

**AIR TOXICS “HOT SPOTS” PROGRAM (AB2588)
RISK REDUCTION PLAN**

**GRAYSON POWER PLANT
CITY OF GLENDALE,
GLENDALE WATER & POWER
SCAQMD FACILITY ID: 800327**

FOR SUBMITTAL TO:

South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, California 91765

PREPARED BY:



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February 2020

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SECTION 1.0

EXECUTIVE SUMMARY

1.1 Project Overview

Glendale Water & Power (GWP) is submitting this Risk Reduction Plan (RRP) for the Grayson Power Plant in response to South Coast Air Quality Management District (SCAQMD) notification letter dated June 18, 2019. Due to the results of an SCAQMD - approved Health Risk Assessment Report, GWP is required to prepare an RRP for the facility. This RRP report has been prepared in accordance with SCAQMD AB2588 and Rule 1402 Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics “Hot Spots” Information and Assessment Act, dated September 2018, with assistance from Montrose Environmental Solutions (Montrose).

1.2 Risk Reduction Measures

The Grayson Power Plant is located at 800 Air Way in Glendale, California and operates under SCAQMD Facility ID 800327. The facility has been providing electrical power to the City of Glendale since 1941. The facility operates two steam turbines (Units 1 and 2), three boilers (Units 3, 4, and 5), and four gas turbines (Units 8A, 8B, 8C, and 9) as the power generating equipment. In addition to this equipment, the facility also operates one diesel-fired emergency engine.

Based on the approved HRA, Boilers 3, 4 and 5 were identified as the high-risk emission sources due to the combustion of landfill gas and the absence of emission control systems. GWP has since discontinued the combustion of landfill gas at the facility in order to reduce health risks. Additionally, GWP will further reduce its utilization of boilers and gas turbines to comply with Rule 1135 by January 1st, 2024.

1.3 Residual Health Risk Assessment

An assessment of residual health risks was conducted to demonstrate the RRP will result in risks below the action level defined in SCAQMD Rule 1402. For the purpose of this RRP, the health risk assessment was conducted based on natural gas combustion for the boilers and turbines at the allowable fuel rate of each unit in accordance with the facility permit for Turbines 8A, 8B and 8C, Turbine 9, and the emergency engine. For Boilers 3, 4 and 5, the risk assessment reflects operating limits that are specified in SCAQMD Rule 1135 through the year 2023. The residual risk assessment does not take into consideration the additional operating restrictions that will become effective on January 1, 2024 for all electric generating equipment at the facility, pursuant to SCAQMD Rule 1135, which will further reduce emissions.

Table 1-1 summarizes the results of the residual health risk assessment, which includes the point of maximum impact (PMI), maximum exposed individual resident (MEIR) and maximum exposed individual worker (MEIW) for cancer risk and non-cancer (chronic, 8-hour chronic, and

acute) risk. Based on the values shown in Table 1-1, the proposed risk reduction measures will reduce the facility-wide emissions below the risk action level, which is defined as a maximum individual cancer risk of 25 in one million (25×10^{-6}), cancer burden of one half, a total acute or chronic hazard index of 3.0 for any target organ system at any receptor location. The Health Risk Assessment Summary Form is provided in Appendix A.

**TABLE 1-1
SUMMARY OF HRA RESULTS**

Exposure Parameters	Result
Cancer Risk – PMI	2.67×10^{-6}
Cancer Risk – MEIR	0.99×10^{-6}
Cancer Risk - MEIW	0.11×10^{-6}
Cancer Burden	6.85E-05
Chronic HI – MEIR	1.28E-03
Chronic HI - MEIW	1.46E-03
8-hour Chronic HI - PMI	
Acute HI – PMI	1.46E-03
Acute HI - MEIR	1.10E-03
Acute HI – MEIW	1.19E-03

1.4 Grayson Repowering Project

In addition to the proposed risk reduction measures, the City of Glendale is currently in the process of designing and permitting a proposed alternative Grayson Repowering Project (the “Alternative Repowering Project”). The proposed Alternative Repowering Project will replace the aging boilers 3, 4, 5, steam turbines 1 and 2, and gas turbines 8A, 8B, and 8C with five natural gas-fired internal combustion engines, with a combined capacity of 93 MW. The Alternative Repowering Project will also include the installation of a 50 MW battery energy storage system that will be scaled up to a 75 MW battery energy storage system in the future. Under SCAQMD Rule 1401, which is more stringent than Rule 1402, the Alternative Repowering Project is also required to meet the health risk values below the action levels.

SECTION 2.0

INTRODUCTION

2.1 Project Summary

On November 5, 2018, Glendale Water & Power (GWP) submitted a Health Risk Assessment (HRA) report based on a Rule 1402 Air Toxic Inventory Report for the year 2015. The HRA was approved by South Coast Air Quality Management District (SCAQMD) on January 22, 2019. Based on the information in the approved HRA, the maximum individual cancer risk (MICR) is above the action risk level of 25 in one million (25×10^{-6}) for cancer. Based upon the results of the HRA, GWP must prepare a Risk Reduction Plan (RRP). Once implemented, the RRP must reduce cancer risk attributed to a level below 25 in one million (25×10^{-6}).

In accordance with the SCAQMD Notice to Prepare an RRP dated June 18, 2019, GWP must submit the RRP no later than October 9, 2019. The RRP must identify the risk reduction measures and an implementation schedule to reduce the facility-wide emissions below the action risk level. This RRP has been prepared with assistance from Montrose Environmental Solutions (Montrose) in accordance with SCAQMD AB2588 and Rule 1402 Supplemental Guidelines, dated September 2018.

