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09-AFC-1	
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Dockets Unit
California Energy Commission
1516 Ninth Street, MS 4
Sacramento, CA 95814-5512

Re: Watson Cogeneration Steam and Electric Reliability Project
Application for Certification 09-AFC-1

On behalf of Watson Cogeneration Company, the applicant for the above-referenced Watson Cogeneration Steam and Electric Reliability Project, we are pleased to submit the following:

- Remainder of Responses to CEC Data Requests #1-39.

We have included 20 hard copies and 20 CDs. The CDs also include the Health Risk Assessment modeling files referenced in Data Response 12.

Please note that the Remainder of Responses to CEC Data Requests #1-39 submittal was also distributed by electronic mail to the recipients identified on the Proof of Service List as preferring electronic mail delivery. One hardcopy and one CD of the submittal were shipped today via Federal Express from Denver, Colorado to each of the other recipients identified on the Proof of Service List.

Sincerely,
URS Corporation

Cindy Kyle-Fischer
Project Manager

Enclosures

cc: Ross Metersky, BP Products North America, Inc.

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REMAINDER OF RESPONSES TO CEC DATA REQUESTS #1-39 APPLICATION FOR CERTIFICATION 09-AFC-1

for Watson Cogeneration Steam and Electric Reliability Project

Submitted to:
California Energy Commission
1516 9th Street , MS 15
Sacramento, CA 95814-5504

Submitted by:
Watson Cogeneration Company
22850 South Wilmington Avenue
Carson, CA 90745

With support from:
URS Corporation
8181 East Tufts Avenue
Denver, CO 80237

October 2009

Response to Data Request Set 1 (Remainder of Responses)

Tables

Appendices

Responses Included in This Document

List of Acronyms and Abbreviations Used in Responses

AFC	Application for Certification
afy	acre-feet per year
Applicant	Watson Cogeneration Company
CAO	Cleanup and Abatement Order
CCR	Code of Regulations
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CRWRF	Carson Regional Water Recycling Facility
CTG	combustion gas turbine
CUP	Conditional Use Permit
District	South Coast Air Quality Management District
DOC	Determination of Compliance
DPH	Department of Public Health
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
ERC	Emission Reduction Credit
FDOC	Final Determination of Compliance
gpm	Gallons per minute
HARP	Hotspots Analysis and Reporting Program
HAZWOPER	Hazardous Waste Operations
HI	Hazard Index
HRA	Health Risk Assessment
HRSG	heat recovery steam generator

lb	Pound
LASCD	Los Angeles County Sanitation District
MEIR	Maximum Exposed Individual Resident
MIR	Maximum impact receptor
MMSCF	Million Standard Cubic Feet
MW	megawatt
NESHAPs	National Emissions Standards for Hazardous Air Pollutants
NO_x	Nitrogen oxides
OSHA	Occupational Safety and Health Administration
PICS	Pacific Industrial Contractor Screening
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of less than 10 microns
$PM_{2.5}$	particulate matter with an aerodynamic diameter of less than 2.5 microns
Project	Watson Cogeneration Steam and Electric Reliability Project
RO	Reverse Osmosis
RWQCB	Regional Water Quality Control Board
SCAQMD	South Coast Air Quality Management District
SRMACT	Site Remediation Maximum Achievable Control Technologies
STGs	Steam turbine generators
UTM E	Universal Transverse Mercator Easting
UTM N	Universal Transverse Mercator Northing
VOC	Volatile Organic Compounds
VOHAPS	Volatile Organic Hazardous Air Pollutants
Watson	Watson Cogeneration Facility
WBMWD	West Basin Municipal Water District

AIR QUALITY

Technical Area: Air Quality

Author: Steve Radis

BACKGROUND: $PM_{10}/PM_{2.5}$ OFFSET STRATEGY

The applicant has proposed to use the existing $PM_{10}/PM_{2.5}$ emission limit for the four existing turbine/HSRG units to cover the fifth unit proposed as part of this project. Under CEQA the baseline is normally defined as the conditions that exist at the time of the Notice of Preparation, or in this case, the Application for Certification (AFC). For air pollutant emissions, baseline conditions are typically defined as the average emissions over the preceding three year period. For CEQA impact analysis purposes, potential impacts of the proposed project would be based on the net emission increase of facility operations above this baseline. Should emissions associated with the proposed project result in increased emissions over the CEQA baseline, additional mitigation would be required.

It is unclear what, if any, PM_{10} emission offsets were utilized when the original four turbine/HSRG units were permitted. If PM_{10} offsets were utilized during the original project permitting in the 1980s, there may be little benefit in relation to the current CEQA baseline.

DATA REQUEST

7. ***Should the project result in an increase in PM10/PM2.5 emissions over the CEQA baseline, as defined above, please provide information on what additional measures would be needed to result in a zero increase in PM10/PM2.5 emissions and/or a net air quality benefit associated with the proposed project.***

RESPONSE

The Watson Cogeneration Steam and Electric Reliability Project (the Project) will not result in an increase in particulate matter with an aerodynamic diameter of less than 10 microns and less than 2.5 microns ($PM_{10}/PM_{2.5}$) above the properly formulated California Environmental Quality Act (CEQA) baseline. The baseline for the Project should be based on the level of emissions previously reviewed under CEQA, mitigated and approved in the certification granted for the Watson Cogeneration Facility in 1986, and later revised in a 1996 Environmental Impact Report (EIR) prepared by the South Coast Air Quality Management District (SCAQMD or District). Specifically, for $PM_{10}/PM_{2.5}$ during operations, the baseline should be 1,244 pounds/day (lb/day) for all turbines and duct burners combined.

CEQA Guidelines Section 15125 explains that the baseline for environmental review of a project normally consists of the physical environmental conditions in the vicinity of the project as they exist at commencement of environmental review. However, other provisions in CEQA, the CEQA Guidelines and reported cases make clear that there are a number of additional principles

that must be taken into account in establishing the CEQA baseline, depending upon the facts of the project.

Most appropriate here, where a project has previously undergone CEQA review, the baseline must include the environmental impacts associated with the project previously reviewed and approved. This baseline is based on CEQA's limitation on subsequent environmental review. When a CEQA environmental document has been prepared for a project, "no subsequent or supplemental environmental impact report shall be required" unless one of three circumstances occur: (a) substantial changes occur in the project which will require major revisions in the prior environmental document due to new or substantially more severe environmental impacts; (b) substantial changes occur with respect to the surrounding circumstances which will require major revisions in the prior environmental document due to new or substantially more severe environmental impacts; or (c) new information becomes available showing new or substantially more severe environmental impacts of the availability of additional feasible mitigation measures. (See Public Resources Code Section 21166; CEQA Guidelines, 14 Code of Regulations (C.C.R.) Section 15162.)

As a corollary principle, when additional CEQA review is triggered under Section 21166, the additional review must be limited to an examination of those impacts associated with the changes that triggered the additional review. Under these circumstances, Section 21166 precludes re-examination of impacts already evaluated, and the impacts previously evaluated are treated in the later CEQA document as part of the baseline.

So, for example, in *Benton v. Board of Supervisors* (1991) 226 Cal.App.3d 1467, the county prepared a negative declaration and issued a use permit for a winery project in 1986. In 1987, after commencing construction of the winery as originally approved, the owner applied for a new use permit to allow the winery project to be relocated to a different parcel of land. The county prepared a second negative declaration in which it estimated project impacts by comparing the winery project the owner was entitled to build under the 1986 approval to the new project proposal. The court found that the county properly defined the scope of the project for environmental review as the ***differences*** between the two proposals. As such, the previously reviewed and approved winery was treated as baseline in the second negative declaration.

Similarly, in *Temecula Band of Luiseno Mission Indians v. Rancho California Water District* (1996) 43 Cal.App.4th 425, a water district approved a groundwater basin storage project in 1984 based on a negative declaration. After the project was partially constructed, the water district proposed modifications consisting of a redesign and rerouting of one of the project pipelines. The water district prepared a new negative declaration to examine the impacts of the "new project", but limited its review to the impacts of the changes to the pipeline. Opponents countered that the second negative declaration should have considered the impacts on the groundwater table from the pumping approved as part of the initial project. The court disagreed with the challengers, finding that the water district properly limited environmental review in the second negative declaration to the incremental effects of the ***modifications*** compared with the project as approved in 1984.

While the projects discussed in *Benton* and *Temecula* might be characterized as mid-construction modifications to the original project reviewed by the prior CEQA document, other cases demonstrate that Section 21166 also limits environmental review of a later expansion that builds

on the foundation of an earlier CEQA-reviewed project. For example, in *Fairview Neighbors v. County of Ventura* (1999) 70 Cal.App.4th 238, an EIR had been prepared in 1976 for a use permit for a mining operation. In approximately 1991, the owner proposed to expand the boundaries of the site, increase the production rate, and obtain approval for an asphalt batch plant. The county prepared a draft EIR and a revised draft EIR for the project, and finally certified a final EIR in 1996. In the 1996 EIR, the county treated the previously approved mining operation as part of the baseline.

The *Fairview* case is particularly noteworthy because the mine was operating well below its permitted capacity in 1996, and thus was not utilizing the full complement of 810 truck trips per day that corresponded to the maximum production rate previously approved in the 1976 use permit. Nonetheless, the court approved of the county's decision to use 810 truck trips as the baseline for the expansion project, saying: "The EIR properly discussed the existing physical condition of the affected area as including the long-operating mine. . . . As in *Benton*, the mining project approved [by the 1976 Conditional Use Permit (CUP)] has already undergone environmental review. . . The instant EIR appropriately assumes the existing traffic impact level to be the traffic generated when the mine operates at full capacity pursuant to the entitlement previously permitted . . ." 70 Cal.App.4th at 242-43.

As applied to the Project, these authorities dictate a baseline that reflects the maximum emissions previously reviewed under CEQA and approved by the Commission, even if the equipment is not currently operating and emitting at that level. The Watson Cogeneration Facility was reviewed by the California Energy Commission (CEC) in 1986, including preparation of the equivalent of an environmental impact report.[1] The Project will "complete the original design of the Watson Cogeneration Facility. (AFC p. 1-1.) While the Project will add a nominal 85 megawatt (MW) combustion gas turbine (CTG) and a heat recovery steam generator (HRSG), the original plant design allocated plot space and included other provisions to accommodate the fifth train. Accordingly, the Project is the modification and expansion of the previously reviewed, previously approved project, and the baseline must be established using the principles and limitations found in Public Resources Code Section 21166. As shown in the 1986 Final Determination of Compliance (FDOC) supporting the Commission's analysis, the operating scenario that produced the maximum estimated emissions of particulate matter consisted in operation of four turbines and duct burners, resulting in emissions of 1,121 lb/day. (See FDOC, May 27, 1986, p. 38, Summary of All Cases Total Controlled Emissions, Case 6.) This level of emissions was accepted by the Commission in certifying the Watson Cogeneration Facility.

Moreover, if the full operation of the previously approved Watson Cogeneration Facility is not attributed to the baseline for the Project, Watson Cogeneration Company (Applicant) may be required to mitigate emissions that have already been mitigated through offsets. As noted in Response to Data Request. 6, the 1986 FDOC added fugitive emissions of 42 lb/day from cooling tower drift (FDOC p. 41) to the turbine/duct burner maximum emissions of 1,121 lb/day,

[1] The CEC is approved to use the environmental review conducted in its certification process as the functional equivalent of an EIR, pursuant to Public Resources Code Section 21080.5. (*See* 14 C.C.R. Section 15251 (j).) Generally, agencies with certified regulatory programs are excused only from Public Resources Code Sections 21100 to 21154 and 21167; all other procedural and substantive requirements apply. Thus, CEQA's principles regarding baseline apply to certified regulatory programs.

for a total maximum emissions of 1,163 lb/day. This total was multiplied by 1.1 to determine the emissions reductions needed to offset the new cogeneration unit, yielding an offset obligation of 1,279 lb/day (FDOC p. 48). The FDOC then describes the equipment that would be removed from service in order to offset the new emissions from the Cogeneration Power Plant, and provides a thorough accounting of the emissions increases and decreases. The emissions offset plan included retiring four boilers at ARCO's refinery (Boilers 31, 32, 33, and 42), in order to reduce emissions of all criteria pollutants. For $PM_{10}/PM_{2.5}$, shutdown of the four boilers provided offsets of 400 lb/day (FDOC p. 46). The applicant proposed an inter-pollutant trade using nitrogen oxides (NO_x) emission reduction credits (ERCs) at a ratio of 7.14:1 to offset the remainder (FDOC p. 47).

The Commission made the equipment retirements mandatory and enforceable through the conditions of approval. Condition 1-38 (Determination of Compliance [DOC] Condition 28) required ARCO to surrender the permits to operate for Boilers 31, 32, and 33 to the District for cancellation within 90 days after startup of the cogeneration system. Other conditions (e.g., 1-16, 1-21, 1-34, 1-36) limited the operating scenarios and the equipment that would be allowed to operate simultaneously, in order to ensure that the operating emissions remained consistent with the emissions estimates used to calculate the necessary offsets.

In 1996, the 1986 figure of 1,121 lb/day for the turbines and duct burners was increased to 1,244 lb/day in conjunction with the applicant's proposal to increase duct burner firing. The modifications were a part of ARCO's Clean Fuels Project, for which an EIR was prepared by the District acting as lead agency. Accordingly, prior CEQA review was completed not just once but twice. Based on the prior review, the baseline $PM_{10}/PM_{2.5}$ emissions should be 1,244 lb/day for all turbines and duct burners.

The District considered the incremental emissions increases associated with the additional duct firing to be exempt from the requirement to provide offsets, since the Clean Fuels Project was undertaken for the sole purpose of complying with updated state and federal motor vehicle fuels specifications. Even so, the additional duct firing is part of the baseline. Public Resource Code Section 21166 precludes subsequent CEQA review of impacts associated with a previously reviewed project regardless whether the impacts were originally determined to be less than significant without mitigation, less than significant following mitigation, or significant and unavoidable.

In sum, the baseline described in the preface to Data Requests 5 through 7 is not the appropriate baseline for this project. The preface states that for air quality, the baseline is typically defined as the average emissions over the preceding three year period. The concept of a baseline based on a 3-year operating average is not found in CEQA Guidelines, and it is not appropriate here, where there was prior CEQA review. The baseline for the turbines and duct burners is appropriately set at 1,244 lb/day, based on the prior CEQA review.

The Project will not result in an increase in $PM_{10}/PM_{2.5}$ emissions above the baseline. The Project proposed to accept an emissions cap of 1,244 lb/day for the turbines and duct burners in all five trains of the cogeneration facility, combined. This is the same as the level of emissions that previously underwent CEQA review, and thus is the same as the baseline.

PUBLIC HEALTH

Technical Area: Public Health

Author Dr. Alvin Greenberg

BACKGROUND

The AFC does not discuss existing health concerns and the applicant's Data Adequacy sheet stated that no studies were identified. Although that may be true for the city of Carson, staff doubts that there are no health studies for the Los Angeles Basin area which includes the cities of Carson, Torrance, Lomita, and Long Beach. Staff needs these studies in order to access the potential incremental and cumulative impacts on public health.

Also, the AFC does not contain a cumulative human health risk assessment. The AFC states that the project impacts are too little to contribute to any cumulative impact. While this may ultimately prove to be true, staff has found that cumulative impacts are possible when sources are very close to one another, say within a few blocks. Given the proximity of the BP Carson refinery and other large industrial emission sources in the Carson/Wilmington area, this project meets that criteria and thus staff needs to have a quantitative cumulative health risk assessment conducted to ensure that cumulative impacts on public health are indeed less than significant.

DATA REQUEST

12. Please provide a cumulative health risk assessment for the combined emissions from the project expansion and the existing Watson power plant and refinery.

RESPONSE

In September 2009, a comprehensive health risk assessment (HRA) was performed by AECOM Inc. for the BP Carson Refinery (also referred to as the BP Refinery and Refinery) site, including the Watson Cogeneration Facility (AECOM, 2009). The analysis performed was an updated HRA pursuant to AB2588 and was submitted to SCAQMD for review. A copy of the September 2009 HRA report and the (Hotspots Analysis and Reporting Program (HARP) input/output files are included in Appendix A. Please note that the updated HRA has not yet been reviewed by SCAQMD and should be considered a draft copy. Any changes that are made to the submittal will be submitted to the CEC.

Table 1-5 in the AB2588 HRA presents a list of the sources included in the analysis, including Flue Gas Cogeneration sources 91, 92, 93, and 94. The HRA performed for the Project indicated that the Maximum Impact Receptor (MIR) health risk values were on the order of:

- 7.00×10^{-7} Cancer Risk (Receptor 9889)
- 0.0297 Chronic Health Index (HI) (Receptor 9889)

- 0.0030 Acute HI (Receptor 1053)

Note: The above-noted HRA values are based on the revised HRA as presented in the AFC. The revised HRA incorporates revised emissions factors for chromium and hexavalent chromium (chromium VI) as derived from the unit source test results dated March 2007 (Report #R145436). These revised factors apply to the combustion of refinery gas only. The revised factor for chromium is 1.04×10^{-4} lbs/million standard cubic feet (mmscf) for refinery gas (turbine and duct burners). The revised factor for chromium VI is 1.47×10^{-4} lbs/mmscf (turbine and duct burners) versus the previous factors of 2.04×10^{-3} lbs/mmscf for the turbine, and 7.70×10^{-3} for the HRSG duct burners.

Table 12-1, presents a summary of the refinery-wide AB2588 HRA combined with the Project risk results.

Table 12-1
Summary of the Refinery-Wide and Project HRAs

Receptor	UTM E	UTM N	Cancer Risk	Chronic HI	Acute HI	Receptor #
BP Refinery MEIR	386977.08	3742586.44	8.63×10^{-6}	0.154	0.0358	282
Project Results at BP Refinery MEIR	-	-	6.23×10^{-8}	0.00186	0.0044	2050 2101[1]
Cumulative Results at BP Refinery MEIR	-	-	*8.69×10^{-6}*	*0.156*	*0.0402*	*282*

Source: AECOM, 2009 and Watson Cogeneration Steam and Electric Reliability Project Team, 2009

Notes:

HI = Hazard Index
MEIR = Maximum Exposed Individual Resident
UTM E = Universal Transverse Mercator Easting
UTM N = Universal Transverse Mercator Northing

[1] These are the two closest receptors from the Expansion Project HRA modeling grid to grid point #282 used in the BP Refinery wide HRA (AECOM, 2009). The highest values from these receptors were used in the table.

The refinery AB2588 HRA also indicated a point of maximum impact on the southern fence line of the refinery which produced a cancer risk of 20.9×10^{-6}. The area immediately adjacent to the southern fence line is predominantly heavy industrial. This location, per the HRA was not identified as a location where a reasonable 70-year exposure could occur.

In addition, the refinery-wide HRA indicated that the existing cogeneration facility (turbines) represented only 3.86 percent of the total facility risk, i.e., turbine cancer risk values ranging from 8.03×10^{-8} to 8.03×10^{-7}.

The refinery-wide HRA also indicated that there are a number of close-proximity receptor locations offsite where cancer risks ranged between 10 and 20 in a million. A significant number of these receptors are worker receptors (as noted in the MEIR worker input/output files). When modeled and analyzed as worker locations, the cancer risks decreased to values well below10 in a million. This is the situation at the Project MIR. Table 12-2 summarizes the cumulative impacts at the Project MIR in conjunction with the refinery wide AB2588 HRA results.

Table 12-2
Summary of the Cumulative Impacts at the Project Maximum Impact Receptor

Receptor	UTM E	UTM N	Cancer Risk	Chronic HI	Acute HI	Receptor #
Project MIR	384807	3742718	7.00×10^{-7}	0.0297	0.00288	9889
BP PMI Results at Project MIR	-	-	1.64×10^{-5}	0.166	0.0399	473, 474, 477
BP PMI Results at Project MIR adjusted for Worker Exposure	-	-	3.63×10^{-6}	0.155	0.0399	-
Cumulative Results at Project MIR	-	-	*4.33×10^{-6}*	*0.185*	*0.0428*	*9889*

Source: AECOM, 2009 and Watson Cogeneration Steam and Electric Reliability Project Team, 2009

Notes:

UTM E = Universal Transverse Mercator Easting
UTM N = Universal Transverse Mercator Northing

[1] These are the three closest receptors from the BP Refinery AB2588 HRA modeling grid to grid point #9889 used in the Project AFC HRA. The highest values from these receptors were used in the table.

We conclude that the cumulative cancer health risks from the Project in conjunction with the refinery-wide risks per the September 2009 AB2588 HRA are less than 10 in one million and the chronic and acute hazard indices are well below the significance level of 1.0.

SOILS AND WATER RESOURCES

Technical Area: Soils and Water Resources

Author Mark Lindley, P.E.

PROJECT BACKGROUND

The BP Watson Project proposes to expand an existing 385-megawatt (MW) cogeneration facility within the BP Carson refinery that has been in operation since 1988. The proposed expansion includes addition of one 85 MW General Electric combustion gas turbine (CTG) with a heat recovery steam generator (HRSG) to provide additional process steam to the BP Carson refinery. The proposed additional CTG and HRSG would be constructed onsite adjacent to the four existing CTG and HRSG systems and would encompass the "fifth train" intended to operate in parallel with the four existing generating trains. The proposed project is intended to improve the efficiency of the Watson cogeneration facility as well as improve the reliability of steam deliveries to the BP Carson refinery.

Related to water resources, the proposed project also includes an inlet fogging system, a boiler feedwater pump, circulating water pump, and two additional cells added to an existing cooling tower. Water supply will be provided by reclaimed water from the West Basin Water Treatment Plant via existing piping systems. Wastewater from power plant processes and stormwater runoff will be delivered to the BP Carson refinery's existing oily water system and ultimately discharged to the Los Angeles Sanitation District via existing pipeline connections under BP Carson's existing waste discharge requirements.

BACKGROUND: WATER SUPPLY

Watson proposes to utilize tertiary-treated recycled water for water used in the evaporative cooling towers and for all plant makeup water. The recycled water will be supplied by the West Basin Water Treatment Plant, via an existing piping connection. The AFC indicates that the existing four-train Watson cogeneration plant utilizes about 4,606 acre-feet per year (afy), with 3,073 afy provided by municipal supply from the California Water Services Company and 1,534 afy from an on-site well. The AFC also indicates that the proposed fifth train would require about 3,015 afy of additional water. It is not clear if all of the water supply for the Watson cogeneration facility is to be converted to reclaimed water. The proposed fifth train would require about 35.5 afy per MW of capacity, which is a relatively inefficient use of water given the plant output.

A will-serve letter from the BP Carson refinery indicates that the refinery will be able to provide sufficient reclaimed water for the existing Watson cogeneration facility and additional reclaimed water for the proposed fifth train. A Memorandum of Understanding between the West Basin Municipal Water District and the BP Carson Refinery indicates that approximately 5,806 afy of reclaimed water may be supplied to the BP Carson Refinery. Staff needs additional information to confirm that the West Basin Municipal Water District can provide an adequate, reliable water

supply to meet the peak demands at the Watson cogeneration facility and to ensure that the project can operate reliably.

DATA REQUEST

16. Please confirm the proposed water supply required for the Watson cogeneration facility including the proposed fifth train.

RESPONSE

We confirm that the existing four units of the Watson Cogeneration Facility plus the fifth train of this Project will use approximately 8,623 acre-feet per year, with 5,806 acre-feet per year of reclaimed water provided by the West Basin Municipal Water District (WBMWD).

APPLICANT CLARIFICATION of BACKGROUND

The Project consists of one 85 MW General Electric CTG with a HRSG to provide additional process steam to the BP Carson refinery. As such, this is not a typical power facility project in that power generation is a secondary objective of steam generation. Although the power generating system consists of modern equipment, the production of steam for the refinery requires an additional amount of water as compared to a combined cycle power facility exporting only power and not steam. The fifth train project will incorporate heavily fired duct burners in the HRSG to maximize steam production for refinery use, which accounts for the water supply requirement. The cogeneration of power in the production of process steam is a highly efficient use of both energy and water.

The addition of the fifth train will not increase the fresh water requirements of the Watson Cogeneration Facility.

Steam produced by the Project will be delivered to the existing steam headers at the Watson Cogeneration Facility. The two existing condensing steam turbine generators (STGs) are also connected to the existing steam headers. The STGs maintain pressure control of the steam headers, acting as the steam system fly-wheel in response to changes in refinery demand. Even with the addition of the fifth train, the significant condensing capacity of the STGs will allow the Watson Cogeneration Facility to control steam header pressure and manage production in response to changes in refinery demand.

DATA REQUEST

17. Please provide a summary of the proposed annual water supply requirements for the existing four-train Watson cogeneration facility, the proposed fifth train, and the total. Please break down the portions of the proposed annual supply to be provided by reclaimed water, groundwater, and municipal water following completion of the proposed expansion.

