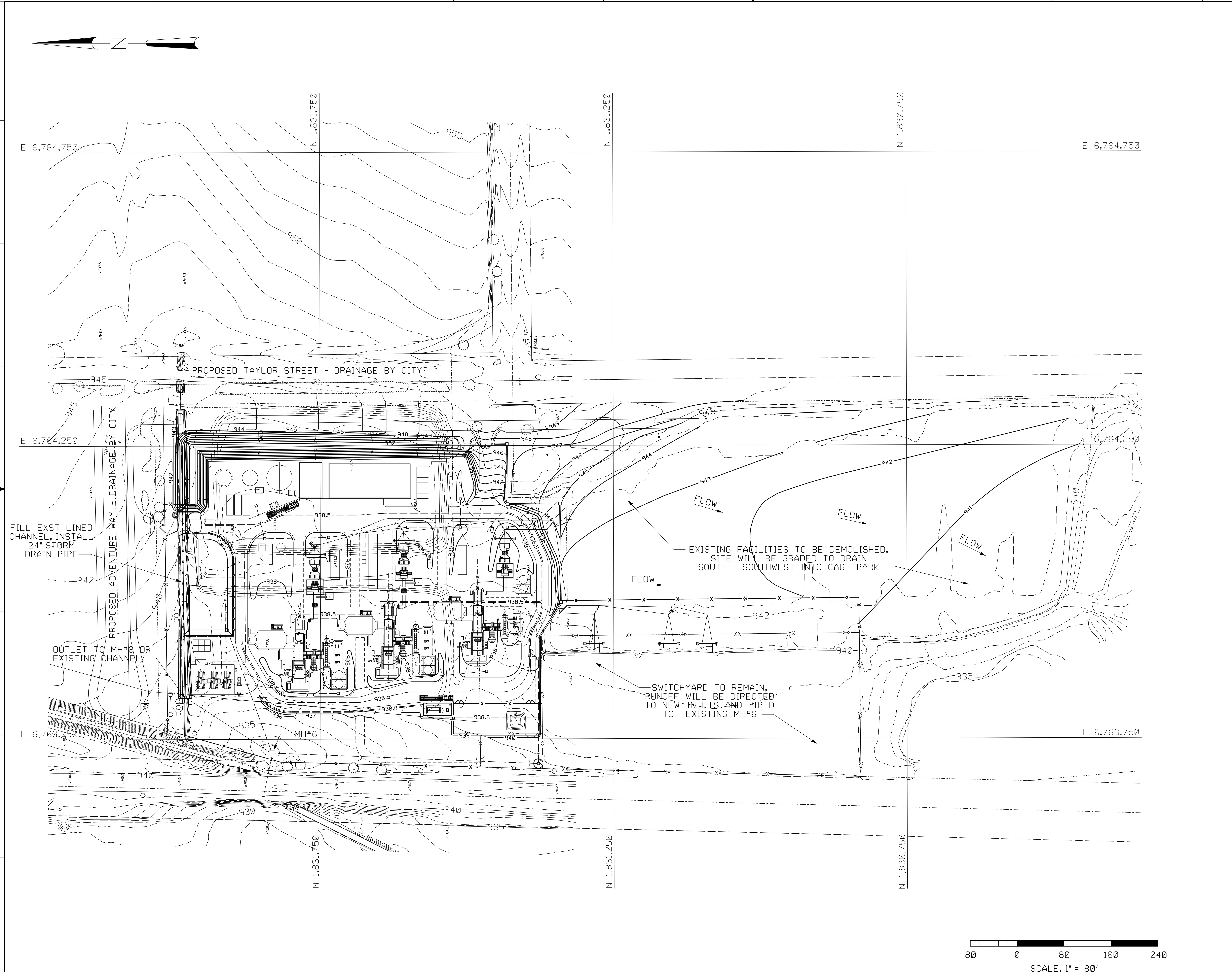
Peak Discharge = 7.62 cfs
Time to Peak = 16.3000 hrs
HYG Volume = .216 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
14.4500	.00	.05	.05	.05	.05
14.7000	.05	.05	.05	.05	.05
14.9500	.06	.07	.08	.09	.10
15.2000	.10	.11	.11	.12	.14
15.4500	.15	.16	.19	.21	.24
15.7000	.26	.35	.45	.54	.63
15.9500	.91	1.18	1.46	1.74	3.21
16.2000	4.68	6.15	7.62	5.82	4.02
16.4500	2.22	.42	.34	.27	.20
16.7000	.12	.11	.10	.09	.08
16.9500	.07	.07	.06	.05	.05
17.2000	.05	.05	.05	.05	.05
17.4500	.05	.05	.05	.05	.05
17.7000	.05	.05	.05	.05	.05
17.9500	.05	.05	.05	.05	.05
18.2000	.05	.05	.05	.05	.05
18.4500	.05	.05	.05	.05	.05
18.7000	.05	.05	.05	.05	.05
18.9500	.05	.05	.05	.05	.05
19.2000	.05	.05	.05	.05	.05
19.4500	.05	.05	.05	.05	.05
19.7000	.05	.05	.05	.05	.05
19.9500	.05	.05	.05	.05	.05
20.2000	.05	.05	.05	.05	.05
20.4500	.05	.05	.05	.05	.05
20.7000	.05	.05	.05	.05	.05
20.9500	.05	.05	.05	.05	.05
21.2000	.05	.05	.05	.05	.05
21.4500	.05	.05	.05	.05	.05
21.7000	.05	.05	.05	.05	.05
21.9500	.05	.05	.05	.05	.05