2.2 Facility Information

The GWP facility, Grayson Power Plant, is located at 800 Air Way in the City of Glendale and operates under SCAQMD Facility ID # 800327. The Standard Industrial Code (SIC) codes for the facility are 4923 and 4931; the North American Industry Classification System (NAICS) codes for the facility are 221210, 221112, and 221118.

The Grayson Power Plant is a municipal facility that generates electricity for customers residing within the City of Glendale. The total permitted power generation capacity of the plant is 248 megawatts (MW). The plant includes three dual-fuel (natural gas and landfill gas) boilers (Boilers 3, 4 and 5), two steam turbines (Unit 1 and 2), three combined cycle turbines (Turbines 8A, 8B and 8C), and one simple cycle turbine (Turbine 9) as its power generating equipment. The facility also includes one diesel emergency generator.

The Grayson Power Plant is located in an industrial area of the City of Glendale, northeast of the Interstate 5 and Highway 134 interchange. The facility is bounded to the south by Verdugo Wash and Highway 134, to the west by the Los Angeles River and Interstate 5, to the north by commercial properties, and to the east of a mixture of residential and commercial properties. The approximate latitude and longitude coordinates of the facility are 34°19'19" N and 118°16'42" W. Facility diagrams and area map are included in Appendix B.

2.3 Technical Project Contacts

For the purposes of this submittal, Montrose will be the primary contact for technical issues related to air quality.

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SECTION 3.0

FACILITY RISK CHARACTERIZATION

GWP submitted an HRA report on July 18, 2018 and an update to the report on November 5, 2018. The HRA report (2015 Approved HRA) was approved by SCAQMD on January 22, 2019. The 2015 Approved HRA indicates a maximum individual cancer risk (MICR) values of 179 in one million (179×10^{-6}) for residential receptor and 6.39 in one million (6.39×10^{-6}) for worker receptor, maximum chronic hazard index (HIC) values of 1.69 on residential receptor and 0.73 on worker receptor, maximum acute hazard index (HIA) values of 0.8 on the point maximum impact, and a cancer burden of 4.97.

SECTION 4.0

RISK REDUCTION MEASURES

4.1 Emission Sources with Modeled High Health Risks

Boilers 3, 4 and 5 have the ability to combust both natural gas and landfill gas. Based on the 2015 Approved HRA, landfill gas emissions from Boilers 3, 4 and 5 are the primary cause of risks that exceed the SCAQMD Rule 1402 action level. Table 4-1 shows the MICR values for a residential receptor and the degree to which risk is attributed to the combustion of landfill gas.

**TABLE 4-1
MICR VALUES FOR RESIDENTIAL RECEPTOR**

Emission Source	2015 Approved HRA
Boiler 3 (Landfill Gas)	47.4 x 10 ⁻⁶
Boiler 4 (Landfill Gas)	33.7 x 10 ⁻⁶
Boiler 5 (Landfill Gas)	97.3 x 10 ⁻⁶
Total Landfill Gas	178.4 x 10 ⁻⁶
Facility Wide Cancer Risk	186 x 10 ⁻⁶
% of Facility-wide Cancer Risk attributed to landfill gas combustion	95.92%

4.2 Risk Reduction Measures

GWP is currently in the process of developing the proposed Alternative Repowering Project at the Grayson Power Plant. The Alternative Repowering Project, consists of replacing Steam Turbines 1 and 2, Boilers 3, 4 and 5, and Gas Turbines 8A, 8B, and 8C with new electric generating systems that meet best available control technology standards. Pursuant to new source review regulations, the Alternative Repowering Project is required to meet the health risk values below action levels of SCAQMD Rule 1401.

However, since the timing of the Alternative Repowering Project has not been formally approved by the City of Glendale and may not meet the required RRP implementation schedule pursuant to Rule 1402, GWP is proposing an RRP to include the following two consecutive measures:

1. Discontinued combustion of landfill gas in Boilers 3, 4 and 5.

2. If a Grayson Repowering Project is not adopted and implemented, GWP will further reduce facility utilization of combustion systems to meet SCQMD Rule 1135 low-use restrictions by January 1, 2024. Boilers 3 and 4 would be utilized up to 2.5% of annual capacity in any single calendar year and 1.0% of annual capacity averaged over three consecutive calendar years on a rolling basis. Gas Turbines 8A, 8B and 8C would be utilized up to 25% of annual capacity in any single calendar year and 10% of annual capacity averaged over three consecutive calendar years on a rolling basis.

4.3 Implementation Schedule

Pursuant to SCAQMD Rule 1402(f), GWP would implement the RRP in according to the deadlines that are reflected in Table 4-2.

**TABLE 4-2
RRP IMPLEMENTATION SCHEDULE**

Risk Reduction Measures	Deadlines
Cessation of landfill combustion at the power plant	Currently implemented
Permit Application Submittal	180 days from RRP approval
Reduce utilization in Boilers 3, 4 and 5 and Gas turbines 8A, 8B and 8C	January 1, 2024

SECTION 5.0

RESIDUAL HEALTH RISK ASSESSMENT

For the risk reduction measures, GWP has discontinued burning landfill gas in Boilers 3, 4 and 5. Additionally, the facility will reduce the utilization of boilers to 1% and Gas Turbines 8A, 8B, and 8C to 10% by January 1st, 2024 to demonstrate compliance with SCAQMD Rule 1135. For the purpose of this RRP, the health risk assessment is based only upon the first phase of the RRP (discontinued use of landfill gas in Boilers 3, 4 and 5). Maximum fuel consumption as allowed by existing permit conditions and the current SCAQMD Rule 1135 provisions are reflected in the risk assessment. Additional future risk reductions that would be achieved through the second stage of the RRP (compliance with SCAQMD Rule 1135 utilization thresholds effective on January 1, 2024) are not reflected in the residual risk assessment.