RESPONSE

The water supply requirements for the existing Units No. 1 through No. 4 without the fifth train, and for the existing Units No. 1 through No. 4 with the fifth train are discussed in AFC Section 5.5.3.1, Project Water Resources Plan, and summarized in AFC Table 5.5-9, Watson Water Consumption / Wastewater Production. As the conversion to use of reclaimed water is not part of this Project and will be completed prior to simultaneous operation of all five cogeneration units, the water supply estimates are based on water use following completion of the conversion. The average annual water supply requirement for the existing Units No. 1 through No. 4 is estimated at 5,607 acre-feet. The average annual water supply requirement for the fifth train is estimated at 3,016 acre-feet. The total annual water supply requirement for all five units is estimated at 8,623 acre-feet. Please see our response to Data Request 20 for a further description of the water conversion project.

DATA REQUEST

19. Please confirm that the 5,806 afy of reclaimed water provided by the West Basin Water District is adequate to meet the water supply requirements of the Watson cogeneration facility including the proposed fifth train and other water supply requirements associated with the BP Carson refinery.

RESPONSE

The 5,806 acre-feed per year (afy) of reclaimed water will supply all of the fifth train average annual demand of 3,016 acre-feet, plus some of the demand of the cogeneration operations of existing Units No. 1 through No. 4. Additional water needs for the Watson Cogeneration Facility and the refinery will continue to be provided by the California Water Services Company and on-site groundwater wells. Please see the response to Data Request 20 below for additional details on the conversion of the water supply.

DATA REQUEST

20. If the Watson Cogeneration facility proposes to continue to rely on groundwater for a portion of the existing facility's water supply, please provide a detailed discussion regarding the availability and feasibility of replacing the existing groundwater supply with additional reclaimed water supply.

RESPONSE

The BP Refinery is implementing a separate program to convert industrial water uses to reclaimed supplies from the WBMWD. The goal of this program is to displace, to the extent possible, current uses of freshwater including the requirements of the Watson Cogeneration Facility. The BP Refinery and West Basin Municipal Water District are evaluating supply options and WBMWD is preparing a Feasibility Study for the expansion of its recycled water facilities.

The conversion to reclaimed supplies related to the fifth train and the existing Watson Cogeneration Facility (Units No. 1 through No. 4) is expected to occur in two phases. Completion of the first phase, supplying nitrified water to the cooling tower, is expected by December 2012. The nitrified water would cover the requirements of the existing cooling tower cells as well as the two new cooling tower cells required by the Project. Completion of the second phase, supplying reverse osmosis (RO) water to the boilers, is expected between December 2012 and July 2013. It may be necessary to stagger the implementation of the RO water supply. First, RO water would be supplied to cover the boiler feedwater requirements of the fifth train. If available, RO water to cover the boiler feedwater requirements of the existing units would be provided at a later date. Until that time, the boiler feedwater necessary to operate existing Units No. 1 through No. 4 will continue to be supplied by the BP Refinery and sourced from the California Water Services Company and on-site groundwater wells.

23. Please confirm that the proposed reclaimed water supply will be available prior to operation of the proposed fifth train. Please provide a current timeline for implementation of the reclaimed water supply connections.

RESPONSE

Based on the current schedule for licensing, contracting, procurement and construction, the Project is expected to achieve commercial operation as early as December 2012. Project commercial operation in December 2012 could result in Project operation prior to implementation of phase two of the reclaimed water program.

As described in the response above to Data Request 20. The BP Refinery and WBMWD are evaluating supply options and WBMWD is preparing a Feasibility Study for the expansion of its recycled water facilities. The conversion to reclaimed supplies related to the fifth train and the existing Watson Cogeneration Facility is expected to occur in two phases. Completion of the first phase, supplying nitrified water to the cooling tower cells, is expected by December 2012. The nitrified water would cover the requirements of the existing cooling tower cells as well as

the two new cooling tower cells required by the Project. Completion of the second phase, supplying RO water to the boilers, is expected between December 2012 and July 2013. If it becomes necessary to stagger the implementation of the RO water supply, the RO water will first be supplied to cover the boiler feedwater requirements of the fifth train, and, if available then the requirements of the existing units. Until that time, the boiler feed water necessary to operate existing Units No. 1 through No. 4 will continue to be supplied by the BP Refinery and sourced from the California Water Services Company and on-site groundwater wells.

BACKGROUND: WATER TREATMENT

The Watson Cogeneration plant plans to utilize reclaimed water from the West Basin Water Treatment Plant. The reclaimed water is to be tertiary treated recycled water treated to California Title 22 regulations for industrial reuse.

Under California Code of Regulations (CCR) Title 22, either the applicant or the West Basin Municipal Water District will be required to prepare an Engineer's Report for the production, distribution, and use of recycled water at the Watson Cogeneration plant and to obtain review and comment from the State Department of Public Health (DPH) and the Regional Water Quality Control Board (RWQCB) which typically approves uses of recycled and reclaimed water.

The production and use of recycled water is regulated under federal and state law. The State Water Resources Control Board (SWRCB) shares jurisdiction with the RWQCBs and DPH over the production and use of recycled water. The SWRCB exercises general oversight over recycled water projects, while DPH is charged with the protection of public health and drinking water supplies through the development of uniform water recycling criteria. Under California Water Code, sections 13522.5, 13523, and 13523.1, any person who proposes to produce or use recycled water must file a report and obtain water reclamation requirements or a master reclamation permit from the appropriate RWQCB.

One of the primary conditions for the use of recycled water is protection of public health. The current Water Recycling Criteria (Title 22, CCR, sections 60301 through 60355) require the submission of an engineering report to the RWQCB and DPH before recycled water projects are implemented. In addition, Title 17, California Code of Regulations addresses the health and safety requirements of backflow prevention and prohibits cross connection of potable and non-potable water lines.

DATA REQUEST

24. Please discuss whether the applicant or the West Basin Municipal Water District will be obtaining approval from the DPH and RWQCB related to the Title 22 requirements.

RESPONSE

The WBMWD currently produces and distributes approximately 30 million gallons per day of recycled water under an existing Water Recycling Requirements permit. This permit was issued on March 29, 2001 by the California Regional Water Quality Control Board (RWQCB), Los Angeles Region, Order No. 01-043, File No. 94-062. The permit was reviewed and approved by the California Department of Public Health (DPH) prior to approval by the RWQCB. This permit covers the WBMWD main treatment plant and two satellite facilities, including the Carson Regional Water Recycling Facility (CRWRF) that provides recycled water to the BP Refinery.

In addition, during the construction of the satellite CRWRF, WBMWD prepared and submitted two Engineering Reports to DPH: one for the CRWRF and one for the ARCO (now BP) Los Angeles Refinery in 1999. Both of these Engineering Reports will be updated and resubmitted to DPH as part of the design process for these facility expansions. The current Engineering Reports are on file with DPH.

When WBMWD enters into the design phase for expanding recycled water supply to the BP Refinery, WBMWD will apply to modify the existing RWQCB permit. WBMWD maintains several permits with the RWQCB and WBMWD's staff interfaces with both the RWQCB and DPH on a regular basis.

DATA REQUEST

25. Please provide documentation showing the applicant has established contact with DPH and RWQCB notifying them that the applicant proposes to treat and use recycled water for project operation. If the applicant has already contacted these agencies regarding their proposed treatment and use, please provide copies of any correspondence.

RESPONSE

WBMWD is still completing the Feasibility Study for the expansion of these recycled water facilities. When WBMWD completes the Feasibility Study and enters into the design phase, WBMWD will submit applications for the modified RWQCB permit and Engineering Reports.

BACKGROUND: WASTEWATER DISPOSAL AND STORMWATER RUNOFF

The Watson Cogeneration project proposes to discharge all project wastewater and stormwater runoff to the adjacent BP Carson refinery oily water disposal system. The average daily wastewater discharge rate is expected to be about 0.12 million gallons per day (mgd) and daily

maximum is expected to be about 0.17 mgd. The oily water treatment system includes treatment processes to remove free oil and suspended solids which are reclaimed and processed within the refinery. Solids remaining after hydrocarbon recovery are disposed at a Resource Conservation Recovery Act (RCRA) spell this out approved facility. Treated wastewater is discharged to the Los Angeles County Sanitation District's joint treatment facility in the City of Carson. This wastewater discharge is regulated by the terms of a waste discharge permit issued by the Los Angeles County Sanitation District.

DATA REQUEST

26. Please provide a detailed description of the treatment processes and storage capacity included in the BP Carson refinery's oily water treatment system.

RESPONSE

The BP Refinery is a separate entity from the Project. The refinery operates its oily water treatment system in compliance with a discharge permit (a copy of the permit is presented in the AFC, Appendix R) which includes a general description of treatment processes. The contribution of the Project to the total flow of wastewater from various existing cogeneration plant and refinery sources is marginal and does not represent a material impact. A letter has been provided by the BP Refinery acknowledging that adequate wastewater treatment capacity is available to support the Project Site operations and that the process wastewater and storm runoff will not prevent the discharge to the Los Angeles County Sanitation District (LACSD) facilities from meeting discharge requirements specified in the industrial waste discharge permit. A copy of this letter is presented in Appendix P of the AFC. Please see response to Data Request 29 for additional information.

DATA REQUEST

27. Please describe all waste streams (discharge flow rates, daily volumes, and origins) that are directed to the oily water treatment system.

RESPONSE

AFC Section 5.5.3.2, Project Wastewater Management Plan, describes the flow rates, daily volumes, and origins. Two numerical errors were inadvertently presented in the first paragraph of Section 5.5.3.2. The corrected text is presented below:

"The Project Site will generate industrial and stormwater for disposal. The primary source of wastewater will be from cooling tower cells blowdown. This wastewater will continue to be discharged to the existing oily water system at the BP Refinery. In addition, runoff from the Project will also be directed to the oily water system. The average daily wastewater volume will be approximately 133,920 gallons (93 gallons per minute [gpm]); the maximum daily wastewater volume will be 198,720 gallons (138 gpm). It is anticipated that the quality of the wastewater

from the cooling tower cell system will be unchanged with the two additional cells. The characterization of the wastewater is provided in Table 5.5-12, Projected Wastewater Quality."

DATA REQUEST

28. Please provide detailed runoff calculations estimating peak discharge for 10-year and 100-year rainfall events and runoff volumes for 10-year and 100-year, 24-hour rainfall events for areas within the Watson cogeneration plant (existing and with the proposed expansion).

RESPONSE

The calculations are provided in Appendix B.

DATA REQUEST

29. Please demonstrate that the existing BP Carson refinery's oily water treatment system has sufficient capacity to treat all wastewater streams and stormwater runoff from the Watson cogeneration plant (existing and with the proposed expansion).

RESPONSE

A letter has been provided by the BP Refinery acknowledging that its oily water treatment system has sufficient capacity to accept these waste streams and continue to meet the discharge limitations specified in the BP Refinery's industrial wastewater discharge permit. A copy of this letter is presented in Appendix P of the AFC. The Industrial Wastewater Discharge Permit presented in Appendix R of the AFC allows the BP Refinery oily water treatment system to process and discharge up to 10,000 gpm. The BP Refinery oily water treatment system currently processes an average of 4,000 gpm and peaks at approximately 8,000 gpm. The incremental daily wastewater volume from the Project will be approximately 93 gpm on average and 138 gpm on peak.

DATA REQUEST

30. Please provide water quality sample results for wastewater discharge from the oily water treatment system.

RESPONSE

The oily water treatment system receives wastewater from the BP Refinery in addition to the wastewater from the Watson Cogeneration Facility. It is not possible to provide water quality sample results that reflect only the Project or the Watson Cogeneration Facility. However, as described in AFC Section 5.5.9.3, Local Authorities and Administering Agencies, the LACSD has issued an Industrial Waste Discharge Permit to the BP Refinery that specifies quality

limitations for the disposal of industrial wastewater to the sanitary sewer. The Project will discharge industrial wastewater to the refinery's existing wastewater system that is regulated under this permit. The permit is included in Appendix R of the AFC.

DATA REQUEST

31. Please provide the waste discharge requirements including limits on discharge flow rates and water quality included in the waste discharge permit issued by the Los Angeles County Sanitation District.

RESPONSE

The waste discharge permit issued to the refinery, which includes limits on discharge flow rates and water quality, is included as Appendix R of the AFC.

VISUAL RESOURCES

Technical Area: Visual Resources – Visible Plume

Author William Walters

BACKGROUND: EXISTING COOLING TOWER OPERATIONS

Staff plans to perform a plume modeling analysis for the cooling tower. The applicant has provided adequate operating data for staff to assess the two new cooling tower cells that will be added to the existing cooling tower, but did not provide a fogging frequency curve that staff uses to check modeling results. Additionally, the applicant did not provide any indication if the existing 5 cells operate with the same general heat balance characteristics as the new cells. Staff requires additional information for the two new cooling tower cells and an explanation of the design of the existing cooling tower in order to complete our plume modeling analysis.

DATA REQUEST

33. Please provide an indication of whether the existing cooling tower cells will operate with a heat balance (exhaust temperatures) similar to the two new cooling tower cells required for the project. If the design/operation is not similar please provide existing cooling tower operating data similar to that what was provided for the two new cooling tower cells in the Supplement in Response to Data Adequacy review (Appendix E, Table E-1).

RESPONSE

The existing cooling tower cells will operate with a heat balance similar to the two new cooling tower cells.

DATA REQUEST

34. Please provide a fogging frequency curve from the cooling tower vendor, if available, for the existing cooling tower, and if designed/operated differently, for the two new cells being added to the cooling tower.

RESPONSE

The fogging frequency curve for the new cooling tower cells is included Appendix C. A fogging frequency curve is not available for the existing cooling tower.

WASTE MANAGEMENT

Technical Area: Waste Management

Author Ellie Townsend-Hough

BACKGROUND

For any site in California proposed for the construction of a power plant, the applicant must provide documentation about the nature of any potential or existing releases of hazardous substances or contamination at the site. If potential or existing releases or contamination at the site are identified, the significance of the release or contamination would be determined by site-specific factors, including, but not limited to: the amount and concentration of contaminants or contamination; the proposed use of the area where the contaminants/contamination is found; and any potential pathways for workers, the public, or sensitive species or environmental areas to be exposed to the contaminants (Siting Regulations Appendix B (g)(12)(A)).

The Phase I Environmental Site Assessment (ESA) for the project identified Recognized Environmental Conditions (RECs). Typically, where RECs are identified a Phase II ESA, is conducted to further evaluate whether there may be harmful contaminants on the site. Staff believes that given these past land uses and proposed construction the project owner should verify that no harmful concentrations of any contaminants will be encountered at the proposed project site.

There will be demolition of an existing warehouse/maintenance shop and ground disturbance during project construction. To protect the workers and reduce/eliminate damage to the environment the project owner shall verify that no harmful concentrations of any contaminant will be encountered at the proposed project site.

DATA REQUEST

37.

a) Please provide results of Phase II ESA field sampling and analysis which adequately characterize the presence of harmful chemicals or conditions, if any.

b) Please discuss whether there will be any risk to construction or plant personnel due to the presence of these chemicals.

RESPONSE

a) The Project Site comprises a small portion (2.5 acres) of the 21.7-acre Watson Cogeneration Facility. The Watson Cogeneration Facility is within the 428-acre parcel on which BP Carson Refinery (BP Refinery) is located. Because the Watson Cogeneration Facility is located within the BP Refinery, there is restricted access to the facility by the public. The BP Refinery is an operating refinery in a heavy industrial area

that includes fuel storage tank farms, pipeline terminals, and commercial refineries. The BP Refinery is under Cleanup and Abatement Order (CAO) Number 90-121, issued by the RWQCB with Environmental Protection Agency (EPA) involvement. The BP Refinery is conducting ongoing assessment and remedial activities on the refinery per the CAO under the jurisdiction of the RWQCB. BP has programs in place for soil management during excavation and construction activities that complies with regulations associated with the Site Remediation Maximum Achievable Control Technologies (SRMACT), also known as Site Remediation National Emissions Standards for Hazardous Air Pollutants (NESHAPS) (40 CRF 63 Subpart GGGGG), for soil contaminated with Volatile Organic Hazardous Air Pollutants (VOHAPS) and SCAQMD Title V SIP Rule 1166, Volatile Organic Compounds (VOC) from Decontamination of Soil. These programs include appropriate pre-assessment and screening, segregation and management of potentially VOC impacted soils on the BP Refinery site. Because construction will take place over a former reservoir, just as construction of adjacent Cogeneration Units No. 1 though No. 4 previously, construction and soil management will be completed consistent with the previous construction activities, and will be compliant with current refinery soil management procedures, health and safety regulatory requirements, and worker protection. These procedures will ensure compliance with applicable environmental, and health and safety regulatory requirements.

During the Project geotechnical assessment activities, samples will be collected and analyzed to investigate the subsurface soils for petroleum hydrocarbon impacts. During the Project geotechnical assessment, any excavated soil will be managed pursuant to applicable Refinery soils management plans, and health and safety of site personnel will be managed in accordance with the site specific health and safety plan and applicable refinery procedures as described below. Sampling will be completed in areas where ground disturbance is planned within the Project footprint.

Because there is no planned on-site reuse of soil excavated for the foundation of the fifth train or other areas identified for this Project and clean soil or aggregate will be imported to the Project Site for backfilling of the excavation(s), the RWQCB has indicated that its approval of a work plan for collecting soil samples during the geotechnical investigation is not required for this construction project. All excavated soil for this Project will be transported off-site for treatment or disposal at a BP-approved facility.

b) There is the potential for petroleum hydrocarbon-impacted soils to be excavated during Project construction activities. As discussed above, BP maintains programs for soil management practices for construction projects. The Project will adopt these procedures for Project construction activities. The BP Refinery has very specific health and safety procedures for on-site work. The BP Refinery requires Contractors to be Pacific Industrial Contractor Screening (PICS) Certified and to develop and maintain a health and safety plan that includes 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations (HAZWOPER) training. The Project-specific health and safety plan will provide procedures for identifying potentially impacted soils. The Plan will also identify appropriate procedures for worker protection and safety

during construction activities so that construction workers and the operating crew comply with the same health and safety requirements as any other worker on the refinery.

DATA REQUEST

39.

a) Please provide staff with a list of state regulating agencies (i.e. Department of Toxic Substances Control) that will be responsible for verifying that the 2.3-acre proposed project site requires no further investigation, that there is no harmful concentrations of any contaminate that will be encountered by workers or the public, and that the site is ready for redevelopment.

b) Please provide names, offices, telephone numbers and any additional contact information of the responsible/oversight agency.

RESPONSE

a) RWQCB will be the lead agency for the Project, as there is ongoing assessment and remediation at the BP Refinery as part of the RWQCB CAO, as discussed in Data Response 37.

b) Paul Cho – RWQCB Case Worker for BP Refinery (CAO):
Phone: 213-576-6721
E-mail: PCHO@waterboards.ca.gov

Appendix A

Public Health
Cumulative Health Risk Assessment

(Best Copy Available)

bp
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Mr. Naveen Berry
Planning and Rules Manager
South Coast Air Quality Management District (SCAQMD)
21865 E. Copley Drive
Diamond Bar, CA 91765-4178

Subject: Submittal of Updated Health Risk Assessment (HRA)
BP Carson (SCAQMD ID No.: 131003)

Dear Mr. Berry

Pursuant to the South Coast Air Quality Management District (SCAQMD) letter dated April 24, 2009, the BP Carson facility (SCAQMD No.: 131003), operated by BP West Coast Products LLC, has completed an updated health risk assessment (HRA) based on emissions for the reporting year 2006-2007. The updated HRA assesses current facility operations, including routine and predictable operations of stationary, portable, and contractor equipment and newly determined toxic air contaminants (TAC) including naphthalene and diesel particulate matter (DPM).
The BP Carson HRA is a multi-pathway risk analysis conducted using the latest versions of the Hot Spots Analysis and Reporting Program (HARP). The HRA is prepared in accordance with *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (OEHHA, 2003), which describes algorithms, exposure methods, and cancer and non-cancer health values needed to perform an HRA under AB2588.

Through the HRA it was determined that the cancer and non-cancer impacts from the BP Carson facility are below the significance thresholds adopted by the SCAQMD.

Enclosed is the Updated AB2588 HRA for the BP Carson facility. The report follows the outline for a HRA report contained in Appendix C of the SCAQMD supplemental risk assessment guidelines. For any questions about the HRA please contact BP Carson at (310) 847-5240.

Adrian Rosu
BP Carson Refinery
Environmental Programs Coordinator
9/17/09

Prepared for:
BP West Coast Products LLC
Carson Refinery
Carson, CA

AB2588 Health Risk Assessment for the BP Carson Refinery (SCAQMD ID No.: 131003)

AECOM Inc.
September 2009
Document No.: 01007-617-01

AECOM

Prepared for:
BP West Coast Products LLC
Carson, CA

Updated AB2588 Health Risk Assessment for the BP Carson Refinery (SCAQMD ID No.: 131003)

Prepared By:

Prepared By:

Reviewed By:

AECOM Inc.
September 2009
Document No.: 01007-617

AECOM

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List of Acronyms and Abbreviations

ACFM	Actual Cubic Feet Per Minute
AER	Annual Emissions Reporting
AT	Alimentary Tract
BHP	Brake horsepower
BO	Bone
CARB	California Air Resources Board
CAS	Chemical Abstract System
CN	Central Nervous System
CV	Cardiovascular System
DEM	Digital Elevation Model
DPM	Diesel Particulate Matter
DV	Developmental
EN	Endocrine
EPA	Environmental Protection Agency
EY	Eye
F	Fahrenheit
FPM	Feet per minute
Ft	Feet
g/s	Grams per second
HARP	Hot Spots Analysis and Reporting Program
HE	Hematologic
HI	Hazard Index
HRA	Health Risk Assessment
IM	Immunological System
ISCST3	Industrial Source Complex Short Term, Version 3
KI	Kidney
Km	Kilometer
Lbs/hr	Pounds per hour
Lbs/yr	Pounds per year
LI	Liver
M	Meter
MEIR	Maximum Exposed Individual Resident

MEIW	Maximum Exposed Individual Worker
NAD	North American Datum
OEHHA	Office of Environmental Health Hazard Assessment
PAH	Polycyclic Aromatic Hydrocarbons
PMI	Point of Maximum Impact
RE	Respiratory System
REL	Reference Exposure Level
RP	Reproductive System
SCAQMD	South Coast Air Quality Management District
SK	Skin
TAC	Toxic Air Contaminant
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
ug/m^3	Micrograms per cubic meter
ZOI	Zone of Impact

Glossary of Definitions

Acute Health Impacts: A health effect that occurs over a relatively short period of time (e.g., minutes or hours). The term is used to describe brief exposures and effects which appear promptly after exposure.

Cancer Health Impacts: Estimates of health risks associated with long-term exposures resulting from emissions of carcinogenic agents. The maximum individual excess cancer risk is an estimate of the highest increased cancer risk any off-site individual can expect from a lifetime (70 years) of exposure to emissions of toxic air contaminants from the facility

Chronic Health Impacts: An adverse non-cancer health effect that develops and persists (e.g., months or years) over time after long-term exposure to a substance.

Hazard Index: The sum of individual acute or chronic hazard quotients for each substance affecting a particular toxicological endpoint.

Health Risk Assessment (HRA): A study of the potential health risks to the public from a facility's toxic air contaminant emissions.

Maximum Exposed Individual Resident (MEIR): MEIR is the offsite location of an actual residence that has the highest estimated impact for each health effect.

Maximum Exposed Individual Worker (MEIW): MEIW is the offsite location of an actual business that has the highest estimated impact for each health effect.

Point of Maximum Impact (PMI): The PMI is the offsite location with the highest estimated impact level for each health effect and does not necessarily coincide with the presence of an individual. The PMI typically occurs on or near the property fenceline, where air toxic concentrations are highest.

Population Cancer Burden: Population cancer burden is the population-weighted number of excess cancer cases resulting from lifetime exposure to pollutants and based on a defined population.

Sensitive Receptor: A location where the individuals are considered to be more sensitive to pollutants than average. Sensitive receptor locations include schools, day care facilities, convalescent homes and hospitals.

Toxic Air Contaminant (TAC): An air pollutant which may cause or contribute to an increased in mortality or in serious illness, or which may pose a present or potential hazard to human health.

Zone of Impact (ZOI): The ZOI is defined as the geographic area within which the total excess lifetime cancer risk to all emitted carcinogens is one-in-a-million or greater, or a chronic or acute hazard index of 0.5 or greater.