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
22.2000	.05	.05	.05	.05	.05
22.4500	.05	.05	.05	.05	.05
22.7000	.05	.05	.05	.05	.05
22.9500	.05	.05	.05	.05	.05
23.2000	.05	.05	.05	.05	.05
23.4500	.05	.05	.05	.05	.05
23.7000	.05	.05	.05	.05	.05



LEGEND:

940 EXISTING GRADE CONTOURS

940 FINAL GRADE CONTOURS

FIGURE S&W66-1A

REV	DATE	DESCRIPTION	DRAWN	CHECKED	LEAD DESIGNER	ENGINEER/TECH SPEC	LEAD DISC ENGINEER	PROJ ENGR MANAGER	PROJECT MANAGER
A	11 08 06	ISSUED FOR PERMITTING	JKW	ALM	KJF	JAW	JAW	GB	GB

PRELIMINARY STATUS — DATE — REPRESENTS GENERAL DESIGN CONCEPTS BASED ON ASSUMPTIONS. REVIEWED NOT CHECKED.

LDE JA WINTERHALTER 11-08-06

APPROVED STATUS — DATE — REPRESENTS REVIEWED AND APPROVED DESIGN. ANY PORTION MARKED 'HOLD' RETAINS PRELIMINARY STATUS.

LDE

ORIGINATING PERSONNEL

DRAWN BY: JKW
CHECKED BY: AL MERKEL
LEAD DESIGNER: KJ FRITZ
ENGINEER/TECH SPECIALIST: JA WINTERHALTER
PROJECT ENGINEERING MANAGER: G BAXTER
PROJECT MANAGER: G BAXTER

PROFESSIONAL ENGINEER'S SEAL

ORIGINALLY PREPARED UNDER THE RESPONSIBLE SUPERVISION OF
PE: STATE:
LIC. NO.: DATE:

Zero Harm — Leadership, No Incidents, Safe Behavior

WorleyParsons
resources & energy

CLIENT/PROJECT TITLE

AES/HIGHGROVE

PRELIMINARY GRADING AND DRAINAGE
OVERALL PLAN

SCALE 1"=80'
DRAWING SIZE ANSI D (22" x 34")
WORLEYPARSONS DWG. NO. HIGH-0-DW-112-735-001
REV A

DWG-FILE: high-0-dw-112-735-001.dgn
DWG-DATE: 08-Nov-06 06:50

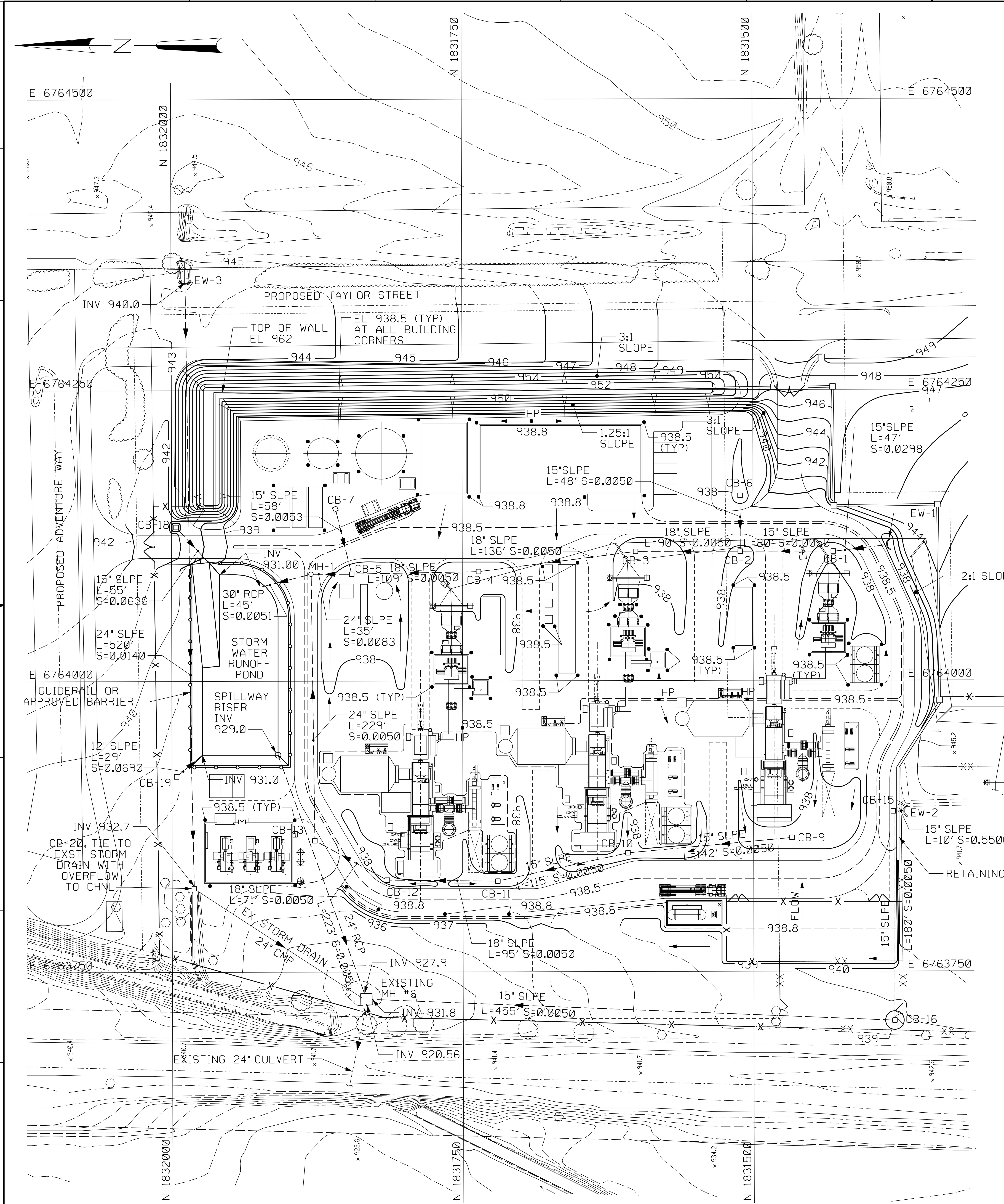


FIGURE S&W66-1B

CATCH BASIN SCHEDULE							
No.	COORDINATE		TYPE	STATE PLANE NGVD29 DATUM			
	NORTH	EAST		TOP	INV IN	INV IN	INV OUT
CB-1	1831431.0	6764111.0	-	937.0	933.6	-	933.6
CB-2	1831511.0	6764111.0	-	937.0	933.20	933.20	933.20
CB-3	1831601.0	6764111.0	-	937.0	932.75	-	932.75
CB-4	1831736.0	6764094.0	-	937.0	932.07	-	932.07
CB-5	1831845.0	6764092.0	-	937.0	931.52	931.52	931.52
CB-6	1831511.0	6764159.0	-	937.0	-	-	933.44
CB-7	1831859.0	6764148.0	-	937.0	-	-	931.83
CB-9	1831467.0	6763865.0	-	937.0	-	-	934.50
CB-10	1831608.0	6763852.0	-	937.0	933.79	-	933.79
CB-11	1831720.0	6763828.0	-	937.0	933.22	-	933.22
CB-12	1831815.0	6763829.0	-	937.0	932.74	-	932.74
CB-13	1831877.5	6763862.9	-	937.0	932.35	-	932.38
CB-15	1831380.0	6763887.5	-	938.0	935.00	-	935.00
CB-16	1831378.9	6763707.8	-	938.0	934.10	-	934.10
CB-18	1831996.0	6764132.0	-	939.0	-	-	934.50
CB-19	1831996.0	6763918.0	-	937.0	-	-	933.00
CB-20	1831981.0	6763822.0	-	937.0	-	-	932.00
EW-1	1831384.3	6764116.5	-	938.0	935.00	-	-
EW-2	1831370.0	6763887.5	-	943.0	940.50	-	-
EW-3	1831987.9	6764342.3	-	943.5	940.00	-	-
MH-1	1831880.0	6764092.0	-	938.5	931.23	931.23	931.23