5.1 Emission Inventory

TAC emissions of each combustion source were calculated using the parameters summarized in Table 5-1.

**TABLE 5-1
EMISSION INVENTORY PARAMETERS**

Emission Source	Annual Fuel Rate	TAC Emission Factors
Boiler 3 ¹	379.29 mmcf	SCAQMD AB2588 Reporting Guideline
Boiler 4 ¹	708.10 mmcf	SCAQMD AB2588 Reporting Guideline
Boiler 5 ¹	948.73 mmcf	SCAQMD AB2588 Reporting Guideline. Ammonia emission was calculated based on the permitted limit of 10 ppmv @ 3% O ₂ .
Gas Turbine 8A ²	1046.33 mmcf	SCAQMD AB2588 Reporting Guideline. Ammonia emission was calculated based on the permitted limit of 5 ppmv @ 3% O ₂ . Each organic TAC is controlled by oxidation catalyst with a control efficiency of 97.7% in accordance with Rule 1401 risk calculator
Gas Turbine 8B ²	1046.33 mmcf	
Gas Turbine 8C ²	1046.33 mmcf	
Gas Turbine 9 ³	4005.06 mmcf	
Diesel-fired Emergency ICE ⁴	470 gallons	Diesel PM emission rate based on equipment specification.

Note:

1. Annual fuel rates of Boilers 3, 4 and 5 were estimated based on SCAQMD Rule 1135 annual NO_x emission limits and an allocation of natural gas consumption based on the historical three years

- reporting data. Natural gas is substituted for historic landfill gas input (MMBtu).
2. Annual fuel rates of Gas Turbines 8A, 8B, and 8C were estimated based on the combined permitted daily limit of 8.6 mmcf for the three turbines (permit condition C1.3).
 3. Annual fuel rate of Gas Turbine 9 was based on the rated capacity of the turbine.
 4. Annual diesel usage of the emergency engine was based on the permitted testing and maintenance hours of 20 hours and fuel consumption rate of 23.5 gallons per hour.

Based on the parameters in the above table, the facility-wide TAC emissions are summarized in Table 5-2. Detailed emission inventories of each emission source are included in Appendix C.

**TABLE 5-2
FACILITY WIDE EMISSION INVENTORY**

Toxic Air Contaminants	CAS	Annual Emission, lbs./year	Hourly Emission, lbs./hour
Ammonia	7664417	5.87E+04	6.70E+00
Acetaldehyde	75070	8.54E+00	9.74E-04
Acrolein	107028	2.70E+00	3.08E-04
Benzene	71432	5.47E+00	6.24E-04
Butadiene, 1,3-	106990	7.21E-02	8.23E-06
Diesel PM	9901	6.46E+00	3.08E-01
Ethylbenzene	100414	9.43E+00	1.08E-03
Formaldehyde	50000	1.26E+02	1.44E-02
Hexane, n-	110543	2.65E+00	3.02E-04
Naphthalene	91203	8.29E-01	9.47E-05
PAH (excluding Naphthalene)	1151	3.54E-01	4.05E-05
Propylene oxide	75569	4.86E+00	5.55E-04
Toluene	108883	3.77E+01	4.31E-03
Xylenes	1330207	2.25E+01	2.57E-03

5.2 Residual Health Risk Assessment

The residual HRA was prepared in accordance with SCAQMD AB2588 and Rule 1402 Supplemental Guidelines dated September 2018 and the Office Environmental Health Hazard

Assessment (OEHHA) Guideline dated February 2015. Two software programs, AERMOD (Version 18081) and HARP2 were used to estimate and analyze cancer and non-cancer health impacts for individual receptors surrounding the facility.

Appendix D contains detailed results of multi-pathway cancer risks and non-cancer (chronic and acute) risks at the PMI, MEIR, MEIW, and any sensitive receptors. The results are grouped based on the contributions by substances. Appendix D also contains isopleth maps showing the locations of the PMI, MEIR, MEIW, and sensitive receptors for the cancer and non-cancer (chronic and acute risks).

5.2.1 Cancer Risk

Table 5-3 shows the cancer risks at the point of maximum impact (PMI), the maximum exposed individual resident (MEIR), and the maximum exposed individual worker (MEIW). Diesel PM emissions account for approximately 91% of cancer risk.

**TABLE 5-3
MAXIMUM INDIVIDUAL CANCER RISK (MICR)**

Type of Receptor	Result	Receptor ID#	Location (UTME, UTMN)
PMI	2.67 x 10 ⁻⁶	81	382130, 3780363
MEIR	0.99 x 10 ⁻⁶	30	382130, 3780507
MEIW	0.11 x 10 ⁻⁶	1256	382160, 3780340

5.2.2 Non-Cancer Chronic Hazard Index

Table 5-4 shows the non-cancer chronic hazard indices (HIC) at the PMI, MEIR, and MEIW. Ammonia and diesel PM emissions contribute approximately 92% of the facility HIC. The primary target organ impacted from chronic exposure is the respiratory system.

**TABLE 5-4
MAXIMUM CHRONIC HAZARD INDEX**

Type of Receptor	Result	Receptor ID#	Location (UTME, UTMN)
PMI	1.63E-03	81	382130, 3780363
MEIR	1.28E-03	28	382155, 3780477
MEIW	1.46E-03	1444	382140, 3780440

5.2.3 Non-Cancer 8-Hour Chronic Hazard Index

The non-cancer 8-hour chronic hazard index (HIC-8) at PMI is 6.73E-05, which is located at receptor #28 with UTM coordinates of 382155 E and 3780477 N. Acrolein and formaldehyde emissions contribute approximately 99% of the HIC-8. The primary target organ impacted from

8-hour chronic exposure is the respiratory system.