1.0 Executive Summary

The Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB 2588) requires facilities that may cause a significant increase in public health risks due to the emissions of toxic air contaminants (TAC) from their operations to assess those impacts in a health risk assessment (HRA). The BP Carson Refinery (referred to as BP Carson henceforth) was required by the South Coast Air Quality Management District (SCAQMD) to prepare an updated HRA using 2006-2007 emissions (per the notice dated April 24, 2009) to reflect current operation. In addition, the SCAQMD also requires that the updated HRA include emissions of several TACs that have been recently determined by the State of California Office of Environmental Health Hazard Assessment (OEHHA) to cause cancer or adverse non-cancer health impacts and were not included in the previous HRA. Examples of such pollutants include diesel exhaust particulate matter (DPM) and naphthalene. In addition, the HRA must also include all routine and predictable diesel particulate matter emissions from all stationary, portable and contractor internal combustion engines (ICE). Further, the HRA also considers SCAQMD Rule 1470 diesel combustion activity and emission rates for all stationary diesel engines greater than 50 brake horsepower (bhp).

The BP Carson HRA is a multi-pathway risk analysis performed using the Hot Spots Analysis and Reporting Program (HARP) software package (Version 1.4a, July 2008) developed by the California Air Resources Board (CARB) for conducting health risk assessments in California under the Air Toxics Hot Spots Program. The HARP modeling system is a comprehensive health risk assessment tool that contains air emissions, dispersion and risk analysis modules. The methods used to assess potential human health risks are consistent with those prepared by The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (OEHHA, 2003) which describes algorithms, exposure methods, and cancer and non-cancer health values needed to perform a HRA under AB2588. This Guidance Manual is generally considered the best available reference for conducting human health risk assessment in California.

The HRA contains three quantitative determinations: emission estimation, air dispersion analysis, and health risk characterization. Source emissions of toxic air contaminants from the facility as reported in the 2006-2007 Annual Emissions Reporting (AER) were estimated using various approved emission factors from the SCAQMD, U.S. Environmental Protection Agency (EPA), and prior source testing. Exposure calculations were performed using air dispersion modeling analysis to predict ground-level air concentrations, by source. Results of the air modeling exposure predictions were applied to emission estimates, and along with the respective cancer health risk factors and chronic and acute non-cancer reference exposure levels for each toxic substance used to perform a health risk characterization that quantified individual health risks associated with predicted levels of exposure.

1.1 Facility Information

BP West Coast Products LLC operates the Carson Refinery (SCAQMD ID: 131003) at 2350 E. 223rd Street, Carson, California. The facility is bounded by East Sepulveda Avenue to the south, E 223rd Street to the north, Alameda Street to the east and Wilmington Avenue to the west. Figure 1-1 shows the general location of the refinery; a facility plot plan is provided in Appendix C. The predominant land use in the immediate vicinity of the facility is port-related storage, manufacturing, and light and heavy industry. These areas are considered actual worker locations per SCAQMD guidance and were evaluated as potential worker receptor locations. The predominant residential areas immediately around the facility are to the southwest, and north, along with residential areas to the east. The nearest residential receptor is approximately a half mile to the

southwest. Sensitive receptors are defined as groups of individuals that may be more susceptible to health risks from TAC exposure. These include infants and children, the elderly, the chronically ill and any other members of the general population who are more susceptible to the effects of TAC exposure than the population at large. Sensitive receptor locations include schools, day care facilities, convalescent homes and hospitals. Twenty-one sensitive receptors were identified for inclusion in the HRA. This HRA includes emissions from various sources at the facility as reported in the 2006-2007 AER.

1.2 Air Toxic Contaminant Emissions

This HRA is based on TAC emissions as reported on the 2006-2007 AER to the SCAQMD per the agency's guidance. A total of 72 toxic air contaminants were identified in the AER as being emitted from the facility, which includes 24 TAC emissions that contribute to cancer risk, 36 TAC emissions that contribute to non-cancer chronic impacts, and 23 TAC emissions that contribute to acute non-cancer impacts. Of the 72 reported TACs, 26 TACs do not have health values (see Table 2-2). All annual TAC emissions estimated were evaluated in the HRA based on the emission mass reported in the AER, with the exception of:

- DPM from internal combustion engines (2 portable cranes, 4 emergency fire water pumps and 1 emergency generator engine): Representative emission factors from the SCAQMD off-road equipments were used to estimate DPM emissions.

- DPM for the stationary emergency fire water pumps: Diesel particulate emissions from the stationary emergency IC engines were determined using the non-emergency operating limit of 30 hours per year.

- DPM from routine and predictable contractor equipment: Representative emission factors from the SCAQMD off-road equipments were used to estimate DPM emissions.

- Emissions from routine and predictable contractor operations, this includes painting, blasting, tank degassing, and cleaning: TAC emissions were calculated using SCAQMD TAC factors.

- Hexavalent Chromium (Cr(VI)) emissions from the Co-generation Unit, Selective Catalytic Reduction Unit: Revised emissions from a recent source test (Delta R1454136, August 2008).

Table 1-1 presents the maximum one-hour and annual facility emissions by substance in pounds/hour (lbs/hr) and pounds/year (lbs/yr) respectively.

1.3 Dispersion Modeling and Exposure Assessment

Air dispersion modeling and health risk analysis were used to assess exposure to TAC emissions from BP Carson. The HRA was performed using the HARP software package (Version 1.4a, July 2008) which is a comprehensive health risk assessment tool that contains air emissions inventory, dispersion, and risk analysis modules. The dispersion analysis is performed in HARP using the Industrial Source Complex (ISCST3 version 99155) dispersion model developed by U.S. EPA, which estimates both short-term and long-term average ambient concentrations at receptor locations to produce exposure estimates. The HRA was completed in accordance with the OEHHA Air Toxics Hot Spots Program Guidance Manual for the Preparation of Health Risk Assessments (OEHHA, August 2003) and SCAQMD Supplemental Guidelines for Preparing Health Risk Assessments for AB2588 (SCAQMD, July 2005).

Two receptor types were modeled to evaluate health risks: grid receptors were used to define the zone of impact (ZOI) and discrete (individual) receptors were used to assess points of maximum impact within areas of anticipated off-site worker and residential exposure, as appropriate along with actual sensitive receptor locations. The ZOI modeling was performed using regularly spaced grid receptors. The maximum exposed individual resident (MEIR), maximum exposed individual worker (MEIW), sensitive receptors and population-wide cancer burden evaluations were performed using discrete receptors indicating that these are locations associated with individuals or populations and correspond to their actual locations.

1.4 Health Risk Characterization

This HRA is conducted in accordance with AB 2588 requirements for completion of a refined health risk analysis that determines cancer risk (multi-pathway analysis) and non-cancer health hazards (chronic and acute). This HRA evaluates cancer risk and non-cancer acute and chronic health hazard for residential, off-site worker and sensitive receptor locations, and identifies points of maximum impact and excess population cancer burden. Cancer risk, non-cancer acute and chronic health risk evaluation requirements for each substance are identified in Table 1-2. The exposure pathways evaluated in this HRA include inhalation, dermal, soil ingestion and home-grown produce and mother's milk. Table 1-3 presents the target organ systems for non-cancer impacts.

1.5 Summary of Results

Cancer risk estimates are expressed in units of increased cancer occurrences per million individuals. Non-cancer health hazard impacts are expressed as a hazard index (HI) value for a specific target organ (toxicological endpoint).

A brief discussion of the HRA results is summarized herein. Per the OEHHA and SCAQMD guidance, all cancer risk values reported in this HRA are to the nearest tenth and all non-cancer risk values are reported to the nearest hundredth; both rounded up from 5.

Location of Maximum Health Risk Impacts

Maximum impact locations include the point of maximum impact (PMI), MEIR and MEIW. The PMI is predicted at the facility fenceline and offsite locations with the highest estimated impact level for each health effect; the PMI does not necessarily coincide with the presence of an individual. The PMI typically occurs on or near the property fenceline, where air toxic concentrations are highest. The MEIR and MEIW are the offsite location of an actual residence and business, respectively that have the highest estimated impact for each health effect. Table 1-4 summarizes impact levels at the maximum impact points for each health effect. Figure 1-2 shows the location of the PMI, MEIR and the MEIW with respect to the facility. The locations presented in this report are expressed in Universal Transverse Mercator (UTM) coordinates in Zone 11 of North American Datum 83 (NAD 83).

Based on the 2006-2007 AER emissions, the facility's potential multi-pathway cancer risk is 8.6-in-one million at the MEIR; 4.6-in-one-million at the MEIW; and 1.4-in-one million at the maximum exposed sensitive receptor (see Table 1-4). Approximately 77.2 percent of the risk at the MEIR is due to emissions from the portable and contractor equipment (Table 1-5). Emissions of diesel particulate matter contribute to approximately 77.7 percent of the MEIR cancer risk, followed by emissions of hexavalent chromium (5.5 percent); benzene (4.9

percent) and napthalene (3.9 percent) (Table 1-6). At the MEIW, approximately 76.4 percent of the cancer risk was attributed to emissions from contractor and portable equipment followed by approximately 5 percent from welding (Table 1-7). Diesel particulate matter emissions contributed to approximately 77.5 percent of the total cancer risk followed by benzene emissions at 6.3 percent (Table 1-8).

The maximum non-cancer chronic HI is 0.16 at the MEIR and 0.19 MEIW (Table 1-4). The maximum non-cancer acute HI at the MEIR is 0.04 and at the MEIW is 0.05 for the respiratory toxicological endpoint (Table 1-4).

Zone of Impact

The ZOI for cancer risk is the area subject to an added cancer risk of more than one-in-one million and is used to identify sensitive receptors and population-wide cancer burden to include in the analysis. The cancer risk ZOI extends approximately 4.3 miles (6.9 kilometers) to the east from the property boundary. Figure 1-2 is a map showing the 70-year lifetime cancer risk ZOI (i.e., one-in-one million risk contour). The 10-in-one million cancer risk isopleth is shown in Figure 1-3.

The ZOI for non-cancer acute or chronic health hazard impacts is the area subject to a HI of 0.5 or greater. Both acute and chronic HI values do not exceed the ZOI isopleth threshold of 0.5, and therefore isopleths are not shown for these impacts.

Population Cancer Burden

Population cancer burden is the population-weighted number of excess cancer cases based on the population within the ZOI. The population excess cancer burden was calculated for residential receptors within the ZOI and is estimated at approximately 0.23, which is below the cancer burden threshold of 0.5.

Conclusions

The HRA results show that excess cancer burden, cancer and non-cancer impacts from the BP Carson Refinery are below all public notification and mandatory risk reduction thresholds. Based on the most recently approved toxics air emissions inventory, these results reflect current facility operations.

Table 1-1: Facility TAC Emission Rate by Substance

CAS	Pollutant	1-Hour Maximum (lb/hr)	1-Hour Maximum (g/s)	Annual Average (lb/yr)	Annual Average (g/s)
1086	Dioxins	1.26E-09	1.58E-10	8.80E-06	1.26E-10
1128	Lead cmp(inorg) compounds	2.28E-03	2.88E-04	1.60E+01	2.31E-04
9901	Diesel Particulate Matter	1.12E+00	1.41E-01	1.16E+03	1.60E-02
50000	Formaldehyde	5.98E-01	7.53E-02	4.19E+03	6.02E-02
50328	Benzo[a]pyrene	1.38E-06	1.74E-07	9.71E-03	1.40E-07
53703	Dibenz[a,h]anthracene	1.25E-09	1.58E-10	8.79E-06	1.26E-10
56553	Benz[a]anthracene	1.47E-06	1.86E-07	1.03E-02	1.48E-07
67561	Methanol	3.53E+00	4.45E-01	2.48E+04	3.56E-01
67630	Isopropyl Alcohol	3.62E-02	4.56E-03	2.53E+02	3.64E-03
67663	Chloroform	7.89E-02	9.94E-03	5.53E+02	7.94E-03
71363	n-Butyl alcohol	1.44E-03	1.81E-04	1.01E+01	1.45E-04
71432	Benzene	2.12E-01	2.67E-02	1.49E+03	2.14E-02
74851	Ethylene	7.39E-02	9.32E-03	5.18E+02	7.45E-03
74908	Hydrocyanic acid	8.50E-02	1.07E-02	5.96E+02	8.56E-03
75070	Acetaldehyde	9.42E-01	1.19E-01	6.60E+03	9.49E-02
75092	Methylene Chloride	1.51E-01	1.90E-02	1.06E+03	1.52E-02
75150	Carbon disulfide	6.95E-03	8.75E-04	4.87E+01	7.00E-04
78922	sec-Butyl Alcohol	1.78E-01	2.24E-02	1.25E+03	1.79E-02
78933	Methyl ethyl ketone	1.31E-01	1.65E-02	1.13E+03	1.63E-02
83329	Acenaphthene	2.26E-05	2.85E-06	1.58E-01	2.28E-06
85018	Phenanthrene	1.89E-02	2.39E-03	1.33E+02	1.91E-03
86737	Fluorene	6.82E-05	8.59E-06	4.78E-01	6.87E-06
91203	Naphthalene	1.40E-01	1.77E-02	9.87E+02	1.42E-02
91576	2-Methyl naphthalene	1.08E-04	1.36E-05	7.58E-01	1.09E-05
95636	1,2,4-Trimethylbenzene	2.77E-01	3.49E-02	1.95E+03	2.80E-02
98828	Cumene	1.50E-02	1.89E-03	1.05E+02	1.52E-03
100414	Ethyl Benzene	1.26E-01	1.59E-02	8.90E+02	1.28E-02
105679	2,4-Dimethylphenol {2,4-Xylenol}	2.74E-07	3.45E-08	1.92E-03	2.76E-08
106990	1,3-Butadiene	9.28E-03	1.17E-03	6.50E+01	9.35E-04
107028	Acrolein	1.63E-01	2.05E-02	1.14E+03	1.64E-02
107211	Ethylene Glycol	8.93E-04	1.13E-04	6.26E+00	9.00E-05

Table 1-1: Facility TAC Emission Rate by Substance

CAS	Pollutant	1-Hour Maximum (lb/hr)	1-Hour Maximum (g/s)	Annual Average (lb/yr)	Annual Average (g/s)
108101	Methyl isobutyl ketone {Hexone}	1.75E-02	2.20E-03	1.51E+02	2.17E-03
108883	Toluene	9.58E-01	1.21E-01	7.29E+03	1.05E-01
108952	Phenol	2.05E-02	2.58E-03	1.44E+02	2.06E-03
110543	Hexane	7.06E-01	8.90E-02	4.96E+03	7.12E-02
110827	Cyclohexane	2.28E-01	2.87E-02	1.60E+03	2.30E-02
111422	Diethanolamine	5.17E-01	6.51E-02	3.62E+03	5.20E-02
115071	Propylene	6.80E-01	8.57E-02	4.77E+03	6.86E-02
120127	Anthracene	3.17E-05	3.99E-06	2.22E-01	3.19E-06
127184	Perchloroethylene {Tetrachloroethene}	2.11E-02	2.65E-03	1.48E+02	2.12E-03
129000	Pyrene	3.58E-05	4.51E-06	2.51E-01	3.60E-06
205992	Benzo[b]fluoranthene	2.67E-06	3.36E-07	1.87E-02	2.68E-07
206440	Fluoranthene	2.81E-05	3.54E-06	1.97E-01	2.83E-06
208968	Acenaphthylene	1.12E-05	1.41E-06	7.84E-02	1.13E-06
218019	Chrysene	3.79E-06	4.78E-07	2.66E-02	3.82E-07
463581	Carbonyl sulfide	3.37E-03	4.25E-04	2.36E+01	3.40E-04
540841	2,2,4-Trimethylpentane	3.22E-01	4.05E-02	2.25E+03	3.24E-02
1319773	Cresols (mixtures of) {Cresylic acid}	1.82E-03	2.29E-04	1.27E+01	1.83E-04
1330207	Xylenes (mixed isomers)	6.82E-01	8.60E-02	4.80E+03	6.90E-02
1332214	Asbestos	6.91E-04	8.71E-05	4.84E+00	6.96E-05
1634044	Methyl tert-butyl ether	1.43E-03	1.80E-04	1.00E+01	1.44E-04
7439965	Manganese	1.33E-01	1.68E-02	9.32E+02	1.34E-02
7439976	Mercury	2.22E-03	2.79E-04	1.55E+01	2.23E-04
7440020	Nickel	1.10E-02	1.39E-03	7.71E+01	1.11E-03
7440224	Silver	4.08E-03	5.14E-04	2.86E+01	4.11E-04
7440280	Thallium	1.46E-02	1.85E-03	1.03E+02	1.48E-03
7440360	Antimony	1.38E-03	1.74E-04	9.69E+00	1.39E-04
7440382	Arsenic	1.01E-03	1.27E-04	7.04E+00	1.01E-04
7440393	Barium	2.55E-02	3.21E-03	1.79E+02	2.57E-03
7440417	Beryllium	8.03E-05	1.01E-05	5.63E-01	8.09E-06
7440439	Cadmium	1.00E-03	1.26E-04	7.03E+00	1.01E-04

Table 1-1: Facility TAC Emission Rate by Substance

CAS	Pollutant	1-Hour Maximum (lb/hr)	1-Hour Maximum (g/s)	Annual Average (lb/yr)	Annual Average (g/s)
7440473	Chromium	8.65E-03	1.09E-03	6.06E+01	8.72E-04
7440484	Cobalt	6.98E-04	8.79E-05	4.89E+00	7.04E-05
7440508	Copper	5.44E-03	6.85E-04	3.82E+01	5.49E-04
7440622	Vanadium	4.71E-02	5.94E-03	3.30E+02	4.75E-03
7440666	Zinc (fume or dust)	2.32E-01	2.92E-02	1.96E+03	2.81E-02
7664417	Ammonia	5.42E+01	6.83E+00	3.80E+05	5.46E+00
7664939	Sulfuric Acid	5.01E+00	6.31E-01	3.51E+04	5.05E-01
7723140	Phosphorus	1.63E-03	2.05E-04	1.14E+01	1.64E-04
7782492	Selenium	2.76E-03	3.48E-04	1.93E+01	2.78E-04
7783064	Hydrogen sulfide	7.08E-01	8.92E-02	4.96E+03	7.13E-02
18540299	Chromium, hexavalent	1.79E-04	2.25E-05	1.35E+00	1.95E-05

Table 1-2: List of AB2588 Substances and Impacts

Listed Substance	CAS Number	Multi-pathway	Carcinogenic	Chronic Non-Cancer	Acute Non-Cancer
1,2,4-Trimethylbenzene	95636				
1,3-Butadiene	106990		X	X	
2,2,4-Trimethylpentane	540841				
2,4-Dimethylphenol {2,4-Xylenol}	105679				
2-Methyl naphthalene	91576				
Acenaphthene	83329				
Acenaphthylene	208968				
Acetaldehyde	75070		X	X	X
Acrolein	107028			X	X
Ammonia	7664417			X	X
Anthracene	120127				
Antimony	7440360				
Arsenic	7440382	X	X	X	X
Asbestos	1332214		X		
Barium	7440393				
Benz[a]anthracene	56553		X		
Benzene	71432		X	X	X
Benzo[a]pyrene	50328		X		
Benzo[b]fluoranthene	205992		X		
Beryllium	7440417	X	X	X	
Cadmium	7440439	X	X	X	
Carbon disulfide	75150			X	X
Carbonyl sulfide	463581				
Chloroform	67663		X	X	X
Chromium	7440473				
Chromium, hexavalent	18540299	X	X	X	
Chrysene	218019		X		
Cobalt	7440484				
Copper	7440508				X
Cresols (mixtures of) {Cresylic acid}	1319773			X	
Cumene	98828				
Cyclohexane	110827				
Dibenz[a,h]anthracene	53703		X		
Diesel Particulate Matter	9901		X	X	
Diethanolamine	111422			X	
Dioxins		X	X	X	
Ethyl Benzene	100414		X	X	
Ethylene	74851				
Ethylene Glycol	107211			X	
Fluoranthene	206440				
Fluorene	86737				
Formaldehyde	50000		X	X	X
Hexane	110543			X	

Table 1-2: List of AB2588 Substances and Impacts

Listed Substance	CAS Number	Multi-pathway	Carcinogenic	Chronic Non-Cancer	Acute Non-Cancer
Hydrocyanic acid	74908			X	X
Hydrogen sulfide	7783064			X	X
Isopropyl Alcohol	67630			X	X
Lead cmp(inorg) compounds	1128	X	X		
Manganese	7439965			X	
Mercury	7439976			X	X
Methanol	67561			X	X
Methyl ethyl ketone	78933				X
Methyl isobutyl ketone {Hexone}	108101				
Methyl tert-butyl ether	1634044		X	X	
Methylene Chloride	75092		X	X	X
Naphthalene	91203		X	X	
n-Butyl alcohol	71363				
Nickel	7440020	X	X	X	X
Perchloroethylene {Tetrachloroethene}	127184		X	X	X
Phenanthrene	85018				
Phenol	108952			X	X
Phosphorus	7723140				
Propylene	115071			X	
Pyrene	129000				
sec-Butyl Alcohol	78922				
Selenium	7782492			X	
Silver	7440224				
Sulfuric Acid	7664939			X	X
Thallium	7440280				
Toluene	108883			X	X
Vanadium	7440622				X
Xylenes (mixed isomers)	1330207			X	X
Zinc (fume or dust)	7440666				

Table 1-3: Toxicological Endpoints for Chronic and Acute Hazard Index Analysis

Listed Substance	Target Organ												
	AT	BO	CV	DV	EN	EY	HE	IM	KI	CN	RE	RP	SK
1,2,4-Trimethylbenzene													
1,3-Butadiene											C		
2,2,4-Trimethylpentane													
2,4-Dimethylphenol {2,4-Xylenol}													
2-Methyl naphthalene													
Acenaphthene													
Acenaphthylene													
Acetaldehyde						A					A,C		
Acrolein						A					A,C		
Ammonia						A					A,C		
Anthracene													
Antimony													
Arsenic			A,C	A,C						A,C	C		C
Asbestos													
Barium													
Benz[a]anthracene													
Benzene				A,C			A,C	A		C		A	
Benzo[a]pyrene													
Benzo[b]fluoranthene													
Beryllium	C							C			C	C	
Cadmium									C		C		
Carbon disulfide				A						A,C		A,C	
Carbonyl sulfide													
Chloroform	C			A,C					C	A		A	
Chromium													
Chromium, hexavalent							C						
Chrysene													
Cobalt													
Copper											A		
Cresols (mixtures of) {Cresylic acid}										C			
Cumene													
Cyclohexane													
Dibenz[a,h]anthracene													
Diesel Particulate Matter											C		
Diethanolamine			C							C			
Dioxins	C			C	C		C				C	C	
Ethyl Benzene	C			C	C				C				
Ethylene													
Ethylene Glycol				C					C		C		
Fluoranthene													
Fluorene													
Formaldehyde						A					C		
Hexane										C			

Table 1-3: Toxicological Endpoints for Chronic and Acute Hazard Index Analysis

Listed Substance	Target Organ												
	AT	BO	CV	DV	EN	EY	HE	IM	KI	CN	RE	RP	SK
Hydrocyanic acid			C		C					A,C			
Hydrogen sulfide										A	C		
Isopropyl Alcohol				C		A			C		A		
Lead cmp(inorg) compounds													
Manganese										C			
Mercury				A,C					C	A,C			
Methanol				C						A,C	C		
Methyl ethyl ketone						A					A		
Methyl isobutyl ketone {Hexone}													
Methyl tert-butyl ether	C					C			C				
Methylene Chloride			C							A,C			
Naphthalene											C		
n-Butyl alcohol													
Nickel	C						C	A			A,C		
Perchloroethylene {Tetrachloroethene}	C					A			C	A	A		
Phenanthrene													
Phenol	C		C			A			C	C	A		
Phosphorus													
Propylene											C		
Pyrene													
sec-Butyl Alcohol													
Selenium	C		C							C			
Silver													
Sulfuric Acid											A,C		
Thallium													
Toluene				A,C		A				A,C	A,C	A	
Vanadium						A					A		
Xylenes (mixed)						A				C	A,C		
Zinc (fume or dust)													

Notes:

C = Chronic toxicity
A = Acute toxicity
AT = Alimentary Tract
BO = Bone
CV = Cardiovascular system
DV = Developmental
EN = Endocrine
EY = Eye
HE = Hematologic
IM = Immunological system
KI = Kidneys
CN = Central nervous system
RE = Respiratory system
RP = Reproductive system
SK = Skin

Table 1-4: Summary of Health Risks for PMI, MEIR, MEIW, and SEN

Receptor	UTM Easting (m)[a]	UTM Northing (m)[a]	Risk (per million for cancer, hazard index for non-cancer)
Cancer Risk			
PMI (70-year)	385003.51	3741425.84	20.9
MEIR (70-year)	386977.08	3742586.44	8.6
MEIW (40-year)	385003.51	3741425.84	4.6
SEN (9-year)	387459.9	3742436.9	1.4
Non-Cancer Chronic Hazard Index			
PMI	385895.91	3742387.55	0.21
MEIR	387193.27	3742770.9	0.16
MEIW	385895.91	3742387.55	0.19
SEN	387541.7	3742485.0	0.15
Non-Cancer Acute Hazard Index			
PMI	385303.51	3741425.84	0.05
MEIR	388967.12	3742984.88	0.04
MEIW	385303.51	3741425.84	0.05
SEN	389279.3	3742979.6	0.04
[a] UTM Zone 11, NAD83, WGS84			