LEGEND

- 940 — EXISTING GRADE CONTOURS
- 940 — FINAL GRADE CONTOURS
- 938.5 — HALF CONTOURS
- • 938.5 — FINAL GRADE SPOT ELEVATION
- ▫ CB-5 — NEW CATCH BASIN
- NEW STORM DRAIN PIPE
- —x— NEW FENCE
- —xx— EXISTING FENCE

REV	DATE	DESCRIPTION	DRAWN	CHECKED	LEAD DESIGNER	ENGINEER/TECH SPEC	LEAD DISC ENGINEER	PROJ ENGR MANAGER	PROJECT MANAGER
A	11 08 06	ISSUED FOR PERMITTING	JKW	ALM	KJF	JAW	JAW	GB	GB

PRELIMINARY STATUS — DATE — REPRESENTS GENERAL DESIGN CONCEPTS BASED ON ASSUMPTIONS. REVIEWED NOT CHECKED.
LDE JA WINTERHALTER 11-08-06

APPROVED STATUS — DATE — REPRESENTS REVIEWED AND APPROVED DESIGN. ANY PORTION MARKED 'HOLD' RETAINS PRELIMINARY STATUS.
LDE

ORIGINATING PERSONNEL — PROFESSIONAL ENGINEER'S SEAL

DRAWN BY: JKW
CHECKED BY: AL MERKEL
LEAD DESIGNER: KJ FRITZ
ENGINEER/TECH SPECIALIST: JA WINTERHALTER
PROJECT ENGINEERING MANAGER: G BAXTER
PROJECT MANAGER: G BAXTER

Zero Harm — Leadership, No Incidents, Safe Behavior

ORIGINALLY PREPARED UNDER THE RESPONSIBLE SUPERVISION OF PE: ____ STATE: ____ LIC. NO.: ____ DATE: ____

WorleyParsons resources & energy

CLIENT/PROJECT TITLE: AES/HIGHGROVE

PRELIMINARY GRADING AND DRAINAGE SITE PLAN

SCALE: 1"=50'
DRAWING SIZE: ANSI D (22" x 34")
WORLEYPARSONS DWG. NO.: HIGH-0-DW-112-735-002
REV: A

DWG-FILE: high-0-dw-112-735-002.dgn
DWG-DATE: 08-Nov-06 06:51

AES HIGHGROVE PROJECT
(06-AFC-2)
DATA RESPONSES, SET 1B

Technical Area: Visible Plume Modeling
Author: Joe Loyer

BACKGROUND

Staff intends to conduct a plume modeling analysis using the Combustion Stack Visible Plume (CSVP) model and the Seasonal Annual Cooling Tower Impact (SACTI) model for the project, as is done for all projects with cooling towers. Staff will provide the applicant with a copy of the CSVP model training manual upon request.

DATA REQUEST

73. Please provide the following meteorological data files:

a. Five years of meteorological data files in either the National Climate Data Center (NCDC) CD144 (surface data), NCDC-TD3280 (hourly surface observations with precipitation), or Hourly United States Weather Observations (HUSWO) format. The files should be the most recent years available. The files must include location, present weather, cloud cover, and visibility data. Please include a complete description of the source of this data (i.e. specific location, anemometer height, etc), and a discussion of why the data is representative of the area. Please also provide an electronic copy of the raw meteorological data file for each year.

Response: Attached are 5 compact diskettes, each containing 5 years of NCDC CD144 meteorological data files from the Riverside Municipal Airport. The most current 5 years available were for 2001 to 2005. Also included on the compact diskettes are the same 5 years of data formatted for use in the ISCST3 air dispersion model. The Riverside Municipal Airport is approximately 8 miles from the project site, with no significant terrain features in between. The meteorological data has been corrected to Pacific Standard Time.

b. Please provide meteorological data files for the same five years requested in part a., above, in Industrial Source Complex (ISCST3) modeling format from the above data source. These files must include stability class data.

Response: See Data Response #73a.