5.2.4 Non-Cancer Acute Hazard Index

Table 5-5 shows the non-cancer acute hazard index (HIA) at the PMI, MEIR, and MEIW. Ammonia and acrolein emissions contribute approximately 94% of the overall HIA. The primary target organ impacted from acute exposure is the eye.

**TABLE 5-5
MAXIMUM ACUTE HAZARD INDEX**

Type of Receptor	Result	Receptor ID#	Location (UTME, UTMN)
PMI	1.46E-03	95	382275, 3780141
MEIR	1.10E-03	19	382251, 3780353
MEIW	1.19E-03	1227	382220, 3780340

5.2.5 Schools and Day Care Facilities

There are no sensitive receptors such as schools, daycares, or hospitals, within an exposure area with a cancer risk of one in one-million or greater.

5.2.6 Cancer Burden

The cancer risk at MEIR is below one in a million; therefore, cancer burden is not required to be analyzed.

SECTION 6.0

REFERENCES

1. Office of Environmental Health Hazard Assessment (OEHHA), Air Toxics Hot Spots Program – Risk Assessment Guidelines: Guidance Manual for Preparation of Health Risk Assessments, February 2015.
<https://oehha.ca.gov/media/downloads/crnrr/2015guidancemanual.pdf>
2. California Air Resource Board (CARB), Hotspots Analysis and Reporting Program (HARP), Version 19121 (ADMRT); Version 2.1.1 (EIM)
<https://www.arb.ca.gov/toxics/harp/harp.htm>
3. South Coast Air Quality Management District (SCAQMD), AB2588 & Rule 1402 Supplemental Guidelines: Supplemental Guideline (Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics “Hot Spots” Information and Assessment Act), dated September, 2018
<http://www.aqmd.gov/docs/default-source/planning/risk-assessment/ab-2588-supplemental-guidelines-201809.pdf>
4. Google Earth
<https://www.google.com/earth/>

APPENDIX A

HEALTH RISK ASSESSMENT SUMMARY FORM



South Coast Air Quality Management District

21865 Copley Drive, Diamond Bar, CA 91765-4182

(909) 396-2000 • www.aqmd.gov

HEALTH RISK ASSESSMENT SUMMARY FORM

(Required in Executive Summary of HRA)

Facility Name : GLENDALE CITY, GLENDALE WATER & POWER (GRAYSON POWER PLANT)
Facility Address: 800 AIR WAY, GLENDALE, CA 91201
Type of Business: MUNICIPAL POWER GENERATING PLANT
SCAQMD ID No.: 800327

A. Cancer Risk

(One in a million means one chance in a million of getting cancer from being constantly exposed to a certain level of a chemical over a period of time)

- 1. Inventory Reporting Year : 2015
- 2. Maximum Cancer Risk to Receptors : *(Offsite and residence = 30-year exposure, worker = 25-year exposure)*
a. Offsite 2.67 in a million Location: 382130 E ; 3780363 N
b. Residence 0.99 in a million Location: 382130 E ; 3780507 N
c. Worker 0.11 in a million Location: 382160 E ; 3780340 N
- 3. Substances Accounting for 90% of Cancer Risk: Diesel PM (91%)
Processes Accounting for 90% of Cancer Risk: DIESEL COMBUSTION IN THE EMERGENCY ENGINE
- 4. Cancer Burden for a 70-yr exposure: *(Cancer Burden = [cancer risk] x [# of people exposed to specific cancer risk])*
a. Cancer Burden Not Analyzed (MEIR < 1 in a million)
b. Number of people exposed to >1 per million cancer risk for a 70-yr exposure _____
c. Maximum distance to edge of 70-year, 1 x 10⁻⁶ cancer risk isopleth (meters) _____

B. Hazard Indices

*[Long Term Effects (chronic) and Short Term Effects (acute)]
(non-carcinogenic impacts are estimated by comparing calculated concentration to identified Reference Exposure Levels, and expressing this comparison in terms of a "Hazard Index")*

- 1. Maximum Chronic Hazard Indices: 382155 E
a. Residence HI: 0.00128 Location: 3780477 N toxicological endpoint: RESPIRATORY SYSTEM
b. Worker HI : 0.00146 Location: 382140 E; 3780440 N toxicological endpoint: RESPIRATORY SYSTEM
- 2. Substances Accounting for 90% of Chronic Hazard Index: AMMONIA (71%), DIESEL PM (21%)
- 3. Maximum 8-hour Chronic Hazard Index: 382155 E
8-Hour Chronic HI: 6.73E-05 Location: 3780477N toxicological endpoint: RESPIRATORY SYSTEM
- 4. Substances Accounting for 90% of 8-hour Chronic Hazard Index: MANGANESE (98%)
- 5. Maximum Acute Hazard Index: 382275 E
PMI: 0.00146 Location: 3780141 N toxicological endpoint: EYE
- 6. Substances Accounting for 90% of Acute Hazard Index: AMMONIA (76%); ACROLEIN (18%)

C. Public Notification and Risk Reduction

THE HRA RESULTS PROVIDED IN THIS FORM IS EXPECTED HEALTH RISKS FROM THE RISK REDUCTION ACTIONS.