Table 1-5: Source Contribution to Cancer Risks at the MEIR

Source	Inhalation Pathway	Non-Inhalation Pathway					Total Cancer Risk	Source Contribution
		Dermal	Soil	Mother's Milk	Home Grown Vegetables	Oral		
Portable ICEs South >250HP	2.97E-06	--	--	--	--	--	2.97E-06	34.41%
Portable ICEs North >250 HP	2.49E-06	--	--	--	--	--	2.49E-06	28.85%
Portable ICEs North <250 HP	8.21E-07	--	--	--	--	--	8.21E-07	9.51%
Portable ICEs South <250 HP	3.83E-07	--	--	--	--	--	3.83E-07	4.44%
No. 1 Hydrogen Plant Heater	8.96E-08	1.32E-08	6.56E-09	--	1.26E-08	3.24E-08	1.22E-07	1.41%
Flue Gas Cogeneration 91/#1	4.91E-08	1.29E-08	6.25E-09	4.78E-10	1.15E-08	3.12E-08	8.03E-07	0.93%
Hydrocracker	8.73E-08	--	--	--	--	--	8.73E-08	1.05%
Flue Gas Cogeneration 92/#2	5.04E-08	1.33E-08	6.42E-09	4.91E-10	1.19E-08	3.20E-08	8.24E-8	0.99%
Flue Gas Cogeneration 94/#4	4.97E-08	1.29E-08	6.27E-09	4.80E-10	1.16E-08	3.13E-08	8.10E-08	0.97%
Area 44 - Fugitives - FCC	8.04E-08	--	--	--	--	--	8.04E-08	0.97%
Flue Gas Cogeneration 93/#3	4.91E-08	1.29E-08	6.25E-09	4.78E-10	1.15E-08	3.12E-08	8.03E-08	0.97%
Fix Roof Tank No. 62	5.74E-08	--	--	--	--	--	5.74E-08	0.67%
Heaters (combined)	3.43E-07	4.91E-08	2.43E-08	0.00E+00	4.73E-08	1.21E-07	4.64E-07	5.38%
Tanks (combined)	3.11E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.11E-07	3.61%
Fugitives (combined)	3.56E-07	5.66E-15	1.87E-13	0.00E+00	3.84E-13	5.76E-13	3.56E-07	4.13%
Other Equipment (combined)	1.77E-07	1.36E-09	9.39E-10	0.00E+00	2.03E-09	4.33E-09	1.81E-07	2.10%
Facility Emergency IC Engine Total	2.33E-08	--	--	--	--	--	2.33E-09	0.27%
SUM	**8.35E-06**	**1.16E-07**	**5.72E-08**	**1.95E-09**	**1.09E-07**	**2.84E-07**	**8.63E-06**	**100%**

Table 1-6: Pollutant Contribution to Cancer Risk at the MEIR

Pollutant	Inhalation Pathway	Non-Inhalation Pathway					Total Cancer Risk	Source Contribution
		Dermal	Soil	Mother's Milk	Home Grown Vegetables	Oral		
Diesel Exhaust Particulate Matter (PM)	6.70E-06	--	--	--	--	--	6.70E-06	77.76%
Cr(VI)	4.70E-07	--	--	--	--	--	4.70E-07	5.45%
Benzene	4.20E-07	--	--	--	--	--	4.20E-07	4.87%
Naphthalene	3.43E-07	--	--	--	--	--	3.43E-07	3.97%
Arsenic	4.27E-08	1.14E-07	5.55E-08	--	1.05E-07	2.74E-07	3.17E-07	3.67%
1,3-Butadiene	1.05E-07	--	--	--	--	--	1.05E-07	1.22%
Cadmium	5.45E-08	--	--	--	--	--	5.46E-08	0.63%
Formaldehyde	5.00E-08	--	--	--	--	--	5.00E-08	0.58%
Nickel	4.82E-08	--	--	--	--	--	4.84E-08	0.56%
Acetaldehyde	3.38E-08	--	--	--	--	--	3.38E-08	0.39%
Other Pollutants	7.89E-08	2.29E-09	1.76E-09	1.95E-09	4.24E-09	1.02E-08	8.91E-08	1.03%
SUM	**8.35E-06**	**1.16E-07**	**5.72E-08**	**1.95E-09**	**1.09E-07**	**2.84E-07**	**8.63E-06**	**100%**

Table 1-7: Source Contribution to Cancer Risks at the MEIW						
Source	Inhalation Pathway	Non-Inhalation Pathway			Total Cancer Risk	Source Contribution
		Dermal	Soil	Oral		
Portable ICEs South >250 HP	2.32E-06	--	--	--	2.32E-06	50.22%
Portable ICEs South <250 HP	5.31E-07	--	--	--	5.31E-07	11.49%
Portable ICEs North >250 HP	4.97E-07	--	--	--	4.97E-07	10.76%
Weld-Welding	2.33E-07	--	--	--	2.33E-07	5.04%
Portable ICEs - North <250 HP	1.82E-07	--	--	--	1.82E-07	3.94%
Area 67 N - Fugitives - 1 Pump Slab	1.18E-07	--	--	--	1.18E-07	2.55%
Area 31 - Fugitives - Alky	4.77E-08	--	--	--	4.77E-08	1.03%
S/H Test ICEs	4.03E-08	--	--	--	4.03E-08	0.87%
No. 1 Hydrogen Plant Heater	2.40E-08	6.81E-09	2.92E-09	9.73E-09	3.37E-08	0.73%
Area 49 - Fugitives - Hydrocracker	2.98E-08	--	--	--	2.98E-08	0.65%
Heaters (combined)	6.35E-08	1.63E-08	6.94E-09	2.32E-08	8.68E-08	1.88%
Tanks (combined)	1.70E-07	--	--	--	1.70E-07	3.68%
Fugitives (combined)	2.72E-07	1.02E-10	7.13E-11	1.73E-10	2.72E-07	5.89%
Other Equipment (combined)	1.87E-08	3.13E-14	5.30E-14	8.44E-14	1.87E-08	0.39%
Facility Emergency IC Engine Total	3.26E-08	--	--	--	3.26E-08	0.70%
Sum	**4.58E-06**	**2.32E-08**	**9.94E-09**	**3.31E-08**	**4.62E-06**	**100.00%**

Table 1-8: Pollutant Contribution to Cancer Risk at the MEIW

Pollutant	Inhalation Pathway	Non-Inhalation Pathway			Total Cancer Risk	Source Contribution
		Dermal	Soil	Oral		
Diesel Particulate Matter	3.58E-06	--	--	--	3.58E-06	77.49%
Benzene	2.92E-07	--	--	--	2.92E-07	6.32%
Naphthalene	2.52E-07	--	--	--	2.52E-07	5.45%
Nickel	2.31E-07	--	--	--	2.31E-07	5.00%
1,3-Butadiene	9.40E-08	--	--	--	9.40E-08	2.03%
Cr(VI)	6.90E-08	--	--	--	6.90E-08	1.49%
Arsenic	4.95E-09	2.28E-08	9.62E-09	3.24E-08	3.73E-08	0.81%
Ethyl Benzene	1.52E-08	--	--	--	1.52E-08	0.33%
Asbestos	1.38E-08	--	--	--	1.38E-08	0.30%
Chloroform	7.93E-09	--	--	--	7.93E-09	0.17%
Other Pollutants	2.58E-08	3.83E-10	2.82E-10	6.65E-10	2.64E-08	0.57%
Sum	**4.58E-06**	**2.32E-08**	**9.94E-09**	**3.31E-08**	**4.62E-06**	**100%**

Figure 1-1 Regional Map

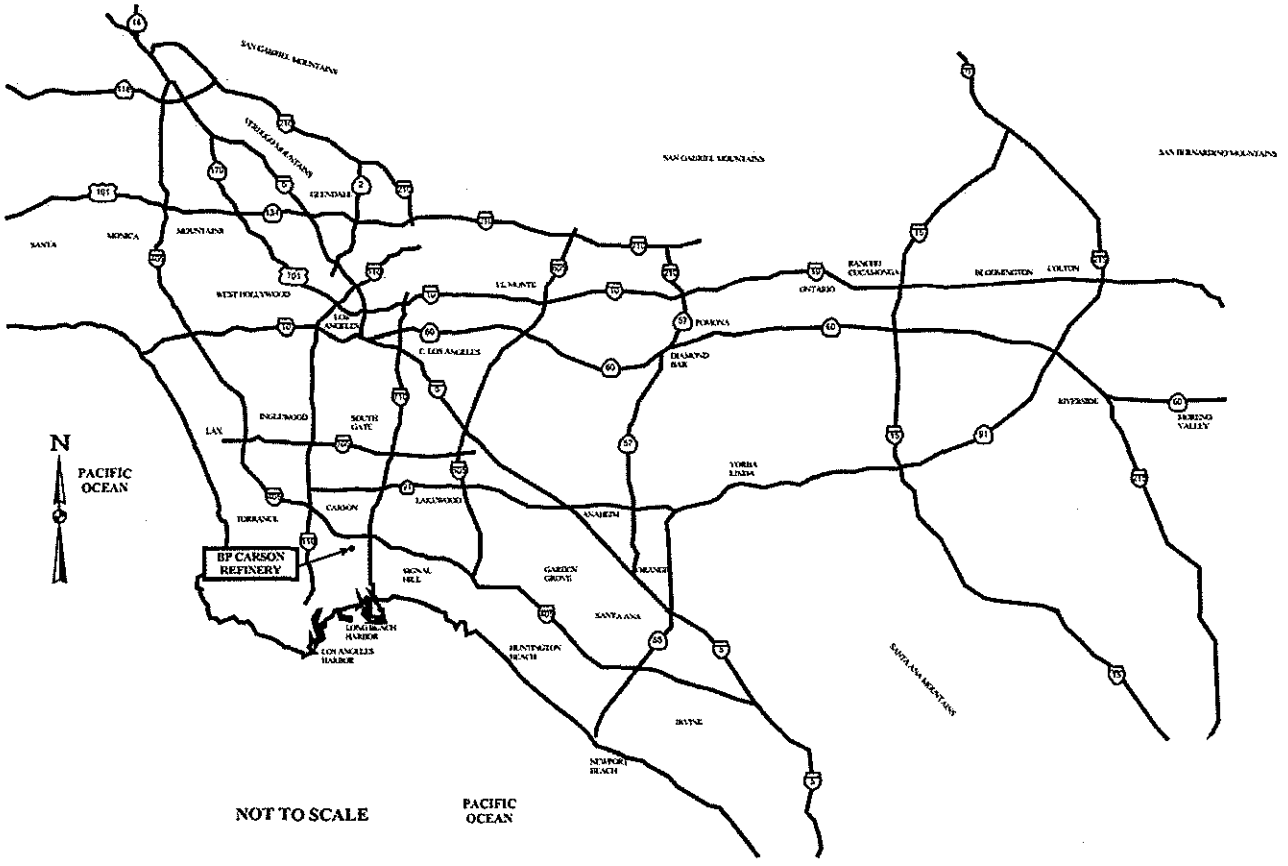
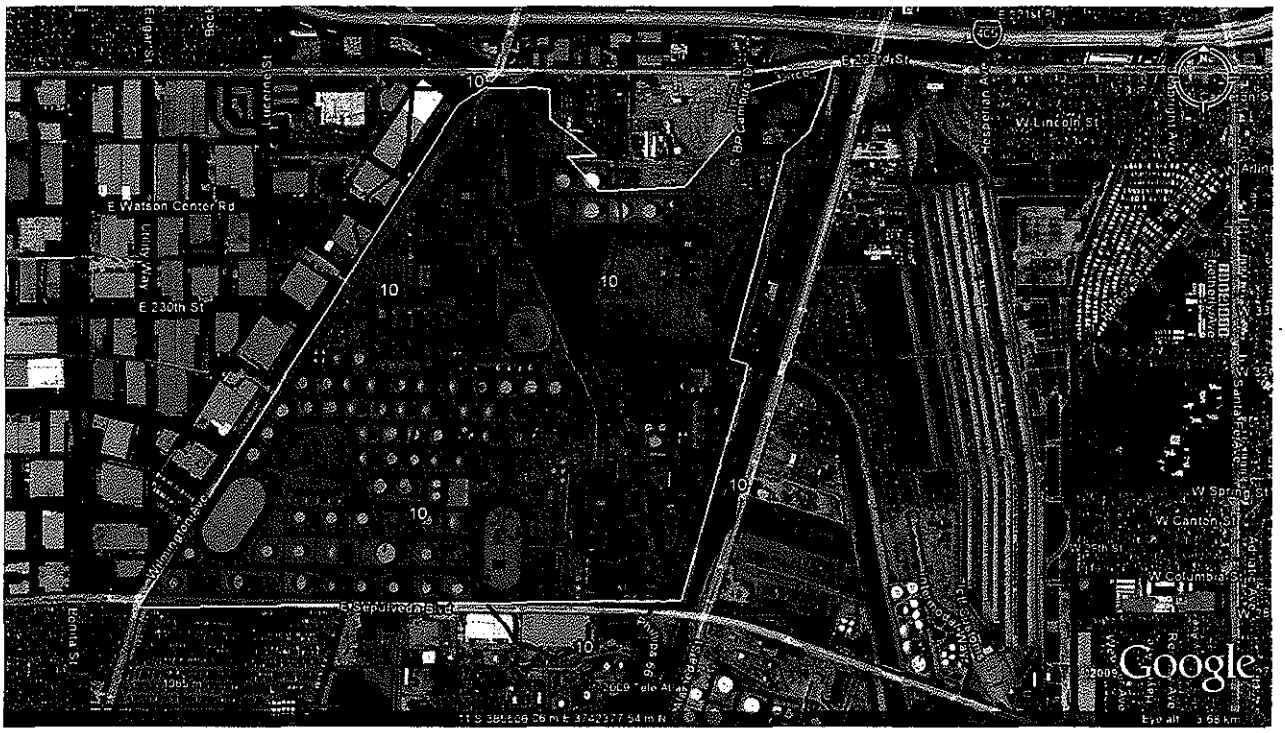


Figure 1-2: Cancer Risk Zone of Impact and Location of Cancer PMI, MEIR and MEIW

Figure 1-3: Cancer Risk 10-in-a-million Isopleth



2.0 Hazard Identification

A number of TACs are emitted from the operation of the refinery. The 2006-2007 AER for the refinery shows 72 TACs emitted from operations including 24 TAC emissions that contribute to cancer risk, 36 TAC emissions that contribute to non-cancer chronic impacts, and 23 TAC emissions that contribute to acute non-cancer impacts. A complete list of all TACs emitted is provided in Table 2-1, sorted by pollutant name, along with the current health factors (updated February 2009) used to evaluate potential health risk impacts. The human health risks potentially associated with these substances were evaluated in the HRA. Cancer risk is assessed using inhalation unit risk factors and oral slope factors to estimate risk, expressed in units of increased occurrences per million individuals. Non-cancer chronic impacts are assessed using inhalation and oral reference exposure level (REL) to estimate health hazard impacts, expressed as a hazard index for specific target organ. Non-cancer acute impacts are assessed using an inhalation REL to estimate health hazard impacts for each specific target organ. The exposure pathways evaluated in this HRA include inhalation, dermal, soil ingestion, home-grown produce, and mother's milk. Table 2-2 presents a list of reported AER TACs that do not have health values.

Table 2-1: Dose/Response Values for AB 2588 Compounds

CAS	Pollutant	Cancer Risk Factors			Non-Cancer Health Factors		
		Inhalation Cancer Unit Risk Factor $(\mu g/m^3)^{-1}$	Inhalation Cancer Slope Factor $(mg/kg\text{-}d)^{-1}$	Oral Cancer Slope Factor $(mg/kg\text{-}d)^{-1}$	Inhalation Chronic Reference Exposure Level $(\mu g/m^3)$	Oral Chronic Reference Exposure Level (mg/kg/d)	Acute Reference Exposure Level $(\mu g/m^3)$
105679	2,4-Dimethylphenol	-	-	-	-	-	-
91576	2-Methyl naphthalene	-	-	-		-	-
83329	Acenaphthene	-	-	-		-	-
208968	Acenaphthylene	-	-	-	-	-	-
75070	Acetaldehyde	2.7E-06	1.0E-02	-	1.4E+02	-	4.7E+02
107028	Acrolein	-	-	-	3.5E-01	-	2.5E+00
7664417	Ammonia	-	-	-	2.0E+02	-	3.2E+03
120127	Anthracene	-	-	-	-	-	-
7440360	Antimony	-	-	-	-	-	-
7440382	Arsenic	3.3E-03	1.2E+01	1.5E+00	1.5E-02	3.5E-06	2.0E-01
1332214	Asbestos	1.9E-04	2.2E+02	-		-	-
7440393	Barium	-	-	-			-
56553	Benz[a]anthracene	1.1E-04	3.9E-01	1.2E+00	-	-	-
71432	Benzene	2.9E-05	1.0E-01	-	6.0E+01	-	1.3E+03
50328	Benzo[a]pyrene	1.1E-03	3.9E+00	1.2E+01	-	-	-
205992	Benzo[b]fluoranthene	1.1E-04	3.9E-01	1.2E+00		-	-
7440417	Beryllium	2.4E-03	8.4E+00	-	7.0E-03	2.0E-03	-
7440439	Cadmium	4.2E-03	1.5E+01	-	2.0E-02	5.0E-04	-
75150	Carbon disulfide	-	-	-	8.0E+02	-	6.2E+03
463581	Carbonyl sulfide	-	-	-	-	-	-
67663	Chloroform	5.3E-06	1.9E-02	-	3.0E+02	-	1.5E+02
7440473	Chromium	-	-	-		-	-
18540299	Chromium, hexavalent	1.5E-01	5.1E+02	-	2.0E-01	2.0E-02	-
218019	Chrysene	1.1E-05	3.9E-02	1.2E-01		-	-

Table 2-1: Dose/Response Values for AB 2588 Compounds

CAS	Pollutant	Cancer Risk Factors			Non-Cancer Health Factors		
		Inhalation Cancer Unit Risk Factor $(\mu g/m^3)^{-1}$	Inhalation Cancer Slope Factor $(mg/kg\text{-}d)^{-1}$	Oral Cancer Slope Factor $(mg/kg\text{-}d)^{-1}$	Inhalation Chronic Reference Exposure Level $(\mu g/m^3)$	Oral Chronic Reference Exposure Level (mg/kg/d)	Acute Reference Exposure Level $(\mu g/m^3)$
7440484	Cobalt	-	-	-		-	-
7440508	Copper	-	-	-	-	-	1.0E+02
1319773	Cresols (mixtures of Cresylic acid	-	-	-	6.0E+02	-	-
98828	Cumene	-	-	-		-	-
110827	Cyclohexane	-	-	-	-	-	-
53703	Dibenz[a,h]anthracene	1.2E-03	4.1E+00	4.1E+00	-	-	-
9901	Diesel Particulate Matter	3.0E-04	1.1E+00	-	5.0E+00	-	-
111422	Diethanolamine	-	-	-	3.0E+00	-	-
1086	Dioxins (as TCDD)						
100414	Ethyl Benzene	2.5E-06	8.7E-03	-	2.0E+03	-	-
74851	Ethylene	-		-		-	
107211	Ethylene Glycol	-	-	-	4.0E+02	-	-
206440	Fluoranthene	-	-	-	-	-	-
86737	Fluorene	-	-	-		-	-
50000	Formaldehyde	6.0E-06	2.1E-02	-	9.0E+00	-	5.5E+01
110543	Hexane	-	-	-	7.0E+03	-	-
74908	Hydrocyanic acid	-		-	9.0E+00	-	3.4E+02
7783064	Hydrogen sulfide	-	-		1.0E+01	-	4.2E+01
67630	Isopropyl Alcohol	-	-	-	7.0E+03	-	3.2E+03
1128	Lead and Compounds	1.2E-05	4.2E-02	8.5E-03	-	-	-
7439965	Manganese and Compounds	-	-	-	9.0E-02	-	-
7439976	Mercury and Compounds	-	-	-	3.0E-02	1.6E-04	6.0E-01
67561	Methanol	-	-	-	4.0E+03	-	2.8E+04
78933	Methyl ethyl ketone	-	-	-	1.0E+00	-	1.3E+04
108101	Methyl isobutyl ketone	-	-	-	-	-	-
1634044	Methyl tert-butyl ether	2.6E-07	1.8E-03	-	8.0E+03	-	-
75092	Methylene Chloride	1.0E-06	3.5E-03	-	4.0E+02	-	1.4E+04
91203	Naphthalene	3.4E-05	1.2E-01	-	9.0E+00	-	-
71363	n-Butyl alcohol	-	-	-	-	-	-
7440020	Nickel	2.6E-04	9.1E-01	-	5.0E-02	5.0E-02	6.0E+00
127184	Perchloroethylene {Tetrachloroethene}	5.9E-06	2.1E-02	-	3.5E+01	-	2.0E+04
85018	Phenanthrene	-	-	-	-	-	-
108952	Phenol	-	-	-	2.0E+02	-	5.8E+03
7723140	Phosphorus	-	-	-	-	-	-
115071	Propylene	-	-	-	3.0E+03	-	-
129000	Pyrene	-	-	-	-	-	
78922	sec-Butyl Alcohol	-	-	-	-	-	-
7782492	Selenium and Compounds	-	-	-	2.0E+01		-

Table 2-1: Dose/Response Values for AB 2588 Compounds

CAS	Pollutant	Cancer Risk Factors			Non-Cancer Health Factors		
		Inhalation Cancer Unit Risk Factor $(\mu g/m^3)^{-1}$	Inhalation Cancer Slope Factor $(mg/kg\text{-}d)^{-1}$	Oral Cancer Slope Factor $(mg/kg\text{-}d)^{-1}$	Inhalation Chronic Reference Exposure Level $(\mu g/m^3)$	Oral Chronic Reference Exposure Level (mg/kg/d)	Acute Reference Exposure Level $(\mu g/m^3)$
7440224	Silver	-	-	-	-	-	-
7664939	Sulfuric Acid	-	-	-	1.0E+00	-	1.2E+02
7440280	Thallium	-	-	-	-	-	-
108883	Toluene	-	-	-	3.0E+02	-	3.7E+04
7440622	Vanadium	-	-	-		-	3.0E+01
1330207	Xylenes (mixed isomers)	-	-	-	7.0E+02	-	2.2E+04
7440666	Zinc (fume or dust)	-	-	-	-	-	-

Table 2-2: TACs without Health Values

CAS	Pollutant
95636	1,2,4-Trimethylbenzene
540841	2,2,4-Trimethylpentane
105679	2,4-Dimethylphenol
91576	2-Methyl naphthalene
83329	Acenaphthene
208968	Acenaphthylene
120127	Anthracene
7440360	Antimony
7440393	Barium
463581	Carbonyl sulfide
7440473	Chromium
7440484	Cobalt
98828	Cumene
110827	Cyclohexane
74851	Ethylene
206440	Fluoranthene
86737	Fluorene
108101	Methyl isobutyl ketone
71363	n-Butyl alcohol
85018	Phenanthrene
7723140	Phosphorus
129000	Pyrene
78922	sec-Butyl Alcohol
7440224	Silver
7440280	Thallium
7440666	Zinc (fume or dust)

3.0 Exposure Assessment

The exposure assessment estimates the potential exposure to the public and determines the ground level concentration of the pollutants using air quality modeling.

3.1 Facility Description

As discussed in the executive summary, the BP Carson refinery (SCAQMD ID: 131003) is a petroleum refinery. The facility is located in the industrial area of Carson, California and is on relatively flat terrain. Figures 1-1 and 1-2 presented in Section 1, Executive Summary, show the location of the facility. A facility plot-plan is provided in Appendix C.

Most of the emissions from BP Carson are volatile organic carbons that remain in a gaseous state when emitted and predominantly cause exposure through the inhalation pathway. A small percentage of semi-volatile organic and toxic metals are emitted as particles that can cause exposures through other pathways such as soil ingestion and dermal exposure. Therefore, the TAC emissions are evaluated for all three pathways discussed above. In addition, other potentially viable pathways such as mother's milk and home-grown produce ingestion are also evaluated for the facility TAC emissions. Pathways such as drinking water, fish or meat ingestion are not considered viable pathways for the facility emissions as the facility emissions are not expected to impact any open waterways (domestic water systems or fish cultivation for consumption) or cattle grazing areas near the facility.

3.2 Emissions Inventory

The emissions considered in this HRA are the emissions reported in the 2006-2007 AER. A total of 72 toxic chemicals were reported in the AER, of which only 46 TACs have health values per the OEHHA's updated health table (OEHHA, February, 2009). The TACs that do not have any health values are listed in Table 2-2. During the development of this HRA, corrections were made to the diesel emission estimation for the internal combustion engines. The sources responsible for the DPM emissions at the facility include four permitted stationary emergency fire water pump engines, one permitted stationary emergency generator, one exempt stationary gas lab knock out engine, thirteen exempt portable engines, and operation of routine and predictable contractor equipment. The DPM emission estimations for the two portable internal combustion engines (cranes), and the permitted stationary IC engines were updated using SCAQMD off-road engine emission factors. The DPM from these engines as reported in the 2006-2007 AER were calculated based on SCAQMD default emission factor of 33.5 pounds per 1000 gallons of diesel used.

This HRA revised the DPM emissions reported in the AER for all the permitted stationary engines by using actual non-emergency operation of the engines during the reporting period and limiting the non-emergency operation of the engines based on Rule 1470 requirements. The stationary engines are limited to a maximum non-emergency operation of 30 hours per year. Since all the stationary engines in this study operated less than 30 hours per year for non-emergency operation, the actual operation of the engine was modeled in the HRA. The DPM emissions were recalculated using equipment and power specific emissions factors for particulate matter, available from the SCAQMD for off-road equipments. These off-road emission factors are developed from CARB's Off-road model and prepared for SCAQMD's "Air Quality Analysis Guidance Handbook" which is to replace the 1993 AQMD approved CEQA Air Quality Handbook. The estimated off-road emission factors are available on the SCAQMD website as supplemental information while the new

handbook is being prepared (http://www.aqmd.gov/ceqa/handbook/offroad/offroad.html). The emission factors are categorized based on equipment category and horse power rating for the average fleet make-up for each year through 2025. The load factor ratings are built into the emission factors to account for variable loads during operation. The DPM emissions from the two maintenance cranes, both with Tier 2 engines and a manufacture's datasheet stating an emission factor of 0.15 grams/bhp-hr at 100% loading were used.

Table 3-1 and Table 3-2 compare the DPM emissions in the AER to the revised emissions using SCAQMD off-road emission factors. The calculated emissions using the revised emission factors result in a reduction in the total DPM emissions from the engines.

Table 3-1: Correction to the DPM Emissions from Emergency Stationary IC Engines

Source	Horse-power	Operating Hours	AER Emissions[1]		Revised Emissions[2]	
			Emission Factor (lb/1000 gal)	DPM Emissions (lb/yr)	Emission Factor (lb/hr)	DPM Emissions (lb/yr)
Fire Water Booster Pump between 7 & 8 CT (Device ID D1970)	515	10.67	33.5	13.45	0.1771	1.89
Fire Water Pump Foam Pump House (Device ID D1998)	400	18.42		25.91	0.1084	2.00
FWPH #1 High Pressure Water Pump (Device ID D1998)	400	24.17		23.32	0.1084	2.62
Clarke Detroit Diesel Firewater Pump - Tank 10 (Device ID D2416)	1000	23.15		51.82	0.4151	9.61
Carson One	755	5.5		-	0.1771	0.97
				Revised Emissions Total (lb/yr) =		**17.09**

[1] 2006-2007 AER emission estimations based on AB2588 Instructions: General Instruction Book for the AQMD 2006-2007 Annual Emissions Reporting Program, Appendix A, Table 2.

[2] SCAQMD Air Quality Analysis Guidance Handbook (in preparation), http://www.aqmd.gov/ceqa/handbook/offroad/offroad.html

Table 3-2: Emissions Correction to the DPM Emissions from Two Portable Cranes

Source	Horse-power	Operating Hours	AER Emissions[1]		Revised Emissions[2]	
			Emission Factor (lb/1000 gal)	DPM Emissions (lb/yr)	Emission Factor (g/bhp-hr)	DPM Emissions (lb/yr)
Daimler Chrysler Crane	231	1587	33.5	913.3	0.112	90.61
Caterpillar Crane (90 Ton)	225	414		25.91	0.115	23.63
				Revised Emissions Total (lb/yr) =		**114.24**

[1] AB2588 Instructions: General Instruction Book for the AQMD 2006-2007 Annual Emissions Reporting Program, Appendix A, Table 2; 2006-2007 Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Emissions Inventory, Supplemental Instructions, June 2007, Table B-2

[2] SCAQMD Air Quality Analysis Guidance Handbook (in preparation), http://www.aqmd.gov/ceqa/handbook/offroad/offroad.html Note: Air Quality Analysis Guidance Handbook is a revision to the CEQA Air Quality Handbook approved by the AQMD Governing Board in 1993 and will replace it.

Table 3-3 represents routine and predictable operations from contracted equipment, per SCAQMD guidance.

Table 3-3 : DPM Emissions from Routine and Predictable Contractor Equipment Operations

Device Name	BHP	Hours of Operation (hr/yr)	lbs/yr	lbs/hr
AtlasCopco Air Compressor (PTS219)	575	1513	134.5476	0.0154
Hertz Rental Light Towers	11.5	35,857	118.9314	0.0136
I/R Air Compressor (185 CFM)	49	384	11.1295	0.0013
I/R Air Compressor I/R (375 CFM)	275	243	13.5238	0.0015
I/R Air Compressor (750 CFM)	275	19	1.0574	0.0001
I/R Air Compressor (825 CFM)	275	223	12.4107	0.0014
I/R Air Compressor I/R (900 CFM)	300	436	24.2649	0.0028
I/R Air Compressor (1300 CFM)	440	10	0.8893	0.0001
I/R Air Compressor (1600 CFM)	605	6,070.5	539.8356	0.0616
Welder 200 amp	39	37	1.1722	0.0001
Welder 250 amp	39	137	4.3404	0.0005
Welder 300 amp	63	1891	59.9100	0.0068
Welder 400 amp	71	1316	41.6930	0.0048
Welder 500 amp	71	978	30.9846	0.0035
Generator (6 kW)	10	8	0.8672	0.0001
Generator (25 kW)	800	48	8.5008	0.0010
Generator (110 kW)	190	-	0	0.0000
Sum		**49,170**	**1004.05**	**0.0992**

Table 3.4 represents DPM emissions from facility operated portable equipment.

Table 3-4: DPM Emissions from Facility Portable Equipment

Rule 219 Exempt Equipment	Output HP	2006-07 Operating Hours	Emissions (lb/year)	Emissions (lb/hr)
GAS Lab Knock Engine #5	4.25	530.6	4.3196	0.0005
Welding Machine Truck 6999	37	17.9	0.5671	0.0001
Welding Machine Truck 7001	37	31.5	0.998	0.0001
Welding Machine Truck 7032	37	30.1	0.9536	0.0001
Welding Machine Truck 7057	37	50.3	1.5936	0.0002
Welding Machine Truck 7059	37	85.5	2.7088	0.0003
Welding Machine Truck 7456	37	127.7	4.0457	0.0005
Welding Machine Truck 7458	37	77.6	2.4585	0.0003
Pioneer 4" Centrifigal Pump - (Behind Blue Barn)	49	60.3	2.2382	--
Blue Barn Portable Sweeper Engine	97	4.8	0.4817	0.0001
Winch Truck Lift Motor (Deutz F2-41011)	48.3	4.7	0.021	--
Winch Truck Lift Motor (Deutz F41011)	48.3	15.4	0.3231	--
Sum		1036.4	20.7089	0.0022

The total annual facility emissions (in lbs/yr and g/s) and maximum hourly facility emissions (in lbs/hr and g/s) by substance is presented in Table 1-1. Detailed TAC emissions by source and substance are presented in Appendix A. Maximum hourly emissions for engines were based on one full hour of engine run time. Sources of air toxic emissions from refinery operations were modeled as point and area sources. A detailed list of modeled point and area sources and their release parameters is presented in Appendix B. The sources at the

facility operate 24 hours per day, and 365 days per year. No emissions scaling or factors were used on operating emissions in this HRA.

3.3 Air Quality Modeling

Air quality modeling was conducted for the emission sources at the facility in accordance with SCAQMD guidelines. Annual and peak 1-hour ground-level air concentrations (expressed in micrograms/cubic-meter) were determined. The multi-source air quality modeling was conducted using the HARP (Version 1.4a), a single integrated software package which integrates air dispersion modeling with risk analysis and mapping capabilities. HARP uses the ISCST3 air dispersion model (version 99155) in its dispersion module. ISCST3 accounts for site-specific terrain, meteorological conditions, and emissions parameters (such as stack exit velocities and temperatures) in order to estimate ambient concentrations.

The ISCST3 dispersion modeling module in HARP was used in the urban mode with model option switches set to non-regulatory default settings, as required by SCAQMD guidance. Because ISCST3 is a single pollutant analysis model, the air dispersion patterns were developed using unit emission rates (1 g/s) for all the emission sources. Table 3-3 shows the summary of the modeling options selected for the HRA. The ground level concentrations for each TAC from all the sources at the maximum impact points are presented in Table 3-4. The output of the ISCST3 modeling analyses was used in the risk assessment module of HARP for characterizing risks and is discussed in Section 4, Risk Characterization. All dispersion modeling inputs and outputs are provided electronically in Appendix B.

Table 3-5: Summary of Modeling Options

Modeling Parameters	Assumption	Comments
Model Control Options		
Use of regulatory default?	No	Calms processing not used
Urban or Rural?	Urban	SCAQMD policy for all air quality impact analyses in its jurisdiction
Gradual Plume Rise?	No	Default
Stack tip downwash?	Yes	Default
Buoyancy induced dispersion?	Yes	Default
Calms processing?	No	Calms processing is inappropriate for SCAQMD meteorological data as ➢ Wind speeds in SCAQMD stations are always 1 m/s or greater and wind direction is always recorded for all wind speeds. ➢ SCAQMD data is site-specific, not NWS data and therefore calms processing is not applicable. ➢ Many sites in the SC Air Basin experience high frequency of calms that correspond with pollutant build-up and therefore this data cannot be eliminated.
Missing data processing?	No	Default
Source Options		

Table 3-5: Summary of Modeling Options

Modeling Parameters	Assumption	Comments
Include building downwash?	Yes	Default
Lowbound option?	No	Default
Meteorology Options		
Meteorological data	Long Beach, 1981	SCAQMD has made available 1981 meteorological datasets for dispersion modeling. The nearest representative meteorological station is chosen for modeling.

Source: Complied from SCAQMD Supplemental Guidelines for HRA, 2005

The methods and requirements used to conduct the air dispersion modeling analysis in HARP for estimating concentrations of toxic air pollutants are presented below.

Meteorological Data

Air dispersion analysis was conducted using one year of hourly meteorological data for Long Beach which is the nearest representative meteorological station. The SCAQMD provides 1981 meteorological data to use in dispersion modeling. The wind-rose for the Long Beach station presented in Figure 3-1 shows a prominent flow of wind from the west which is expected to disperse the pollutants to the east causing higher concentrations in that direction on an annual basis. The results from the risk assessment correlate well with this wind pattern. The meteorological file is provided in Appendix B.

Modeled Sources and Source Parameters

Sources of air toxic emissions from facility operations were modeled as point and area sources. A detailed list of modeled sources and their release parameters are presented in Appendix A.

Terrain

ISCST3 incorporates both simple and complex terrain algorithms that can be enabled to predict ground-level concentrations at receptors below stack height as well as above stack height. The HARP program assigns receptor elevations relative to sea level using United States Geological Survey (USGS) Digital Elevation Model (DEM) data.

Receptors

Two types of receptors were modeled to evaluate health risks: grid receptors were used to define the ZOI and discrete (individual) receptors used to assess points of maximum impact at within areas of anticipated off-site worker and residential exposure, as appropriate, along with actual sensitive receptor locations. The ZOI modeling was performed using evenly spaced grid receptors. The PMI, MEIR, MEIW, sensitive receptor and population cancer burden modeling were performed using discrete receptors, indicating that these are locations associated with individuals or populations and correspond to their actual location. Table 3-5 shows the spacing and the number of receptors modeled. Figures 3-2 and 3-3 show the location of the residential

and off-site worker receptors modeled in the HRA. Receptors are represented on the figures as evenly spaced, orange triangles. Table 3-6 lists the sensitive receptors considered.

Coordinate System

All source and receptor locations were represented in UTM coordinate system using NAD 83 for Zone 11.

Figure 3-1: Wind Rose for Long Beach Meterological Station (1981)

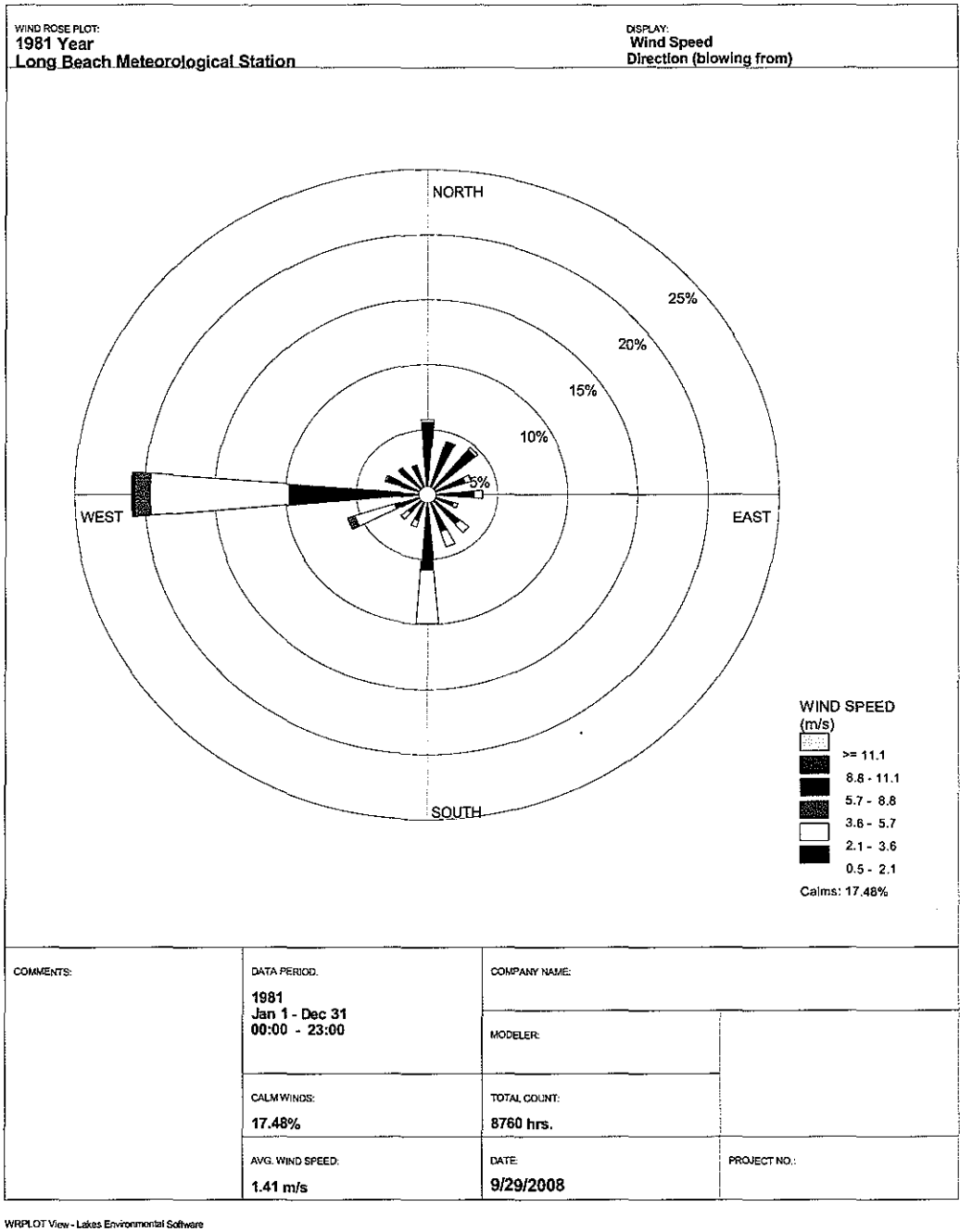


Table 3-6: Ground Level Concentration at the Maximum Impact Points

CAS	Concentration (ug/m^3)								
	Annual Average		Max 1-hr	Annual Average		Max 1-hr	Annual Average		Max 1-hr
	PMI			MEIR			MEIW		
	Cancer	Chronic	Acute	Cancer	Chronic	Acute	Cancer	Chronic	Acute
1128	3.48E-05	2.58E-05	1.42E-03	4.29E-05	4.73E-05	1.06E-03	3.48E-05	2.58E-05	1.42E-03
7439965	1.90E-03	6.96E-04	6.75E-02	1.40E-03	1.34E-03	3.90E-02	1.90E-03	6.96E-04	6.75E-02
7439976	9.33E-06	1.35E-05	4.31E-04	2.52E-05	2.58E-05	6.97E-04	9.33E-06	1.35E-05	4.31E-04
7440020	4.44E-03	4.76E-04	1.46E-01	1.84E-04	1.50E-04	8.26E-03	4.44E-03	4.76E-04	1.46E-01
7440417	1.30E-06	1.05E-06	5.40E-05	1.59E-06	1.77E-06	4.07E-05	1.30E-06	1.05E-06	5.40E-05
7440473	3.23E-03	1.65E-04	1.06E-01	1.28E-04	1.10E-04	6.06E-03	3.23E-03	1.65E-04	1.06E-01
7440508	2.13E-04	8.11E-05	8.01E-03	1.04E-04	1.02E-04	2.45E-03	2.13E-04	8.11E-05	8.01E-03
7440622	2.61E-04	6.74E-04	1.04E-02	6.41E-04	6.53E-04	1.53E-02	2.61E-04	6.74E-04	1.04E-02
7440666	5.17E-02	2.69E-02	2.01E+00	1.78E-02	1.75E-02	2.54E-01	5.17E-02	2.69E-02	2.01E+00
18540299	2.37E-06	2.01E-06	9.71E-05	3.18E-06	3.45E-06	7.86E-05	2.37E-06	2.01E-06	9.71E-05
74851	9.85E-03	7.64E-03	4.02E-01	7.47E-03	7.96E-03	8.73E-02	9.85E-03	7.64E-03	4.02E-01
106990	2.74E-03	1.38E-03	1.45E-01	6.02E-04	5.81E-04	1.12E-02	2.74E-03	1.38E-03	1.45E-01
115071	1.24E-01	6.61E-02	7.76E+00	2.53E-02	2.50E-02	5.88E-01	1.24E-01	6.61E-02	7.76E+00
71432	5.12E-02	4.77E-02	2.43E+00	1.45E-02	1.00E-02	2.27E-01	5.12E-02	4.77E-02	2.43E+00
110543	1.67E-01	1.36E-01	8.44E+00	4.59E-02	3.75E-02	7.61E-01	1.67E-01	1.36E-01	8.44E+00
110827	5.25E-02	4.00E-02	2.57E+00	1.35E-02	1.04E-02	2.39E-01	5.25E-02	4.00E-02	2.57E+00
463581	2.80E-05	2.46E-05	1.13E-03	4.94E-05	3.12E-05	1.38E-03	2.80E-05	2.46E-05	1.13E-03
7783064	1.74E-02	4.44E-02	7.73E-01	2.02E-02	1.92E-02	4.00E-01	1.74E-02	4.44E-02	7.73E-01

Table 3-6: Ground Level Concentration at the Maximum Impact Points

	CAS	Concentra (ug/m^3)								
		Annual Average		Max 1-hr	Annual Average		Max 1-hr	Annual Average		Max 1-hr
		PMI			MEIR			MEIW		
		Cancer	Chronic	Acute	Cancer	Chronic	Acute	Cancer	Chronic	Acute
	108883	2.49E-01	1.72E-01	1.33E+01	7.38E-02	6.30E-02	1.05E+00	2.49E-01	1.72E-01	1.33E+01
	540841	9.25E-02	7.21E-02	3.31E+00	2.33E-02	1.37E-02	3.42E-01	9.25E-02	7.21E-02	3.31E+00
	50000	5.69E-03	4.41E-03	2.92E-01	8.21E-03	8.09E-03	2.03E-01	5.69E-03	4.41E-03	2.92E-01
	67561	6.75E-01	1.28E-01	3.25E+01	1.09E-01	1.38E-01	3.11E+00	6.75E-01	1.28E-01	3.25E+01
	71363	3.10E-04	1.59E-04	1.50E-02	1.02E-04	1.01E-04	1.77E-03	3.10E-04	1.59E-04	1.50E-02
	95636	6.14E-02	8.02E-02	2.75E+00	2.15E-02	1.59E-02	3.02E-01	6.14E-02	8.02E-02	2.75E+00
	100414	3.05E-02	2.59E-02	1.36E+00	8.89E-03	6.74E-03	1.35E-01	3.05E-02	2.59E-02	1.36E+00
	108101	4.65E-03	2.38E-03	1.82E-01	1.53E-03	1.51E-03	2.15E-02	4.65E-03	2.38E-03	1.82E-01
	1330207	1.63E-01	1.36E-01	7.14E+00	5.69E-02	4.67E-02	7.19E-01	1.63E-01	1.36E-01	7.14E+00
	78933	3.43E-02	1.83E-02	1.32E+00	1.19E-02	1.16E-02	1.55E-01	3.43E-02	1.83E-02	1.32E+00
	7440393	4.99E-04	4.12E-04	2.10E-02	5.95E-04	6.13E-04	1.27E-02	4.99E-04	4.12E-04	2.10E-02
	7440439	5.43E-06	7.77E-06	2.65E-04	1.26E-05	1.25E-05	3.31E-04	5.43E-06	7.77E-06	2.65E-04
	7440484	2.48E-04	1.10E-05	8.13E-03	9.97E-06	8.69E-06	4.64E-04	2.48E-04	1.10E-05	8.13E-03
	67663	7.30E-03	8.23E-03	4.19E-01	4.01E-03	3.50E-03	7.05E-02	7.30E-03	8.23E-03	4.19E-01
	91203	3.68E-02	2.70E-02	1.39E+00	9.87E-03	8.90E-03	1.62E-01	3.68E-02	2.70E-02	1.39E+00
	105679	8.82E-08	1.65E-07	4.43E-06	2.86E-08	1.85E-08	3.47E-07	8.82E-08	1.65E-07	4.43E-06
	108952	6.25E-04	8.34E-04	2.83E-02	5.11E-04	4.99E-04	1.14E-02	6.25E-04	8.34E-04	2.83E-02
	111422	7.75E-02	5.06E-01	3.86E+00	7.70E-02	4.79E-02	6.63E-01	7.75E-02	5.06E-01	3.86E+00

Table 3-6: Ground Level Concentration at the Maximum Impact Points

	CAS	Concentration (ug/m^3)								
		Annual Average		Max 1-hr	Annual Average		Max 1-hr	Annual Average		Max 1-hr
		PMI			MEIR			MEIW		
		Cancer	Chronic	Acute	Cancer	Chronic	Acute	Cancer	Chronic	Acute
	1319773	5.55E-04	7.02E-04	2.59E-02	1.20E-04	8.12E-05	2.10E-03	5.55E-04	7.02E-04	2.59E-02
	1634044	1.47E-03	1.36E-04	8.22E-02	5.69E-05	4.29E-05	1.66E-03	1.47E-03	1.36E-04	8.22E-02
	7664417	2.25E-01	2.90E-01	9.61E+00	5.88E-01	6.33E-01	1.66E+01	2.25E-01	2.90E-01	9.61E+00
	85018	7.25E-03	8.55E-03	3.25E-01	1.39E-03	1.12E-03	2.34E-02	7.25E-03	8.55E-03	3.25E-01
	98828	2.60E-03	2.06E-03	1.13E-01	8.05E-04	6.58E-04	1.43E-02	2.60E-03	2.06E-03	1.13E-01
	107211	1.26E-04	1.60E-04	4.38E-03	1.12E-04	9.44E-05	4.49E-04	1.26E-04	1.60E-04	4.38E-03
	127184	5.45E-03	1.50E-03	6.06E-01	8.60E-04	7.58E-04	2.14E-02	5.45E-03	1.50E-03	6.06E-01
	74908	3.13E-03	3.15E-03	1.66E-01	1.74E-03	1.55E-03	3.35E-02	3.13E-03	3.15E-03	1.66E-01
	86737	9.38E-07	9.38E-07	4.54E-05	1.43E-06	1.44E-06	2.88E-05	9.38E-07	9.38E-07	4.54E-05
	7440360	3.01E-05	2.59E-05	1.26E-03	3.73E-05	3.87E-05	7.84E-04	3.01E-05	2.59E-05	1.26E-03
	7782492	1.53E-05	1.71E-05	6.77E-04	3.61E-05	3.70E-05	9.21E-04	1.53E-05	1.71E-05	6.77E-04
	75070	4.83E-03	6.29E-03	2.31E-01	1.17E-02	1.15E-02	2.99E-01	4.83E-03	6.29E-03	2.31E-01
	7664939	4.33E-02	3.08E-02	1.62E+00	7.78E-02	8.57E-02	1.88E+00	4.33E-02	3.08E-02	1.62E+00
	50328	2.58E-08	2.09E-08	1.06E-06	3.18E-08	3.43E-08	7.44E-07	2.58E-08	2.09E-08	1.06E-06
	83329	1.70E-07	1.60E-07	7.14E-06	3.43E-07	3.62E-07	8.13E-06	1.70E-07	1.60E-07	7.14E-06
	91576	2.28E-06	1.82E-06	9.39E-05	2.72E-06	3.04E-06	6.01E-05	2.28E-06	1.82E-06	9.39E-05
	120127	3.04E-07	2.72E-07	1.23E-05	5.30E-07	5.68E-07	1.22E-05	3.04E-07	2.72E-07	1.23E-05
	129000	2.94E-07	2.59E-07	1.17E-05	5.55E-07	5.86E-07	1.33E-05	2.94E-07	2.59E-07	1.17E-05