- 1. Public Notification Required? Yes No
a. If 'Yes', estimated population exposed to risks > 10 in a million for a 30-year exposure, or an HI >1 _____
- 2. Risk Reduction Required? Yes No

APPENDIX B

FACILITY MAPS AND DIAGRAMS

**GLENDALE CITY, GLENDALE WATER & POWER
800 AIR WAY, GLENDALE, CA 91201**

AREA MAP

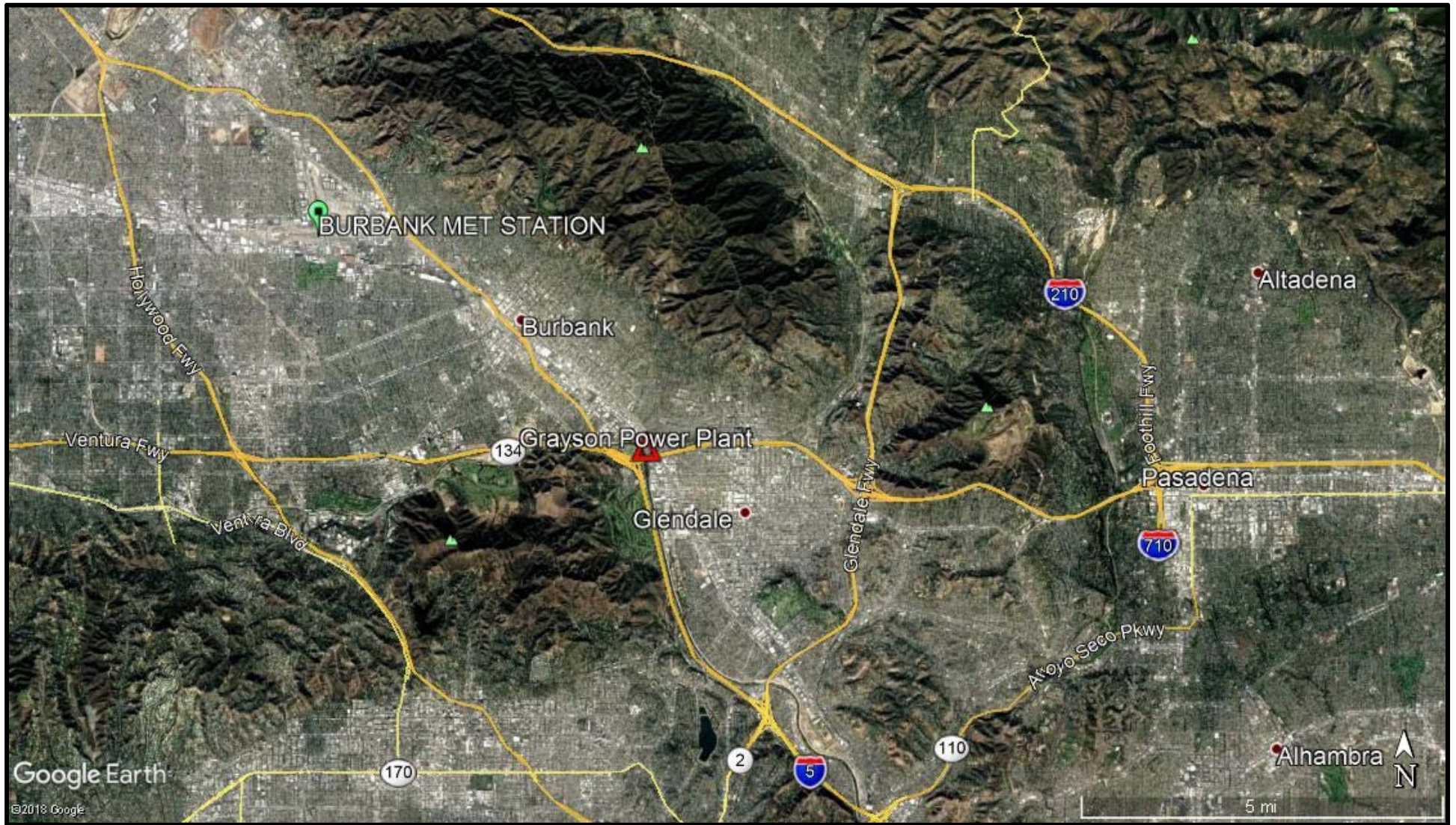


Image courtesy of Google ©2018 (www.google.com)