Table 5-6: Ground Level Concentration at the Maximum Impact Points

	CAS	Concentra (ug/m^3)								
		Annual Average		Max 1-hr	Annual Average		Max 1-hr	Annual Average		Max 1-hr
		PMI			MEIR			MEIW		
		Cancer	Chronic	Acute	Cancer	Chronic	Acute	Cancer	Chronic	Acute
	205992	3.53E-08	2.71E-08	1.39E-06	5.06E-08	5.44E-08	1.22E-06	3.53E-08	2.71E-08	1.39E-06
	206440	2.55E-07	2.25E-07	1.03E-05	4.50E-07	4.78E-07	1.08E-05	2.55E-07	2.25E-07	1.03E-05
	208968	1.75E-07	1.32E-07	7.06E-06	2.40E-07	2.67E-07	5.32E-06	1.75E-07	1.32E-07	7.06E-06
	218019	4.39E-08	3.46E-08	1.74E-06	6.63E-08	7.04E-08	1.65E-06	4.39E-08	3.46E-08	1.74E-06
	7440224	8.43E-05	7.04E-05	3.44E-03	1.07E-04	1.12E-04	2.25E-03	8.43E-05	7.04E-05	3.44E-03
	7440280	3.03E-04	2.53E-04	1.23E-02	3.86E-04	4.02E-04	8.07E-03	3.03E-04	2.53E-04	1.23E-02
	7440382	7.21E-06	8.10E-06	3.19E-04	1.37E-05	1.43E-05	3.64E-04	7.21E-06	8.10E-06	3.19E-04
	7723140	3.36E-05	2.81E-05	1.37E-03	4.28E-05	4.46E-05	8.96E-04	3.36E-05	2.81E-05	1.37E-03
	107028	3.74E-04	8.16E-04	2.27E-02	1.60E-03	1.52E-03	4.45E-02	3.74E-04	8.16E-04	2.27E-02
	1086	1.71E-12	6.06E-12	1.07E-10	1.22E-11	1.15E-11	3.37E-10	1.71E-12	6.06E-12	1.07E-10
	53703	1.71E-12	6.05E-12	1.07E-10	1.22E-11	1.15E-11	3.37E-10	1.71E-12	6.05E-12	1.07E-10
	56553	6.55E-09	2.79E-09	2.09E-07	1.96E-08	2.10E-08	4.70E-07	6.55E-09	2.79E-09	2.09E-07
	75150	1.42E-03	1.29E-04	2.30E-01	1.19E-04	8.20E-05	4.71E-03	1.42E-03	1.29E-04	2.30E-01
	67630	1.86E-02	1.35E-03	3.08E+00	7.71E-04	5.79E-04	4.00E-02	1.86E-02	1.35E-03	3.08E+00
	78922	9.16E-02	6.63E-03	1.51E+01	3.79E-03	2.84E-03	1.97E-01	9.16E-02	6.63E-03	1.51E+01
	75092	2.10E-02	2.61E-02	7.33E-01	1.89E-02	1.59E-02	7.29E-02	2.10E-02	2.61E-02	7.33E-01
	9901	5.69E-02	2.20E-02	8.37E+00	2.10E-02	1.75E-02	1.33E+00	5.69E-02	2.20E-02	8.37E+00
	1332214	1.09E-06	2.23E-07	2.87E-05	9.50E-08	5.38E-08	2.48E-06	1.09E-06	2.23E-07	2.87E-05

Table 3-7: Receptor Spacing

Receptor Type	Spacing	No. of Receptors Modeled
Boundary	50 m	159
Grid	250 m	6561
Residential	100 m	464
Worker	100 m	899
Sensitive	Not Applicable	21

Table 3-8: Sensitive Receptors Included in the HRA

Number	HARP Receptor ID	Receptor Name	Type	UTM Easting (km) [a]	UTM Northing (km) [a]
1	1376	Robinson (Jackie) School	School	389.628	3741.3412
2	1377	Oakwood Academy	School	389.8893	3741.8369
3	1378	Muir Elementary School	School	387.9126	3742.0287
4	1379	Broad Avenue Elementary School	School	383.1575	3740.8003
5	1380	Phineas Banning Senior High School	School	383.2876	3740.0319
6	1381	Webster Elementary School	School	387.4599	3742.4369
7	1382	Long Beach Brethren Elementary School	School	390.1426	3743.1897
8	1383	Long Beach Head Start	School	391.1248	3741.6948
9	1384	Long Beach Unified School District	School	391.2148	3742.2994
10	1385	Holy Family School	School	384.3988	3739.3647
11	1386	Wilmington Christian School	School	383.004	3740.6583
12	1387	Old King Cole Day Care	Day Care	388.8477	3742.5275
13	1388	Pacific Hospital of Long Beach	Hospital	389.5867	3741.419
14	1389	Miller Children's Hospital	Hospital	390.1205	3741.5215
15	1390	Santa Fe Convalescent Hospital	Hospital	387.5417	3742.485
16	1391	Hillcrest Care Center	Care Center	389.3433	3742.8181
17	1392	The Palmcrest Grand Care Center, Inc	Care Center	389.2793	3742.9796
18	1393	Memorial Heart Institute	Hospital	390.1205	3741.5215
19	1394	Jonathan Jaques Children's Center	Hospital	390.3453	3741.55
20	1395	Royal Care Skilled Nursing	Care Center	389.48	3741.3568
21	1396	Medical Sisters-Saint Joseph	Hospital	390.9124	3743.1734

[a] UTM Zone 11, NAD83, GRS80

Figure 3-2: Location of Modeled Residential Receptors

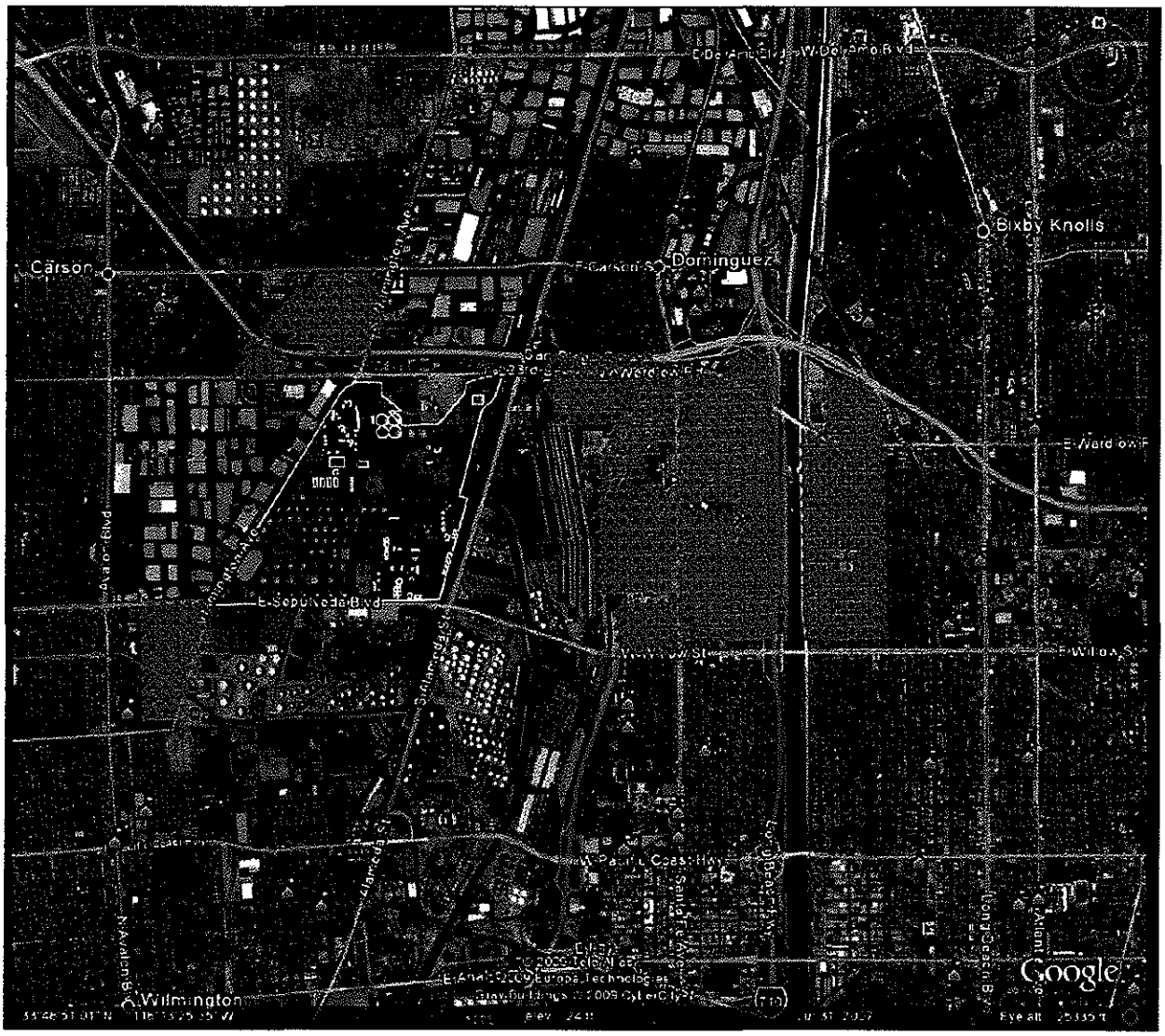


Figure 3-3: Location of Modeled Worker Receptors

4.0 Risk Characterization

This HRA evaluated cancer risk (multi-pathway analysis), non-cancer acute and chronic HIs for residential, off-site worker, sensitive receptor locations and identified points of maximum impact and excess population cancer burden. The HRA evaluated cancer risk and non-cancer health hazards using the risk module of the HARP model based on the annual average and peak one-hour ground level concentrations predicted from the dispersion module. Carcinogenic risks and potential non-carcinogenic chronic health effects were calculated using the annual ground level concentrations while the acute non-cancer health hazards were determined using the predicted maximum one-hour ground level concentrations. Chemical substance toxicity factors used in this analysis were obtained from the list of approved health values by the OEHHA and the CARB for use in facility health risk assessments conducted for the AB2588 Air Toxics Hot Spots Program (OEHHA, 2008). The approved health values are incorporated into HARP Version 1.4a. All HARP risk modeling files are presented electronically in Appendix B.

The following HARP modeling options were used for the risk analysis to estimate cancer and non-cancer impacts at the maximum exposed points.

- 70-year Resident Cancer Risk – Derived (Adjusted) Method
- Worker Cancer Risk – Point Estimate
- 9-year Child Cancer Risk – Derived (OEHHA) Method
- Chronic Hazard Index – Derived (OEHHA) Method
- Acute Hazard Index – Acute Simple HI (Concurrent max)

The exposure pathways that were analyzed consisted of all pathways recommended for a health risk assessment. Exposure pathways that were enabled include homegrown produce, dermal absorption, soil ingestion, and mother's milk in addition to the inhalation pathway. Exposure routes for the ingestion of local fish, poultry, or livestock and drinking water were not considered in this risk analysis because there are no such areas within BP Carson's area of influence.

Cancer Risk Assessment Methodology

The HRA analysis included estimates of health risks associated with long-term exposures resulting from emissions of carcinogenic agents. The maximum individual residential and sensitive receptor excess cancer risk is an estimate of the highest increased cancer risk any off-site resident or sensitive receptor location can expect from a lifetime (70 years) of exposure to continuous emissions of toxic air contaminants from the facility. The maximum individual off-site worker excess cancer risk is an estimate of the highest increased cancer risk any off-site worker can expect from a 40-year exposure to continuous emissions of toxic air contaminants from the facility. The actual risks are not expected to be any higher than the predicted risks and are likely to be substantially lower. The cancer risk due to inhalation of toxic air contaminants is estimated in HARP by calculating the dose of each air toxic and multiplying the dose by the inhalation cancer potency factor for each air toxic. HARP also performs non-inhalation dose calculations for multi-pathway air toxics and determines the cancer risk due to non-inhalation pathways of exposure. For a

multi-pathway assessment of cancer risk, HARP calculated the individual excess cancer risk by summing the contributions due to inhalation and non-inhalation pathways.

Non-Cancer Hazard Index Assessment Methodology

Non-cancer health effects can be either due to chronic (long-term) or acute (short-term) exposures. In determining potential non-cancer health impacts from air toxics, it is assumed that there is a dose of the chemical of concern below which there would be no impact on human health. The air concentration corresponding to this dose is called the reference exposure level. Non-cancer health risks are measured in terms of a multi-pathway HI (using all applicable exposure pathways) which is the calculated exposure of each contaminant divided by its REL. Hazard indices for those pollutants affecting the same target organ are summed, with the resulting totals expressed as hazard indices for each organ system.

Chronic toxicity is defined as adverse health effects from prolonged chemical exposure caused by chemicals accumulating in the body. Because chemical accumulation to toxic levels typically occurs slowly, symptoms of chronic effects usually do not appear until long after exposure commences. The potential for chronic health effects was evaluated in HARP by comparing the long-term exposure level from all pathways for each pollutant with the acceptable long-term exposure level for that substance. Acute toxicity is defined as adverse health effects caused by a short-term chemical exposure of no more than 24 hours. For most chemicals, the exposure required to produce acute effects is higher than levels required for causing chronic effects due to shorter exposure duration. The potential for acute health effects was evaluated by comparing the short-term exposure level from inhalation for each substance with the acceptable short-term exposure level for that substance. The acute HI is based on the maximum one-hour emissions and modeling results. The chronic HI is based on the annual average emissions and modeling results.

This HRA identifies cancer risk, and chronic and acute hazards indices for the following criteria or locations:

- Health Risk Levels at the Points of Maximum Impact
- Health Risk Levels at the Maximum Exposed Individuals
- Health Risk Levels at Selected Offsite Sensitive Receptors
- Population-wide Health Risk Impact Levels for Cancer Risk
- The Zone of Impact for Health Effects

Points of Maximum Impact

The PMI for cancer risk is equivalent to the highest individual excess cancer risk value occurring at any location on or outside the facility property boundary, assuming a 70-year exposure to facility emissions. The point of maximum impact for each health effect was identified using fenceline receptors at 50-meter spacing, and an additional 250-meter grid extending out 10 kilometers from the facility fenceline. This was done to ensure that the area(s) with highest impact were identified for cancer risk and acute and chronic hazard indices. The grid spacing of 250 meters was chosen to keep the number of receptors to a reasonable number while still providing an adequate resolution for identifying the PMI. As discussed later in this report, the PMI occurred near the fenceline with receptors placed every 50 meters.

Maximum Exposed Individuals

The location of the offsite MEIR and MEIW area were identified based on Google Maps, USGS topographic maps, and aerial photographs. Additional receptors were added in the areas of maximum downwind concentrations to demonstrate that the maximum exposure locations were identified and modeled. A total of 464 residential and 899 off-site worker receptors were identified as potential maximum exposure candidates. There are many more off-site worker receptors within the ZOI because the area surrounding the facility is mainly industrial. Figures 3-2 and 3-3 (see Section 3, Exposure Assessment) illustrate the residential and off-site worker receptors used to identify the MEIR and MEIW. Receptors are represented by the orange triangle on the figure.

Sensitive Receptors

A total of 21 sensitive receptors were identified within the ZOI. The locations of the offsite sensitive receptors were identified based on Google Maps, and aerial photographs. A list of potential off-site sensitive receptors used is provided in Section 3, Exposure Assessment (Table 3-6).

Population Excess Cancer Burden

Cancer risk was assessed for the population of residents and off-site worker areas located within the ZOI. Residential and off-site worker population data available in HARP includes a population-weighted center, or centroid; a single location that may be used to represent the population within the census tract. The census tracts are located within the cancer risk ZOI. The cancer burden was calculated by multiplying the total excess lifetime cancer risk at the centroid location by the number of persons in the population census tract. Excess cancer burden for residents was determined using a lifetime (70 years) exposure. Population burden estimates for non-cancer health hazards are not required. The assessed census tracts, population centroid locations, and number of individuals within the census tracts are provided in Appendix B.3.

Zone of Study

In accordance with SCAQMD guidelines the ZOI was defined as the geographic area within which the total excess lifetime cancer risk to all emitted carcinogens is one-in-a-million or greater, or a chronic or acute HI of 0.5 or greater. The ZOI is used to identify the extent of the health impacts (i.e., the boundaries on the analysis) from the facility.

4.1 Cancer Risk Estimates

Table 4-1 presents a summary of the cancer risk impact levels at the maximum impact points. The PMI, MEIR and MEIW for cancer risk are shown in Figure 1-2 in Section 1, Executive Summary.

Table 4-1 Cancer Risk Maximum Impact Points

Receptor	UTM Easting (m) [a]	UTM Northing (m) [a]	Maximum Cancer Risk (per million)
PMI	385003.51	3741425.84	20.9
MEIR	386977.08	3742586.44	8.6
MEIW	385003.51	3741425.84	4.6
Sensitive	387459.9	3742436.9	1.4
[a] UTM Zone 11, NAD83, GRS80			

Point of Maximum Impact

Cancer risk at the PMI is 20.9-in-one million. The PMI is located along the southern fenceline of the facility. No individual is actually located at this exposure point for the 70-year exposure period required for the PMI estimate. Contributions by inhalation and non-inhalation pathways to the total risk at the PMI by source and by pollutant are presented in Tables 4-2 and 4-3, respectively. As can be seen, a number of sources contribute primarily to the near-field cancer risk at the PMI.

Table 4-2: Source Contribution to Cancer Risks at the PMI

Source	Inhalation Pathway	Non-Inhalation Pathway					Total Cancer Risk	Source Contribution
		Dermal	Soil	Mother's Milk	Home Grown Vegetables	Oral		
Portable ICEs South >250 HP	1.11E-05	--	--	--	--	--	1.11E-05	50.24%
Portable ICEs South < 250 HP	2.42E-06	--	--	--	--	--	2.42E-06	11.58%
Portable ICEs North >250 HP	2.26E-06	--	--	--	--	--	2.26E-06	10.81%
Weld-Welding	1.06E-06	--	--	--	--	--	1.06E-06	5.07%
Portable ICEs North < 250 HP	8.29E-07	--	--	--	--	--	8.29E-07	3.97%
Area 67 N - Fugitives - 1 Pump Slab	5.34E-07	--	--	--	--	--	5.34E-07	2.56%
Area 31 - Fugitives - Alky	2.17E-07	--	--	--	--	--	2.17E-07	1.04%
S/H Test ICE	1.83E-07	--	--	--	--	--	1.83E-07	0.88%
Hydrocracker	1.35E-07	--	--	--	--	--	1.35E-07	0.65%
Fix Roof Tank No. 62	1.22E-07	--	--	--	--	--	1.22E-07	0.58%
Heaters (combined)	2.49E-07	2.51E-09	2.09E-08	7.65E-11	1.14E-08	3.48E-08	2.84E-07	1.36%
Tanks (combined)	7.67E-07	0	0	0	0	0	7.67E-07	3.67%
Fugitives (combined)	8.35E-07	0	0	0	0	0	8.35E-07	4.70%
Equipment (combined)	5.67E-07	3.33E-11	4.34E-10	0	2.6E-10	7.26E-10	5.68E-07	2.72%

ility Emergency IC Engine Total	1.48E-07	–	–	–	–	–	1.48E-07	0.71
SUM	**2.08E-05**	**3.60E-09**	**3.01E-08**	**6.31E-11**	**5.67E-09**	**3.94E-08**	**2.09E-05**	**100.0%**

Table 4-3: Pollutant Contribution to Cancer Risk at the PMI

Pollutant	Inhalation Pathway	Non-Inhalation Pathway					Total Cancer Risk	Source Contribution
		Dermal	Soil	Mother's Milk	Home Grown Vegetables	Oral		
Diesel Exhaust PM	1.71E-05	–	–	–	–	–	1.71E-05	77.99%
Benzene	1.33E-06	–	–	–	–	–	1.33E-06	6.36%
Naphthalene	1.15E-06	–	–	–	–	–	1.15E-06	5.50%
Nickel	1.05E-06	–	–	–	–	–	1.05E-06	5.02%
1,3-Butadiene	4.27E-07	–	–	–	–	–	4.27E-07	2.04%
Cr(VI)	3.14E-07	–	–	–	–	–	3.14E-07	1.50%
Arsenic	2.25E-08	3.54E-09	2.92E-08	–	1.55E-08	4.82E-08	7.07E-08	0.34%
Ethyl Benzene	6.90E-08	–	–	–	–	–	6.90E-08	0.30%
Asbestos	6.26E-08	–	–	–	–	–	6.26E-08	0.29%
Other Pollutants	1.53E-07	5.95E-11	8.55E-10	6.31E-11	3.02E-10	1.28E-09	1.54E-07	0.74%
SUM	**2.08E-05**	**3.60E-09**	**3.01E-08**	**6.31E-11**	**5.67E-09**	**3.94E-08**	**2.09E-05**	**100.0%**

Maximum Exposed Individual Resident (MEIR)

Cancer risk at the MEIR is 8.6 in-one million. The MEIR is located within the residential receptor grid to the east of the facility. Contributions by inhalation and non-inhalation pathways to the total risk at the MEIR by pollutant and by source are presented in Section 1, Executive Summary. Approximately 77.2 percent of the risk at the MEIR is due to emissions from portable IC engines and contractor equipment (Table 1-5). Emissions of diesel particulate matter contribute to approximately 77.7 percent of the MEIR cancer risk, followed by emissions of hexavalent chromium (5.5%), benzene (4.9%), and naphthalene (3.9%) (Table 1-6).

Maximum Exposed Individual Worker (MEIW)

The cancer risk at the MEIW is approximately 4.6-in-one million. The MEIW is located adjacent to the southern fenceline of the facility. Contributions by inhalation and non-inhalation pathways to the total risk at the MEIW by pollutant and by source are presented in Section 1, Executive Summary. At the MEIW, approximately 76.4% of the cancer risk was attributed to emissions from portable IC engine's (including routine and predictable contractor operation and facility stationary and portable IC engine's) followed by approximately 5% from welding (Table 1-7). Diesel particulate matter emissions contributed to approximately 77.5% of the total cancer risk followed by benzene emissions at 6.3% (Table 1-8).

Sensitive Receptors

Cancer risk at the maximum exposed sensitive receptor is 1.4-in-one million. The maximum exposed sensitive receptor is the Webster Elementary School which lies to the east of the facility. Table 4-4 and 4-5 present the source and the pollutant contributions at the maximum exposed sensitive receptor by pollutant and source. Approximately 64.6 percent of the cancer risk at the sensitive receptor is due to emissions from routine and predictable contractor operations and facility portable and stationary IC engines.