**GLENDALE CITY, GLENDALE WATER & POWER
800 AIR WAY, GLENDALE, CA 91201**

SITE MAP

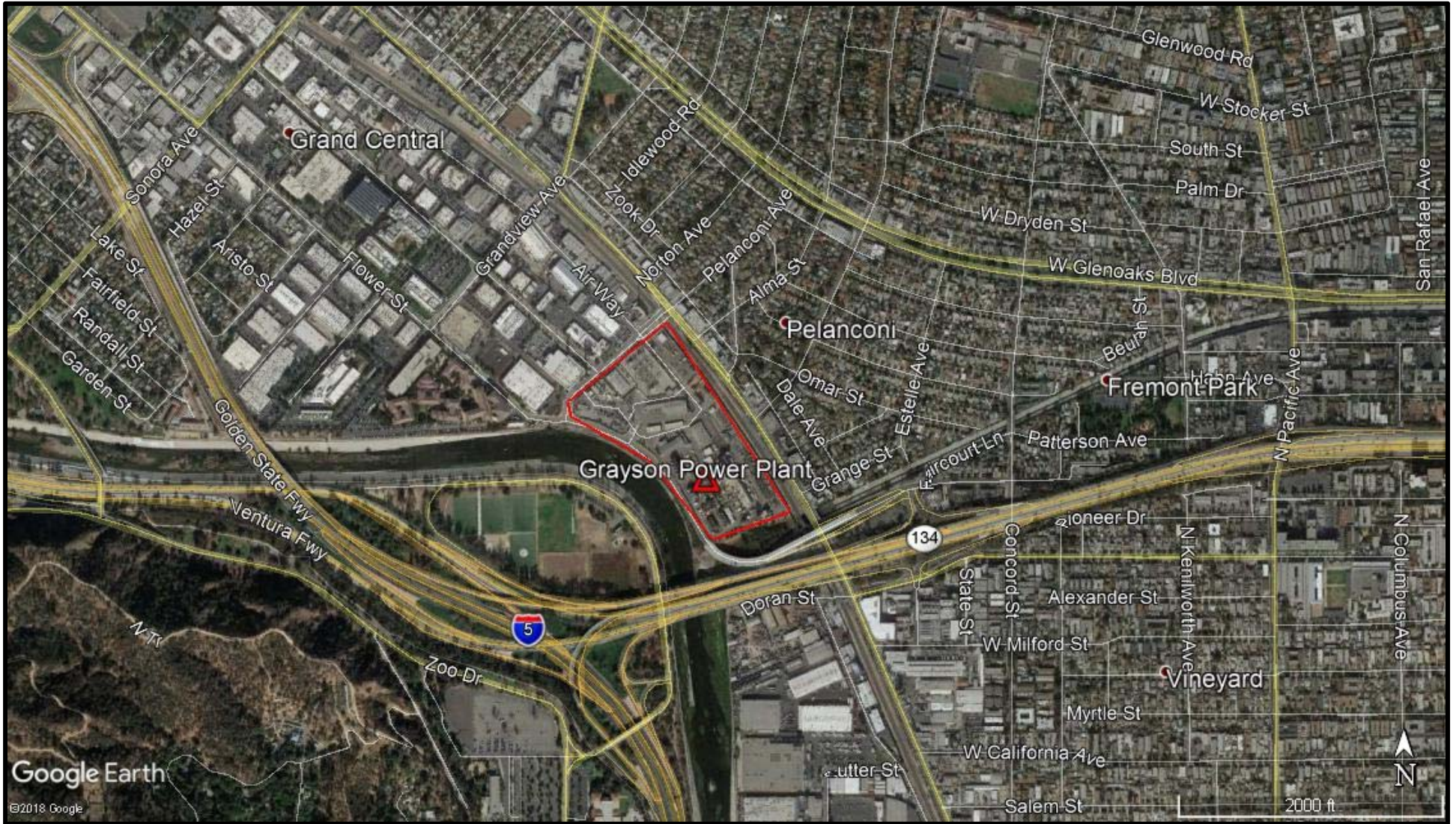


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**GLENDALE CITY, GLENDALE WATER & POWER
800 AIR WAY, GLENDALE, CA 91201**

FACILITY MAP



SOURCE DESCRIPTION	
S0001	D1-Unit 4 Boiler (NG)
S0002	D2-Unit 3 Boiler (NG)
S0003	D3-Unit 5 Boiler (NG)
S0004	C51- SCR (Connected to D4 and C52) / Gas Turbine 8A
S0005	C53- SCR (Connected to D5, D6 and C54) / Gas Turbine 8BC
S0006	C61- SCR (connected to C60) / Gas Turbine 9
S0007	D12-Emergency ICE
S0028	Unit 8A-Ammonia Injection Line
S0029	Unit 8BC-Ammonia Injection Line
S0030	Unit 9-Ammonia Injection Line
S0031	D1-Unit 4 Boiler (LG)
S0032	D2-Unit 3 Boiler (LG)
S0033	D3-Unit 5 Boiler (LG)

APPENDIX C

EMISSION RATE AND SOURCE INFORMATION

**GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
FACILITY WIDE EMISSION INVENTORY**

Compound	CAS	Boilers		Turbines		Engine		Facility Wide	
		Annual	Hourly	Annual	Hourly	Annual	Hourly	Annual	Hourly
Ammonia	7664417	7.92E+03	9.04E-01	5.08E+04	5.79E+00	0	0	5.87E+04	6.70E+00
Acetaldehyde	75070	1.83E+00	2.09E-04	6.70E+00	7.65E-04	0	0	8.54E+00	9.74E-04
Acrolein	107028	1.63E+00	1.86E-04	1.07E+00	1.22E-04	0	0	2.70E+00	3.08E-04
Benzene	71432	3.46E+00	3.95E-04	2.00E+00	2.29E-04	0	0	5.47E+00	6.24E-04
Butadiene, 1,3-	106990	0	0	7.21E-02	8.23E-06	0	0	7.21E-02	8.23E-06
Diesel PM	9901	0	0	0	0	6.15E+00	3.08E-01	6.15E+00	3.08E-01
Ethylbenzene	100414	4.07E+00	4.65E-04	5.36E+00	6.11E-04	0	0	9.43E+00	1.08E-03
Formaldehyde	50000	7.33E+00	8.37E-04	1.19E+02	1.36E-02	0	0	1.26E+02	1.44E-02
Hexane, n-	110543	2.65E+00	3.02E-04	0	0	0	0	2.65E+00	3.02E-04
Naphthalene	91203	6.11E-01	6.97E-05	2.19E-01	2.49E-05	0	0	8.29E-01	9.47E-05
PAH (excluding Naphthalene)	1151	2.04E-01	2.32E-05	1.51E-01	1.72E-05	0	0	3.54E-01	4.05E-05
Propylene oxide	75569	0	0	4.86E+00	5.55E-04	0	0	4.86E+00	5.55E-04
Toluene	108883	1.59E+01	1.81E-03	2.19E+01	2.49E-03	0	0	3.77E+01	4.31E-03
Xylenes	1330207	1.18E+01	1.35E-03	1.07E+01	1.22E-03	0	0	2.25E+01	2.57E-03

**GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
BOILER EMISSION INVENTORY**

Natural Gas Consumption Estimation for Boiler

Unit	Heat Input, MMBtu/Hr	Rated Power, MW	Rule 1135 Limit NOX, lbs/year	Emission Factor NOX-lbs/mmcf	Allowed Maximum Fuel Usage, mmcf/year
Boiler 3	260	20	14227.09	37.51	379.29
Boiler 4	492	44	26922.02	38.02	708.1
Boiler 5	527.25	44	28850.89	30.41	948.73

Note:

1. The natural gas consumption in the boilers is based on Rule 1135 NOX limit of 35 tons per year from the combined total of three boilers.
2. Emission factor of lbs of NOX per natural gas consumption in mmcf of each boiler is based on the historical three years reported data.

Boiler Emissions Inventory

Compound	CAS	Emission Factor, lbs/mmcf	ANNUAL EMISSIONS, LBS/YEAR			HOURLY EMISSIONS, LBS/HOUR		
			Boiler 3	Boiler 4	Boiler 5	Boiler 3	Boiler 4	Boiler 5
Ammonia	7664417	Varies	1.21E+03	2.27E+03	4.44E+03	1.39E-01	2.59E-01	5.07E-01
Acetaldehyde	75070	9.00E-04	3.41E-01	6.37E-01	8.54E-01	3.90E-05	7.28E-05	9.75E-05
Acrolein	107028	8.00E-04	3.03E-01	5.66E-01	7.59E-01	3.46E-05	6.47E-05	8.66E-05
Benzene	71432	1.70E-03	6.45E-01	1.20E+00	1.61E+00	7.36E-05	1.37E-04	1.84E-04
Ethylbenzene	100414	2.00E-03	7.59E-01	1.42E+00	1.90E+00	8.66E-05	1.62E-04	2.17E-04
Formaldehyde	50000	3.60E-03	1.37E+00	2.55E+00	3.42E+00	1.56E-04	2.91E-04	3.90E-04
Hexane, n-	110543	1.30E-03	4.93E-01	9.21E-01	1.23E+00	5.63E-05	1.05E-04	1.41E-04
Naphthalene	91203	3.00E-04	1.14E-01	2.12E-01	2.85E-01	1.30E-05	2.43E-05	3.25E-05
PAH (excluding Naphthalene)	1151	1.00E-04	3.79E-02	7.08E-02	9.49E-02	4.33E-06	8.08E-06	1.08E-05
Toluene	108883	7.80E-03	2.96E+00	5.52E+00	7.40E+00	3.38E-04	6.31E-04	8.45E-04
Xylenes	1330207	5.80E-03	2.20E+00	4.11E+00	5.50E+00	2.51E-04	4.69E-04	6.28E-04

Note:

1. Emission factor is based on default emission factor per SCAQMD AB2588 Facilities Reporting Guideline.
2. Ammonia emission factor for Boiler 5 is based on permit limit of 10 ppmv NH₃ @ 3% O₂.

**GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
GAS TURBINE EMISSION INVENTORY**

Natural Gas Consumption Estimation for Gas Turbines

Unit	Heat Input, MMBtu/Hr	Rated Power, MW	Annual Fuel Usage, mmcf/year
Gas Turbine 8A	350	30	1046.33
Gas Turbine 8B	350	30	1046.33
Gas Turbine 8C	350	30	1046.33
Gas Turbine 9	470	49.6	4005.06

Note:

1. Gas turbine 8ABC annual usage is based on the daily fuel usage limit of 8.6 mmcf for combined usges in three turbines (permit condition C1.3).
2. Gas turbine 9 annual usage is based on the rated heat input and operating hours of 8,760 hours per year

Compound	CAS	Emission Factor, lbs/mmcf	ANNUAL EMISSIONS, LBS/YEAR				HOURLY EMISSIONS, LBS/YEAR			
			Turbine 8A	Turbine 8B	Turbine 8C	Turbine 9	Turbine 8A (5 ppm NH3 limit)	Turbine 8B (5 ppm NH3 limit)	Turbine 8C (5 ppm NH3 limit)	Turbine 9 (5 ppm NH3 limit)
Ammonia	7664417	7.104	7.43E+03	7.43E+03	7.43E+03	2.85E+04	8.49E-01	8.49E-01	8.49E-01	3.25E+00
Acetaldehyde	75070	4.08E-02	9.82E-01	9.82E-01	9.82E-01	3.76E+00	1.12E-04	1.12E-04	1.12E-04	4.29E-04
Acrolein	107028	6.53E-03	1.57E-01	1.57E-01	1.57E-01	6.02E-01	1.79E-05	1.79E-05	1.79E-05	6.87E-05
Benzene	71432	1.22E-02	2.94E-01	2.94E-01	2.94E-01	1.12E+00	3.35E-05	3.35E-05	3.35E-05	1.28E-04
Butadiene, 1,3-	106990	4.39E-04	1.06E-02	1.06E-02	1.06E-02	4.04E-02	1.21E-06	1.21E-06	1.21E-06	4.62E-06
Ethylbenzene	100414	3.26E-02	7.85E-01	7.85E-01	7.85E-01	3.00E+00	8.96E-05	8.96E-05	8.96E-05	3.43E-04
Formaldehyde	50000	7.24E-01	1.74E+01	1.74E+01	1.74E+01	6.67E+01	1.99E-03	1.99E-03	1.99E-03	7.61E-03
Naphthalene	91203	1.33E-03	3.20E-02	3.20E-02	3.20E-02	1.23E-01	3.65E-06	3.65E-06	3.65E-06	1.40E-05
PAH (excluding Naphthalene)	1151	9.18E-04	2.21E-02	2.21E-02	2.21E-02	8.46E-02	2.52E-06	2.52E-06	2.52E-06	9.65E-06
Propylene oxide	75569	2.96E-02	7.12E-01	7.12E-01	7.12E-01	2.73E+00	8.13E-05	8.13E-05	8.13E-05	3.11E-04
Toluene	108883	1.33E-01	3.20E+00	3.20E+00	3.20E+00	1.23E+01	3.65E-04	3.65E-04	3.65E-04	1.40E-03
Xylenes	1330207	6.53E-02	1.57E+00	1.57E+00	1.57E+00	6.02E+00	1.79E-04	1.79E-04	1.79E-04	6.87E-04

Note:

1. Emission factor is based on default emission factor per SCAQMD AB2588 Facilities Reporting Guideline
2. Ammonia emission factor for turbines is based on permit limit of 5 ppmv NH3 @ 15% O2
3. Each turbine is equipped with oxidation catalyst. The control efficiency of oxidation catalyst is 97.7% per Rule 1401 calculator

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
DIESEL-FIRED ENGINE EMISSION INVENTORY

Diesel Engine

Engine Rating:	465	bhp
Max. diesel consumption for T&M:	470	gallons/year
Max. operating hour for T&M:	20	hour/year

Compound	CAS	Emission Factor, lbs/hr	Annual Emissions	Max. Hourly Emissions
Diesel PM	9901	0.3075	6.15E+00	3.08E-01

Note:

1. Diesel PM emission factor is based on 0.30 g/bhp-hr PM emission rate from the equipment specification.

APPENDIX D

HRA RESULTS

**GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201**

CANCER RISK BY SUBSTANCE

TAC	CAS	PMI (REC #81)	MEIR (REC #30)	MEIW (REC #1256)
PAHs-w/o	1151	2.19E-07	1.63E-07	5.78E-09
Formaldehyde	50000	4.71E-09	4.37E-09	3.94E-10
Benzene	71432	4.06E-09	3.00E-09	3.75E-10
Acetaldehyde	75070	2.83E-10	2.30E-10	2.52E-11
Naphthalene	91203	8.42E-10	6.17E-10	7.81E-11
Ethyl Benzene	100414	4.48E-10	3.41E-10	4.09E-11
Acrolein	107028	0.00E+00	0.00E+00	0.00E+00
Toluene	108883	0.00E+00	0.00E+00	0.00E+00
Hexane	110543	0.00E+00	0.00E+00	0.00E+00
Xylenes	1330207	0.00E+00	0.00E+00	0.00E+00
NH3	7664417	0.00E+00	0.00E+00	0.00E+00
Propylene Oxide	75569	7.63E-11	7.96E-11	5.95E-12
1,3-Butadiene	106990	5.23E-11	5.45E-11	4.07E-12
DieselExhPM	9901	2.44E-06	8.18E-07	1.03E-07

**GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201**

NON-CANCER CHRONIC RISK BY SUBSTANCE

TAC	CAS	PMI (REC #81) (RESPIRATORY SYSTEM)	MEIR (REC #28) (RESPIRATORY SYSTEM)	MEIW (REC #1444) (RESPIRATORY SYSTEM)
PAHs-w/o	1151	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	50000	3.69E-05	3.48E-05	3.63E-05
Benzene	71432	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	75070	2.99E-07	2.55E-07	2.76E-07
Naphthalene	91203	1.15E-06	9.11E-07	1.01E-06
Ethyl Benzene	100414	0.00E+00	0.00E+00	0.00E+00
Acrolein	107028	8.13E-05	6.49E-05	7.20E-05
Toluene	108883	9.94E-07	8.09E-07	8.91E-07
Hexane	110543	0.00E+00	0.00E+00	0.00E+00
Xylenes	1330207	3.03E-07	2.43E-07	2.69E-07
NH3	7664417	1.09E-03	9.75E-04	1.04E-03
Propylene Oxide	75569	2.89E-07	2.99E-07	3.03E-07
1,3-Butadiene	106990	0.00E+00	0.00E+00	0.00E+00
DieselExhPM	9901	6.56E-04	2.04E-04	3.09E-04

**GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201**

NON-CANCER ACUTE RISK BY SUBSTANCE

TAC	CAS	PMI (REC #95) (EYE)	MEIR (REC #19) (EYE)	MEIW (REC #1227) (EYE)
PAHs-w/o	1151	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	50000	8.41E-05	7.33E-05	7.79E-05
Benzene	71432	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	75070	1.72E-06	1.14E-06	1.23E-06
Naphthalene	91203	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	100414	0.00E+00	0.00E+00	0.00E+00
Acrolein	107028	2.59E-04	1.50E-04	1.64E-04
Toluene	108883	1.75E-07	1.05E-07	1.15E-07
Hexane	110543	0.00E+00	0.00E+00	0.00E+00
Xylenes	1330207	2.15E-07	1.26E-07	1.38E-07
NH3	7664417	1.12E-03	8.80E-04	9.47E-04
Propylene Oxide	75569	2.35E-08	3.22E-08	3.35E-08
1,3-Butadiene	106990	0.00E+00	0.00E+00	0.00E+00
DieselExhPM	9901	0.00E+00	0.00E+00	0.00E+00

APPENDIX E

DIGITAL FILES (AERMOD & HARP2)