Table 4-4: Source Contribution to Cancer Risk at the Maximum Exposed Sensitive Receptor

Source	Inhalation Pathway	Non-Inhalation Pathway					Total Cancer Risk	Source Contribution
		Dermal	Soil	Mother's Milk	Home Grown Vegetables	Oral		
Portable ICEs North >250 HP	4.35E-07	--	--	--	--	--	4.35E-07	31.99%
Heaters/Incinerators (combined)	1.59E-07	2.91E-08	3.78E-08	--	--	2.26E-07	2.93E-07	16.61%
Portable ICEs South >250 HP	1.77E-07	--	--	--	--	--	1.77E-07	13.01%
Fugitives (combined)	1.44E-07	5.26E-15	2.28E-13	--	--	2.33E-13	1.44E-07	10.59%
Portable ICEs South <250 HP	1.38E-07	--	--	--	--	--	1.38E-07	10.15%
Portable ICEs North <250 HP	1.73E-08	--	--	--	--	--	1.29E-07	9.49%
Tanks (combined)	7.29E-08	--	--	--	-	--	7.29E-08	5.36%
Other Equipment	2.36E-08	1.04E-12	4.53E-11	--	--	4.63E-11	2.37E-08	1.74%
Facility Emergency IC Engine Total	9.14E-09	--	--	--	--	--	9.14E-09	0.67%
SUM	**1.29E-06**	**2.92E-07**	**3.81E-08**	**--**	**--**	**6.72E-08**	**1.36E-06**	**100.0%**

Table 4-5: Pollutant Contribution to Cancer Risk at the Maximum Exposed Sensitive Receptor

Pollutant	Inhalation Pathway	Non-Inhalation Pathway					Total Cancer Risk	Source Contribution
		Dermal	Soil	Mother's Milk	Home Grown Vegetables	Oral		
Diesel Exhaust PM	8.88E-07	--	--	--	--	--	8.88E-07	65.29%
Cr(VI)	1.13E-07	--	--	--	--	--	1.13E-07	8.31%
Benzene	1.05E-07	--	--	--	--	--	1.05E-07	7.72%
Naphthalene	8.19E-07	--	--	--	--	--	8.19E-07	6.02%
Arsenic	9.24E-09	2.86E-08	3.68E-08	--	4.07E-09	6.95E-08	7.87E-07	5.79%
1,3-Butadiene	2.49E-08	--	--	--	--	--	2.49E-08	1.83%
Cadmium	1.40E-08	--	--	--	--	--	1.40E-08	1.03%
Nickel	1.29E-08	--	--	--	--	--	1.29E-08	0.95%
Formaldehyde	1.24E-08	--	--	--	--	--	1.24E-08	0.91%
Other Pollutants	1.88E-08	6.04E-10	1.18E-09	5.98E-10	2.46E-09	2.12E-08	1.88E-08	1.56%
SUM	**1.29E-06**	**2.92E-07**	**3.81E-08**	**7.59E-11**	**1.17E-08**	**6.72E-08**	**1.36E-06**	**100.0%**

4.2 Non-Carcinogenic Chronic Health Effects

The maximum chronic HI at the maximum impact points are shown in Section 1, Executive Summary (see Table 1-4). The PMI and MEIW are located south of the facility, and the MEIR is located east of the facility. The maximum chronic HI endpoint is the respiratory system. Nickel, sulfuric acid and arsenic emissions are the primary contributors to chronic HI at the PMI (approximately 88.6 percent). Because these risks are all well below public notification and significance health risk levels, detailed tables by source and pollutant contributions are not presented.

4.3 Non-Carcinogenic Acute Health Effects

The acute HI at the maximum impact points are shown in Section 1, Executive Summary (see Table 1-4). The PMI is located along the south fenceline of the facility. The MEIR is located in the residential area to the northeast of the facility, while the MEIW is located south of the facility. Because the acute risks for the MEIR and MEIW are all well below the public notification and significance health risk levels, detailed tables by source and pollutant contributions are not presented.

4.4 Population Cancer Burden

Population cancer burden is the population-weighted number of excess cancer cases based on the population within the ZOI. The population excess cancer burden was calculated for residential receptors within the ZOI and is estimated at approximately 2.32E-01. A summary of the excess cancer burden estimate is presented in Table 4-6.

Table 4-6: Summary of Cancer Risk Population Exposure Estimates

Estimated Number of Persons Exposed	Cancer Risk (per million)	Total Cancer Burden[1] (# of Cancer Cases)
92,204	1-10	2.32 E-01
0	10-100	–
0	>100	n/a
[1] The cancer burden is the estimated number of excess cancer cases expected from a 70-year exposure to the modeled facility emissions.		

4.5 Zone of Impact

The one-in-one million (1.0×10^{-6}) cancer risk ZOI extends approximately 4.3 miles to the east from the facility. The ZOI was determined using a 70-year residential exposure period. A plot of the one-in-one million cancer risk isopleth is presented as Figure 1-2 in Section 1, Executive Summary. A plot of ten-in-one million cancer risk isopleth for a 70-year residential exposure is shown in Figure 1-3. There is no ZOI for chronic or acute health effects because grid receptor impacts were below the threshold level of 0.5. Accordingly, no isopleth maps were developed for these non-cancer health effects.

5.0 Uncertainty Analysis

Sources of uncertainty in the assessment of risks include emissions estimates, dispersion modeling, exposure characteristics and extrapolation of toxicity data in animals to humans used to develop unit risk factors (cancer) and RELs (non-cancer). To address this uncertainty, highly conservative assumptions were used in this HRA, as discussed below. In aggregate, these assumptions overestimate the predicted risks such that actual risks are unlikely to be higher, but could be considerably lower or non-existent.

Air Dispersion Modeling

In general, EPA-dispersion models such as HARP (used in this HRA) are designed to over-predict concentrations rather than under-predict. For example, the model algorithms assume chemical emissions are not transformed in the atmosphere into other chemical compounds (e.g., photochemical reactions). For certain pollutants, conversion may occur quickly enough to reduce concentrations substantially.

Exposure Assessment

Important uncertainties related to exposure include the identification of exposed populations and their exposure characteristics. The choice of a "residential" MEI is very conservative in the sense that no real person is likely to spend 24 hours a day, 365 days a year over a 70-year period at exactly the point of highest toxicity-weighted annual average air concentration.

Toxicity Assessment

Another area of uncertainty is in the use of toxicity data in risk estimation. Estimates of toxicity for the HRA obtained from OEHHA are conservative compilations of toxicity information. Toxicity estimates are derived either from observations in humans or from projections derived from experiments with laboratory animals. When toxicity estimates are derived from animal data, they usually involve extra safety factors to account for

possibly greater sensitivity in humans, and the less-than-human-lifetime observations in animals. Overall, the chemical toxicity factors (e.g., unit risk factors and RELs) used in this HRA are biased toward over-estimating risk. The amount of the bias is unknown, but could be substantial.

DPM Unit Risk Factor

The DPM inhalation potency factor is a best-estimate value established by the Air Resources Board (ARB) Scientific Review Panel (SRP) based on review of more than 30 DPM exposure studies. The established potency risk factor is a 95th percentile upper confidence limit value, meaning that there is only a five percent chance that the value is underestimated (too low). The most significant of these studies reviewed by the SRP are occupational studies of exposure to DPM by railroad workers. The occupational results were then extrapolated to the general population, which may include more sensitive individuals than the railroad workers evaluated in the study (ARB, 2004a).

6.0 References

California Air Pollution Control Officers Association (CAPCOA), 1993. Air Toxics "Hot Spots" Program: Revised 1992 Risk Assessment Guidelines.

California ARB, 2008. HARP Version 1.4a, July.

Office of Environmental Health Hazard Assessment (OEHHA), 2008. Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, June.

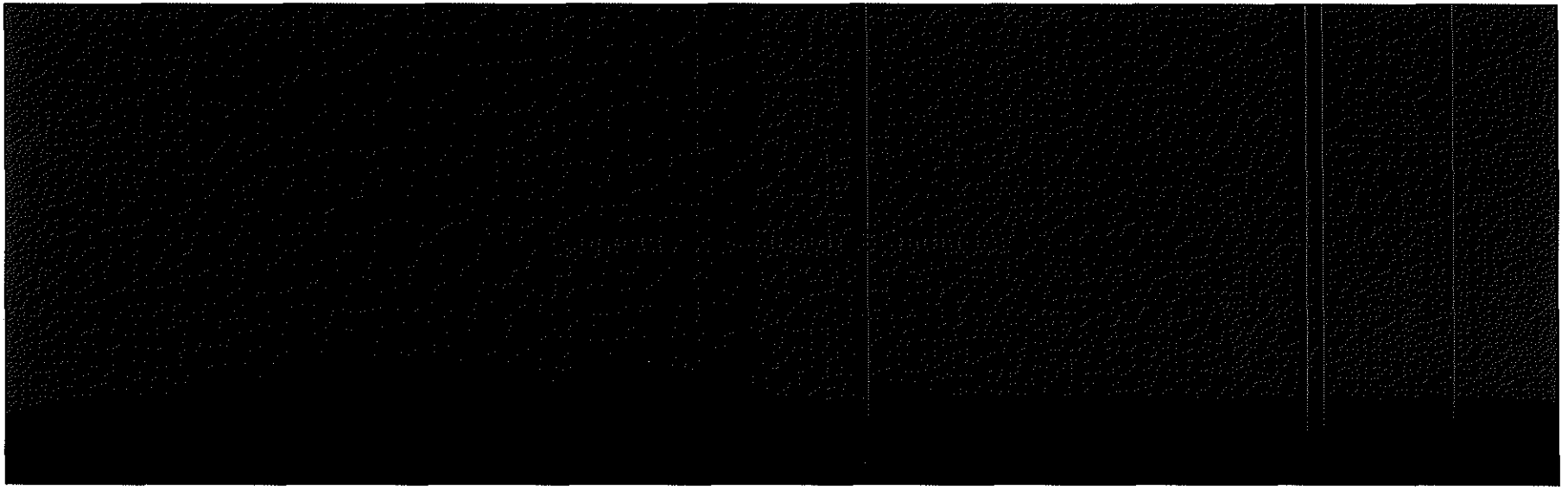
OEHHA, 2003. Air Toxics Hotspots Program Guidance Manual for Preparation of Health Risk Assessments. August.

South Coast Air Quality Management District (SCAQMD), "Off-road Mobile Source Emission Factors (Scenario Years 2007-2025)", (http://www.aqmd.gov/cega/handbook/offroad/offroad.html, Last accessed 2008).

SCAQMD, 2005, "Supplemental Guidelines for Preparing Risk Assessments to Comply with the Air Toxics "Hot Spots" Information and Assessment Act (AB2588)", July.

Appendix A Emissions by Source and Substance

BP Carson Refinery
AB2588 HRA Report
September 2009



Emissions Summary - HARP Output		
HOTSPOTS ANALYSIS AND REPORTING SYSTEM		
FACILITY SUMMARY - ALL REPORTED SUBSTANCES		
BP Carson Refinery		
	Emittent	Emissions (lb/yr)
1,2,4-Trimethlybenezene	95636	1949.295
1,3-Butadiene	106990	65.04
2,2,4-Trimethylpentane	540841	2253.555
2,4-Dimethylphenol {2,4-Xylenol}	105679	1.92E-03
2-Methyl naphthalene	91576	0.758
Acenaphthene	83329	0.158
Acenaphthylene	208968	7.84E-02
Acetaldehyde	75070	6602.952
Acrolein	107028	1139.675
Ammonia	7664417	3.80E+05
Anthracene	120127	0.222
Antimony	7440360	9.691
Arsenic	7440382	7.044
Asbestos	1332214	4.842
Barium	7440393	179.012
Benz[a]anthracene	56553	1.03E-02
Benzene	71432	1487.057
Benzo[a]pyrene	50328	9.71E-03
Benzo[b]fluoranthene	205992	1.87E-02
Beryllium	7440417	0.563
Cadmium	7440439	7.03
Carbon disulfide	75150	48.684
Carbonyl sulfide	463581	23.627
Chloroform	67663	552.641
Chromium	7440473	60.632
Chromium, hexavalent (& compounds)	18540299	1.354
Chrysene	218019	2.66E-02
Cobalt	7440484	4.895
Copper	7440508	38.221
Cresols (mixtures of) {Cresylic acid}	1319773	12.731
Cumene	98828	105.473
Cyclohexane	110827	1600.433
Dibenz[a,h]anthracene	53703	8.79E-06
Diesel engine exhaust, particulate matter	9901	1160.846
Diethanolamine	111422	3619.832
Dioxins, total, w/o individ. isomers reporte	1086	8.80E-06
Ethyl benzene	100414	889.692
Ethylene	74851	518.16
Ethylene glycol	107211	6.259
Fluoranthene	206440	0.197
Fluorene	86737	0.478
Formaldehyde	50000	4190.95
Hexane	110543	4955.727
Hydrocyanic acid	74908	595.535
Hydrogen sulfide	7783064	4962.377
Isopropyl alcohol	67630	253.493

Lead compounds (inorganic)	1128	16.038
Manganese	7439965	932.408
Mercury	7439976	15.534
Methanol	67561	2.48E+04
Methyl ethyl ketone {2-Butanone}	78933	1133.938
Methyl isobutyl ketone {Hexone}	108101	151.053
Methyl tert-butyl ether	1634044	10.039
Methylene chloride {Dichloromethane}	75092	1055.38
Naphthalene	91203	987.17
n-Butyl alcohol	71363	10.09
Nickel	7440020	77.067
Perchloroethylene {Tetrachloroethene}	127184	147.647
Phenanthrene	85018	132.708
Phenol	108952	143.547
Phosphorus	7723140	11.398
Propylene	115071	4774.12
Pyrene	129000	0.251
sec-Butyl alcohol	78922	1245.719
Selenium	7782492	19.336
Silver	7440224	28.585
Sulfuric acid	7664939	3.51E+04
Thallium	7440280	102.621
Toluene	108883	7292.914
Vanadium (fume or dust)	7440622	330.275
Xylenes (mixed)	1330207	4799.469
Zinc	7440666	1955.154

(NOTE 1: emissions in LBS/YR for toxics, TONS/YR for criteria pollutants, CURRIES/YR for radionuclides)

Table 1: Emergency IC Engine Emissions (AER and Revised)

Device Name	AQMD Device ID	Type	Bhp	2006-2007 Fuel Use (Mgal)	Emission Factor (lbs/1000 gallons)	Revised Emission Factor (lb/hr)[1]	Non-emergency operation (hrs) provided by BP	Annual DPM Emissions based on 1470 Rule Limit of 20 hours	Max Hourly DPM Emissions (lb/hr)
Permitted IC Engines					**33.5**				
Mobil "Hotsy" hot soap water #00386	D1288		18	0.0000	0				
Fire Water Booster Pump between 7 & 8 CT	D1970	Stationary	515	0.4016	13.4523	0.1771	10.67	**1.89**	0.1771
Fire Water Pump Foam Pump House	D1997	Stationary	400	0.7734	25.9086	0.1084	18.42	**2.00**	0.1084
FWPH #1 High Pressure Water Pump	D1998	Stationary	400	0.6961	23.3180	0.1084	18.47	**2.00**	0.1084
Firewater Pump - NE Tank Farm Driver for P5	D1999	Stationary	113	--					
Air Compressor (Model # NTA-855-C450)	D2000	Stationary	435	--					
Clarke Detroit Diesel Firewater Pump - Tank 10	D2416	Stationary	1000	1.5468	51.8171	0.4151	23.15	**9.61**	0.4151
Catepillar 800 HP Portable Firewater pump	D2417	Portable	870	0.0000	0.0000				
Catepillar 800 HP Portable Firewater pump	D2418	Portable	870	0.0000	0.0000				
Carson One 755 HP Emergency ICE	D2859	Stationary	755			0.1771	5.5	**0.97**	0.1771
				AER Total DPM (lb/yr) =	**114.495965**		**Revised Total DPM (lb/yr) =**	**16.47**	**0.9861**

Notes* 1. SCAQMD Off-road emission factors were used to calculate the revised DPM emissions.

Table 2: Contractor Equipment Emissions

Equipment	Output HP	Average Annual Operating Hours	Emergency or Non-Routine Use Factor[1] (%)	Emergency Operating Hours	Annual Routine Operating Hours	Emission Factor (lbs/hr)[2]	Average Annual Emissions (lbs/yr)
Rule 219 - Diesel (Rental)							
AtlasCopco Air Compressor (PTS219)	575	1,513	0%	-	1,513	0.0889	134.55
Hertz Rental Light Towers	11.5	38,556	7%	2,699	35,857	0.0033	118.93
I/R Air Compressor I/R (185 CFM)	49	384	0%	-	384	0.0290	11.13
I/R Air Compressor I/R (375 CFM)	275	243	0%	-	243	0.0557	13.52
I/R Air Compressor I/R (750 CFM)	275	19	0%	-	19	0.0557	1.07
I/R Air Compressor (825 CFM)	275	223		-		0.0557	-
I/R Air Compressor I/R (900 CFM)	300	436	0%	-	436	0.0557	24.26
I/R Air Compressor (1300 CFM)	440	10	0%	-	10	0.0889	0.89
I/R Air Compressor I/R (1600 CFM)[4]	605	6,071	0%	-	6,071	0.0889	539.84
Welder 200 amp	39	39	5%	2	37	0.0317	1.17
Welder 250 amp	39	144	5%	7	137	0.0317	4.33
Welder 300 amp	63	1,990	5%	100	1,891	0.0317	59.90
Welder 400 amp	71	1,385	5%	69	1,316	0.0317	41.70
Welder 500 amp	71	1,029	5%	51	978	0.0317	30.98
Generator (6 kW)	10	8	0%	-	8	0.0081	0.06
Generator (25 kW)	800	48	0%	-	48	0.1771	8.55
Generator (110 kW)	190	-	0%	-	-	0.0795	-
SUBTOTAL		**52,098**			**48,947**		**990.9**

Notes*

1. Emergency use factor based on contractor non-routine usage records.
2. Emissions calculated using SCAQMD Off-road emission factors.
3. Emissions for contractor equipment was spread over the north and south processing units to account for annual profile of releases from operating equipment.
4. Hours of operation are based on actual operating records for 2006-2007

Table 3: Facility Portable Equipment Emissions

Rule 219 Exempt Equipment	Output HP	2006-07 Operating Hours	Emergency Use Factor (%)	Emergency Operating Hours	Annual Routine Operating Hours	Emission Factor (lbs/hr)[1]	Average Annual Emissions (lbs/yr)
Rule 219 - Diesel (CP 0711)							
Mobil "Hotsy" hot soap water #00386	18	0	0%	0%	-		-
GAS Lab Knock Engine #5	4.25	530.6	0%	0%	531	0.0081	4.32
Daimler Chrysler Crane Engine (demag Terex)	231	1,587.0	0%	0%	1,587	0.0571	90.61
Caterpiller 3126 (90 Ton crane)	225	413.9	0%	0%	414	0.0571	23.63
Welding Machine Truck 6999	37	17.9	0%	0%	18	0.0317	0.57
Welding Machine Truck 7001	37	31.5	0%	0%	32	0.0317	1.00
Welding Machine Truck 7032	37	30.1	0%	0%	30	0.0317	0.95
Welding Machine Truck 7057	37	50.3	0%	0%	50	0.0317	1.59
Welding Machine Truck 7059	37	85.5	0%	0%	86	0.0317	2.71
Welding Machine Truck 7456	37	127.7	0%	0%	128	0.0317	4.05
Welding Machine Truck 7458	37	77.6	0%	0%	78	0.0317	2.46
Pioneer 4" Centrifigal Pump - (Behind Blue Barn)	49	60.3	0%	0%	60	0.0371	2.24
Blue Barn Portable Sweeper Engine	97	4.8	0%	0%	5	0.1003	0.48
Winch Truck Lift Motor (Deutz F2-41011)	48.3	4.7	0%	0%	5	0.0334	0.16
Winch Truck Lift Motor (Deutz F41011)	48.3	15.4	0%	0%	15	0.0334	0.52
	SUBTOTAL	3,037.3					135.3
					TOTAL Portable and Contractor Emissions (lbs/yr) =		**1,126.2**

Notes*

1. Emissions calculated using SCAQMD Off-road emission factors.
2. Emissions for portable equipment was spread over the north and south processing units to account for annual profile of releases from operating equipment.

Table 4: Contractor Equipment - Painting and Blasting

TAC	CAS	Emissions (lbs/year)	Emissions (Lbs/hour)
Lead	1128	0.075	0.000
MEK	78933	541.200	0.062
Ethyl Benzene	100414	8.641	0.001
MIBK	108101	71.294	0.008
Toluene	108883	1431.649	0.163
Xylenes	1330207	2.340	
Mercury	7439976	0.000	0.000
Nickel	7440020	0.030	0.000
Barium	7440393	1.336	0.000
Cadmium	7440439	0.002	0.000
Chromium	7440473	0.038	0.000
Cobalt	7440484	0.008	0.000
Copper	7440508	0.295	0.000
Zinc	7440666	826.899	0.094

Notes

1. Emissions based on contractor usage records.
2. Emissions spread over north and south painting process units to account fo annual profile of releases.

Table 5: Contractor Equipment - Tank Cleaning and Degassing

TAC	CAS	Emissions (lb/year)	Emissions (lb/hr)
Benzene	71432	2.684	0.000
Acetaldehyde	750-0	0.000	0.000
Mercury	85018	0.001	0.000
Napthalene	91203	11.478	0.001
1,2,4TriMeBenz	95636	15.153	0.002
Cumene	98828	0.292	0.000
Ethyl Benzene	100414	8.290	0.001
2,4-DiMePhenol	105679	0.000	0.000
1,3-Butadiene	106990	0.000	0.000
Toluene	108883	10.997	0.001
Phenol	108952	0.024	0.000
Hexane	110543	15.118	0.002
Cyclohexane	110827	9.266	0.001
Propylene	115071	18.715	0.002
2,2,4TriMePentr	540841	0.815	0.000
Cresols	1319773	0.017	0.000
Xylenes	1330207	44.111	0.005

Notes

1. Emissions based on contractor usage records.
2. Emissions spread over north and south desgassing process units to account fo annual profile of releases.

Appendix B HARP Modeling Files (CD)

AECOM Environment
999 West Town & Country Road, 4th Floor, Orange, CA 92868-4713
T 714.973.9740 F 714.973.9750 www.aecom.com

Modeling Files for BP Carson's AB2588 Health Risk Assessment
Modeling Analysis
Carson, CA – September, 2009

PMI / MEIW 100-meter Fine Grid

Output files of the HARP for the fine grid run used to report maximum public health risk impacts at the PMI and MEIW. Modeling results are for cancer risk, non-cancer chronic and non-cancer acute exposure impacts for all sources, by grid receptor, using a 100-meter spacing grid, and for the meteorological data year 1981. This meteorological data set has been approved by the SCAQMD for modeling coastal facilities near the vicinity of the BP Carson refinery.

Files include:

PMI_Rep_Can_70yr_Avg_AllRec_AllSrc_AllCh_ByRec_Site.txt
PMI_Rep_Acu_AllRec_AllSrc_AllCh_ByRec_Site.txt
PMI_Rep_Chr_Res_DerOEH_AllRec_AllSrc_AllCh_ByRec_Site.txt

MEIW_Rep_Can_WRK_Avg_AllRec_AllSrc_AllCh_ByRec_Site.txt
MEIW_Rep_Acu_AllRec_AllSrc_AllCh_ByRec_Site.txt
MEIW_Rep_Chr_Wrk_PtEst_AllRec_AllSrc_AllCh_ByRec_Site.txt

Cancer Risk Culpability Analysis at the PMI / MEIW

Output files of the HARP model that identifies culpability to health risk impacts at the PMI and MEIW by chemical substance and by emission source. Modeling results are for cancer risk at the PMI (Receptor 555 based on the 100-meter fine grid), assuming a 70-year exposure period, and for the meteorological data year 1981. Modeling results of the MEIW (Receptor 555 based on the 100-meter fine grid), assuming a 40-year exposure period, and for the meteorological data year 1981.

Files include:

PMI_Rep_Can_70yr_Avg_Rec555_AllSrc_AllCh_ByRec_ByChem_Site.txt
PMI_Rep_Can_70yr_Avg_Rec555_AllSrc_AllCh_BySrc_Site.txt

MEIW_Rep_Can_WRK_Avg_Rec555_AllSrc_AllCh_ByRec_ByChem_Site.txt
MEIW_Rep_Can_WRK_Avg_Rec555_AllSrc_AllCh_BySrc_Site.txt

MEIR

Output files of the HARP model that identifies health risk impacts at the maximum exposed individual resident (MEIR). Modeling results are for cancer risk, non-cancer chronic and non-cancer acute exposure impacts for all sources, by sensitive (SEN) receptor, and for the meteorological data year 1981 (the worst-case year).

Files include:

MEIR_Rep_Can_70yr_DerAdj_AllRec_AllSrc_AllCh_ByRec_Site.txt
MEIR_Rep_Acu_AllRec_AllSrc_AllCh_ByRec_Site.txt

MEIR_Rep_Chr_Res_DerOEH_AllRec_AllSrc_AllCh_ByRec_Site.txt

Cancer Risk Culpability Analysis at the MEIR

Output files of the HARP model that identifies culpability to health risk impacts at the MEIR by chemical substance and by emission source. Modeling results are for cancer risk at the MEIR (Receptor 282), assuming a 70-year exposure period, and for the meteorological data year 1981.

Files include:

MEIR_Can_70yr_DerAdj_Rec282_AllSrc_AllCh_ByRec_ByChem_Site.txt
MEIR_Can_70yr_DerAdj_Rec282_AllSrc_AllCh_BySrc_Site.txt

Sensitive Receptors

Output files of the HARP model that identifies cancer risk impact from all sources for 9-year child and worker exposure scenarios at sensitive (school) receptors (Receptor 6).

Files include:

SEN_Rep_Can_9yrC_DerOEH_Rec6_AllSrc_AllCh_ByRec_Site.txt
SEN_Rep_Acu_AllRec_AllCh_ByRec_Site.txt
SEN_Rep_Chr_Res_DerOEH_AllRec_AllSrc_AllCh_ByRec_Site.txt

SEN_Rep_Can_WRK_Avg_Rec6_AllSrc_AllCh_ByRec_Site.txt

Excess Cancer Burden

Output files of HARP model that identifies the population exposure and cancer burden for all census receptors where the cancer risk levels exceed 1-in-a million.

Files include:

CEN_Cnacer_Popultion_Exposure.txt

Meteorological Data Files

Sequential hourly processed meteorological data from 1981 for use in conducting public health risk assessment in HARP. Modeling meteorological data is based on wind speed, wind direction and temperature data from the Long Beach Meteorological Station.

Files include:

LONGBCH.ASC

Appendix B1 Modeled Source Parameters

	Source Type	UTM Easting (km)	UTM Northing (km)	Stack Height (ft)	Stack Diameter (ft)	Stack Temperatu	Rate CFM)	Flow Velocity (fpm)	Vertical Dimension of Area (ft)	Side of Area (ft)	Side of Area (ft)
R COKE DRUM	AREA	385.4783	3742.38	4	0	0	0	0	1.86000001	38	168
R COKE DRUM	AREA	385.4783	3742.38	4	0	0	0	0	1.86000001	38	168
R COKE DRUM	AREA	385.4783	3742.38	4	0	0	0	0	1.86000001	38	168
R COKE DRUM	AREA	385.4783	3742.38	4	0	0	0	0	1.86000001	38	168
R COKE DRUM	AREA	385.5491	3742.38	4	0	0	0	0	1.86000001	38	168
R COKE DRUM	AREA	385.5491	3742.38	4	0	0	0	0	1.86000001	38	168
ADING (TRUCI	AREA	384.9966	3742.052	10	0	0	0	0	4.6500001	12	75
DING (TRUCK)	AREA	384.9966	3742.052	10	0	0	0	0	4.6500001	12	75
DING (RAIL)	AREA	385.7971	3742.263	15	0	0	0	0	6.96999979	12	120
(RAIL)	AREA	385.7971	3742.263	15	0	0	0	0	6.96999979	12	120
DING (TRUCK)	AREA	385.3977	3742.223	12	0	0	0	0	5.57999992	12	58
ADING (RAIL)	AREA	385.7971	3742.263	15	0	0	0	0	6.96999979	12	120
ADING (RAIL)	AREA	385.214	3741.601	12	0	0	0	0	5.57999992	12	100
LOADING (RAI	AREA	385.214	3741.601	12	0	0	0	0	5.57999992	12	100
PAINTING - NC	AREA	384.9242	3742.99	6	0	0	0	0	2.78999996	6	6
PAINTING - SC	AREA	385.3418	3742.063	6	0	0	0	0	2.78999996	6	6
team Plant	AREA	384.9965	3742.793	5	0	0	0	0	2.31999993	239.44	239.44
ac	AREA	385.248	3741.828	5	0	0	0	0	2.31999993	137.76	137.76
ac	AREA	385.143	3741.824	5	0	0	0	0	2.31999993	164	164
	AREA	385.4	3741.777	5	0	0	0	0	2.31999993	190.24	190.24
mer	AREA	385.4	3741.777	5	0	0	0	0	2.31999993	190.24	190.24
splitter	AREA	385.4	3741.777	5	0	0	0	0	2.31999993	190.24	190.24
s	AREA	385.4875	3742.239	5	0	0	0	0	2.31999993	95.12	95.12
EN	AREA	384.851	3742.478	5	0	0	0	0	2.31999993	308.32	308.32
r	AREA	385.54	3742.312	5	0	0	0	0	2.31999993	242.72	242.72
e #1	AREA	385.243	3741.931	5	0	0	0	0	2.31999993	249.28	249.28
e #2	AREA	385.2225	3741.656	5	0	0	0	0	2.31999993	193.52	193.52
e #4	AREA	385.124	3741.707	5	0	0	0	0	2.31999993	288.64	288.64
	AREA	384.869	3742.808	5	0	0	0	0	2.31999993	314.88	314.88
Training	AREA	385.5555	3742.593	5	0	0	0	0	2.31999993	1039.76	1039.76
- #5	AREA	385.606	3742.471	5	0	0	0	0	2.31999993	282.08	282.08
- HDS	AREA	384.803	3742.741	5	0	0	0	0	2.31999993	177.12	177.12
- FCC	AREA	385.1135	3743.072	5	0	0	0	0	2.31999993	193.52	193.52
	AREA	384.91	3743.116	5	0	0	0	0	2.31999993	196.8	196.8
ocracker	AREA	384.91	3743.116	5	0	0	0	0	2.31999993	196.8	196.8
H2 Plant	AREA	384.91	3743.116	5	0	0	0	0	2.31999993	196.8	196.8
h H2 Plant	AREA	385.307	3741.809	5	0	0	0	0	2.31999993	242.72	242.72
v	AREA	385.226	3742.22	5	0	0	0	0	2.31999993	111.52	111.52
	AREA	384.806	3742.671	5	0	0	0	0	2.31999993	183.68	183.68
3bl	AREA	384.732	3742.835	5	0	0	0	0	2.31999993	124.64	124.64
- ISOM	AREA	385.4	3741.777	5	0	0	0	0	2.31999993	190.24	190.24
HAPS TANKS	AREA	385.2225	3741.656	5	0	0	0	0	2.31999993	193.52	193.52

nner #2	AREA	384.695	3742.956	5	0	0	0	0	2.31999993	242.72	242.72
rner #3	AREA	384.7505	3742.946	5	0	0	0	0	2.31999993	298.48	298.48
	AREA	385.226	3742.22	5	0	0	0	0	2.31999993	111.52	111.52
	AREA	384.806	3742.671	5	0	0	0	0	2.31999993	183.68	183.68
	AREA	385.143	3741.824	5	0	0	0	0	2.31999993	164	164
age/Handling	AREA	384.5725	3741.961	5	0	0	0	0	2.31999993	226.32	226.32
torage/Handling	AREA	385.2855	3742.907	5	0	0	0	0	2.31999993	285.36	285.36
ter #1	AREA	385.222	3742.033	5	0	0	0	0	2.31999993	13.12	13.12
T	AREA	385.2915	3742.281	5	0	0	0	0	2.31999993	305.04	305.04
ON NO. 1	AREA	385.3129	3742.188	6	0	0	0	0	2.78999996	25	90
ON NO. 4	AREA	385.5545	3741.989	6	0	0	0	0	2.78999996	20	94
ON NO. 7	AREA	384.9641	3741.997	6	0	0	0	0	2.78999996	34	75
ON NO. 9	AREA	385.31	3742.331	12	0	0	0	0	5.57999992	34	38
RATOR NO. 6	AREA	385.0357	3742.938	2	0	0	0	0	0.93000001	28	68
RATOR NO. 9	AREA	385.3357	3742.333	12	0	0	0	0	5.57999992	42	312
5	AREA	385.2919	3742.418	12	0	0	0	0	5.57999992	25	50
2, 3	AREA	385.2042	3742.418	8	0	0	0	0	3.72000003	12	60
5	AREA	384.524	3742.594	40	0	0	0	0	18.6000004	104.96	104.96
	AREA	385.214	3741.601	33	0	0	0	0	15.3400002	33	50
TOWER	POINT	385.1252	3741.727	70	28	87	667567.1	1080.71	0	0	0
TOWER	POINT	385.7555	3742.107	80	16	89	217981.1	1080.71	0	0	0
TOWER	POINT	385.698	3741.878	80	16	87	217981.1	1080.71	0	0	0
TOWER	POINT	385.0127	3743.036	80	22	100	412120.5	1080.71	0	0	0
G TOWER	POINT	385.001	3742.927	90	22	92	412120.5	1080.71	0	0	0
G TOWER	POINT	385.127	3741.691	90	22	95	412120.5	1080.71	0	0	0
OLING TOWER	POINT	385.2856	3742.235	85	22	88	412120.5	1080.71	0	0	0
G TOWER	POINT	384.8298	3743.03	70	12	88	122614.4	1080.71	0	0	0
G TOWER	POINT	384.8213	3743.064	80	12	100	122614.4	1080.71	0	0	0
OLING TOWER	POINT	385.1343	3743.01	80	22	90	412120.5	1080.71	0	0	0
OLING TOWER	POINT	384.9535	3742.511	70	28	85	667567.1	1080.71	0	0	0
NO. 1	AREA	384.86	3741.614	41.8	0	0	0	0	19.4400005	203.36	203.36
NO. 11	AREA	384.86	3741.726	41.2	0	0	0	0	19.1599998	203.36	203.36
NO. 13	AREA	384.6135	3741.72	69	0	0	0	0	32.0900002	226.32	226.32
NO. 16	AREA	384.324	3741.726	48	0	0	0	0	22.3199997	209.92	209.92
NO. 17	AREA	384.2185	3741.719	48	0	0	0	0	22.3199997	206.64	206.64
NO. 18	AREA	383.9525	3741.718	41.8	0	0	0	0	19.4400005	200.08	200.08
O. 21	AREA	384.8545	3741.83	60	0	0	0	0	27.8999996	219.76	219.76
NO. 23-area65	AREA	384.5725	3741.961	41	0	0	0	0	19.0599995	226.32	226.32
NO. 24	AREA	384.54	3741.839	41.7	0	0	0	0	19.3899994	203.36	203.36
NO. 25	AREA	384.433	3741.839	48	0	0	0	0	22.3199997	203.36	203.36
NO. 26	AREA	384.326	3741.839	48	0	0	0	0	22.3199997	203.36	203.36
NO. 44	AREA	384.6235	3742.118	40.6	0	0	0	0	18.8799992	232.88	232.88
NO. 56	AREA	384.4205	3742.199	40.6	0	0	0	0	18.8799992	232.88	232.88
NO. 58	AREA	384.257	3742.187	40.6	0	0	0	0	18.8799992	236.16	236.16
NO. 59	AREA	384.207	3742.116	40.6	0	0	0	0	18.8799992	229.6	229.6
NO. 60	AREA	384.1595	3742.044	40.6	0	0	0	0	18.8799992	232.88	232.88

NO. 84	AREA	384.797	3741.976	48	0	0	0	0	22.3199997	104.96	104.96
93	AREA	384.5095	3742.451	41.8	0	0	0	0	19.4400005	200.08	200.08
103	AREA	385.2795	3741.672	30	0	0	0	0	13.9499998	101.68	101.68
NO. 191	AREA	385.217	3742.026	48	0	0	0	0	22.3199997	104.96	104.96
NO. 192	AREA	385.217	3742.057	48	0	0	0	0	22.3199997	104.96	104.96
NO. 22-area65	AREA	384.5725	3741.961	41.8	0	0	0	0	19.4400005	226.32	226.32
NO. 700	AREA	385.637	3742.303	30	0	0	0	0	13.9499998	104.96	104.96
NO. 773	AREA	385.507	3742.114	40	0	0	0	0	18.6000004	229.6	229.6
NO. 776	AREA	385.5875	3742.303	18	0	0	0	0	8.36999989	22.96	22.96
NO. 777	AREA	385.5795	3742.303	18	0	0	0	0	8.36999989	22.96	22.96
NO. 778	AREA	385.5705	3742.303	18	0	0	0	0	8.36999989	22.96	22.96
NO. 905-area65	AREA	384.5725	3741.961	48	0	0	0	0	22.3199997	226.32	226.32
NO. 957	AREA	385.3695	3742.873	42.8	0	0	0	0	19.8999996	278.8	278.8
NO. 958	AREA	385.2705	3742.872	42	0	0	0	0	19.5300007	278.8	278.8
NO. 959-area65	AREA	384.5725	3741.961	52	0	0	0	0	24.1800003	226.32	226.32
NO. 968	AREA	385.269	3742.969	42	0	0	0	0	19.5300007	275.52	275.52
NO. 969	AREA	385.1735	3742.97	52.8	0	0	0	0	24.5499992	259.12	259.12
NO. 90	AREA	384.522	3742.37	41.8	0	0	0	0	19.4400005	203.36	203.36
NO. 101	AREA	385.2805	3741.609	30	0	0	0	0	13.9499998	101.68	101.68
NO. 102	AREA	385.279	3741.64	30	0	0	0	0	13.9499998	104.96	104.96
NO. 956	AREA	385.4655	3742.878	48	0	0	0	0	22.3199997	259.12	259.12
NO. 2	AREA	384.7535	3741.612	48	0	0	0	0	22.3199997	206.64	206.64
NO. 3	AREA	384.6455	3741.614	42	0	0	0	0	19.5300007	206.64	206.64
NO. 4	AREA	384.5405	3741.615	41.7	0	0	0	0	19.3899994	200.08	200.08
NO. 5	AREA	384.433	3741.614	41.8	0	0	0	0	19.4400005	203.36	203.36
NO. 6	AREA	384.32	3741.609	176.5	0	0	0	0	82.0899963	236.16	236.16
NO. 8	AREA	384.1075	3741.61	176.5	0	0	0	0	82.0899963	232.88	232.88
NO. 19	AREA	384.6715	3741.946	40	0	0	0	0	18.6000004	232.88	232.88
NO. 20	AREA	384.5855	3741.946	40	0	0	0	0	18.6000004	232.88	232.88
NO. 31	AREA	384.8605	3742.034	42	0	0	0	0	19.5300007	206.64	206.64
NO. 32	AREA	384.778	3742.035	41.8	0	0	0	0	19.4400005	209.92	209.92
NO. 33	AREA	384.703	3742.036	42.8	0	0	0	0	19.8999996	203.36	203.36
NO. 34	AREA	384.622	3742.038	42	0	0	0	0	19.5300007	229.6	229.6
NO. 35	AREA	384.5405	3742.037	41	0	0	0	0	19.0599995	239.44	239.44
NO. 40	AREA	385.038	3742.112	41	0	0	0	0	19.0599995	229.6	229.6
NO. 41	AREA	384.945	3742.114	48	0	0	0	0	22.3199997	229.6	229.6
NO. 42	AREA	384.7805	3742.119	48	0	0	0	0	22.3199997	200.08	200.08
NO. 45	AREA	384.5395	3742.119	40.6	0	0	0	0	18.8799992	239.44	239.44
NO. 50	AREA	384.957	3742.194	48	0	0	0	0	22.3199997	229.6	229.6
NO. 51	AREA	384.875	3742.196	40.6	0	0	0	0	18.8799992	229.6	229.6
NO. 52	AREA	384.7485	3742.198	48	0	0	0	0	22.3199997	232.88	232.88
NO. 53	AREA	384.667	3742.2	40.6	0	0	0	0	18.8799992	229.6	229.6
NO. 54	AREA	384.5795	3742.196	55	0	0	0	0	25.5799999	259.12	259.12
NO. 55	AREA	384.5015	3742.203	40.6	0	0	0	0	18.8799992	232.88	232.88
NO. 57	AREA	384.338	3742.2	40.6	0	0	0	0	18.8799992	229.6	229.6

NO. 68	AREA	384.566	3742.28	48	0	0	0	0	22.3199997	229.6	229.6
9	AREA	384.4835	3742.282	48	0	0	0	0	22.3199997	232.88	232.88
0	AREA	384.4025	3742.278	48	0	0	0	0	22.3199997	232.88	232.88
NO. 71	AREA	384.321	3742.279	48	0	0	0	0	22.3199997	229.6	229.6
NO. 152	AREA	385.2195	3741.92	40	0	0	0	0	18.6000004	68.88	68.88
NO. 154	AREA	385.2195	3741.975	40	0	0	0	0	18.6000004	68.88	68.88
NO. 188-area65	AREA	384.5725	3741.961	48	0	0	0	0	22.3199997	226.32	226.32
NO. 189-area65	AREA	384.5725	3741.961	48	0	0	0	0	22.3199997	226.32	226.32
NO. 91	AREA	384.455	3742.372	42.8	0	0	0	0	19.8999996	203.36	203.36
NO. 27	AREA	384.4775	3741.913	48	0	0	0	0	22.3199997	101.68	101.68
NO. 28	AREA	384.4415	3741.913	48	0	0	0	0	22.3199997	101.68	101.68
NO. 29	AREA	384.405	3741.912	48	0	0	0	0	22.3199997	104.96	104.96
NO. 30	AREA	384.368	3741.912	48	0	0	0	0	22.3199997	104.96	104.96
NO. 426	AREA	385.6755	3742.307	30	0	0	0	0	13.9499998	101.68	101.68
NO. 501-area65	AREA	384.5725	3741.961	28	0	0	0	0	13.0200005	226.32	226.32
NO. 502-area65	AREA	384.5725	3741.961	28	0	0	0	0	13.0200005	226.32	226.32
NO. 619	AREA	385.4155	3742.239	36	0	0	0	0	16.7399998	49.2	49.2
NO. 620	AREA	385.4155	3742.257	36	0	0	0	0	16.7399998	49.2	49.2
NO. 153-area65	AREA	384.5725	3741.961	40	0	0	0	0	18.6000004	226.32	226.32
PIT D	AREA	385.4981	3742.263	14.67	0	0	0	0	6.82000017	8	36
NO. 164	AREA	385.6285	3741.782	30	0	0	0	0	13.9499998	49.2	49.2
NO. 49	AREA	385.039	3742.194	40.6	0	0	0	0	18.8799992	229.6	229.6
NO. 12	AREA	384.7545	3741.727	41.2	0	0	0	0	19.1599998	200.08	200.08
NO. 96	AREA	384.475	3742.469	48	0	0	0	0	22.3199997	104.96	104.96
NO. 97	AREA	384.4385	3742.471	48	0	0	0	0	22.3199997	101.68	101.68
K NO. 173R	AREA	384.868	3742.786	13	0	0	0	0	6.03999996	19.68	19.68
NO. 284	AREA	385.1205	3742.147	40	0	0	0	0	18.6000004	68.88	68.88
IO. 14	AREA	384.4725	3741.738	64	0	0	0	0	29.7600002	108.24	108.24
NO. 190	AREA	385.315	3741.731	48	0	0	0	0	22.3199997	85.28	85.28
NO. 157-area65	AREA	384.5725	3741.961	24	0	0	0	0	11.1599998	226.32	226.32
NO. 210-area65	AREA	384.5725	3741.961	15	0	0	0	0	6.96999979	226.32	226.32
NO. 288-area65	AREA	384.5725	3741.961	30	0	0	0	0	13.9499998	226.32	226.32
NO. 309-area65	AREA	384.5725	3741.961	24	0	0	0	0	11.1599998	226.32	226.32
NO. 310-area65	AREA	384.5725	3741.961	24	0	0	0	0	11.1599998	226.32	226.32
NO. 371-area65	AREA	384.5725	3741.961	45	0	0	0	0	20.9300003	226.32	226.32
NO. 372-area65	AREA	384.5725	3741.961	45	0	0	0	0	20.9300003	226.32	226.32
NO. 394-area65	AREA	384.5725	3741.961	30.7	0	0	0	0	14.2700005	226.32	226.32
K NO. 5380-area	AREA	384.5725	3741.961	50	0	0	0	0	23.25	226.32	226.32
K NO. 5381-area	AREA	384.5725	3741.961	50	0	0	0	0	23.25	226.32	226.32
NO. 596-area65	AREA	384.5725	3741.961	28	0	0	0	0	13.0200005	226.32	226.32
NO. 610-area65	AREA	384.5725	3741.961	16	0	0	0	0	7.44000006	226.32	226.32
NO. 614-area65	AREA	384.5725	3741.961	13	0	0	0	0	6.03999996	226.32	226.32
NO. 617-area65	AREA	384.5725	3741.961	24	0	0	0	0	11.1599998	226.32	226.32
NO. 618-area65	AREA	384.5725	3741.961	24	0	0	0	0	11.1599998	226.32	226.32
NO. 634-area65	AREA	384.5725	3741.961	20	0	0	0	0	9.30000019	226.32	226.32

NO. 913-area6	AREA	384.5725	3741.961	30	0	0	0	0	13.9499998	226.32	226.32
916-area6	AREA	384.5725	3741.961	20	0	0	0	0	9.30000019	226.32	226.32
917-area6	AREA	384.5725	3741.961	20	0	0	0	0	9.30000019	226.32	226.32
NO. 919-area6	AREA	384.5725	3741.961	15	0	0	0	0	6.96999979	226.32	226.32
NO. 981-area6	AREA	384.5725	3741.961	6.63	0	0	0	0	3.07999992	226.32	226.32
K NO. 2940-area	AREA	384.5725	3741.961	0	0	0	0	0	0	226.32	226.32
K NO. 2941-area	AREA	384.5725	3741.961	0	0	0	0	0	0	226.32	226.32
K NO. 2942-area	AREA	384.5725	3741.961	0	0	0	0	0	0	226.32	226.32
K NO. 2943-area	AREA	384.5725	3741.961	0	0	0	0	0	0	226.32	226.32
K NO. 2944-area	AREA	384.5725	3741.961	0	0	0	0	0	0	226.32	226.32
K NO. 5485-area	AREA	384.5725	3741.961	0	0	0	0	0	0	226.32	226.32
K NO. 5486-area	AREA	384.5725	3741.961	0	0	0	0	0	0	226.32	226.32
HEATER	POINT	385.2857	3742.008	230.1	12	445.269989	195781.8	1725.6	0	0	0
E HEATER (NO	POINT	385.1589	3741.667	161.5	6.5	470.269989	34593.59	1039.2	0	0	0
E HEATER (NO	POINT	385.1588	3741.681	102	7.0999999	469.269989	47280.2	1190.4	0	0	0
HEATER	POINT	385.1648	3741.757	157	6	506.269989	33313.88	1174.5	0	0	0
IUM HEATER S	POINT	385.2878	3741.857	153.8	10	344.269989	93224.03	1183.2	0	0	0
IUM HEATER	POINT	385.1644	3741.811	174	6.5999999	490.269989	42142.53	1227.9	0	0	0
UN HEATER	POINT	385.1739	3741.841	59	2.5	370.0400085	862.7477	175.2	0	0	0
ER HEATER (E	POINT	385.4439	3742.341	165	6.8000002	460.269989	31696.17	870	0	0	0
ER HEATER (V	POINT	385.4359	3742.341	165	6.8000002	440.269989	31543.16	865.8	0	0	0
R HEATER	POINT	385.5882	3742.343	150	7.0999999	595.2700195	44754.14	1126.8	0	0	0
IEATER	POINT	384.9314	3742.817	178.8	6.5	365.269989	15639.02	469.8	0	0	0
RMER DESULF	POINT	384.7602	3742.821	83	5	575.7700195	17721.79	899.7	0	0	0
MER HEATER	POINT	384.7584	3742.851	83	7	477.769989	24843.59	643.5	0	0	0
FORMER DESU	POINT	384.8457	3743.033	87	4	669.7999878	13191.29	1046.4	0	0	0
FORMER DESU	POINT	384.8575	3743.029	87	4	718.2700195	14757	1170.6	0	0	0
MER HEATER	POINT	384.8668	3743.029	85	7.3000002	572.2700195	49710.58	1183.95	0	0	0
MER HEATER	POINT	384.7514	3742.968	90	5	572.7700195	19866.84	1008.6	0	0	0
TER	POINT	384.7491	3742.747	125	4.5	746.2700195	27828.58	1744.2	0	0	0
L FEED HEATE	POINT	384.7326	3742.874	116	5.8000002	629.3300171	16030.15	604.8	0	0	0
L REBOILER H	POINT	384.7326	3742.895	100	5	519.2700195	15234	773.4	0	0	0
O FEED HEATE	POINT	384.7746	3742.913	84	3	618.2700195	6381.97	900	0	0	0
CKER FRAC RE	POINT	384.8571	3743.061	196	8	547.2700195	61599.72	1221.6	0	0	0
CKER R1 HEAT	POINT	384.9626	3743.16	125	3.3	521.2700195	7284.593	849	0	0	0
CKER R4 HEAT	POINT	384.9689	3743.16	150	2.8	501.269989	3331.937	539.4	0	0	0
CKER R2 HEAT	POINT	384.9563	3743.161	110	3.3	586.9899902	11454.57	1335	0	0	0
CKER R3 HEAT	POINT	384.9413	3743.157	125	2.8	474.269989	2612.92	423	0	0	0
OGEN PLANT	POINT	384.9278	3743.156	143	6	307.9400024	65696	2316.15	0	0	0
R R2 STABILIZE	POINT	384.8647	3743.136	67	2.3	817.2700195	4826.518	1158	0	0	0
R R3 HYDROGE	POINT	384.8645	3743.132	70	2.3	615.2700195	3392.317	813.9	0	0	0
R R1 DESULF H	POINT	384.8556	3743.091	75	3.2	796.2700195	9492.892	1176.6	0	0	0
OGEN PLANT	POINT	385.3217	3741.841	250	7.5	364.269989	146333.3	3301.8	0	0	0
M HDS HEATE	POINT	385.443	3741.745	115.16	4.9860001	600.0800171	15692.94	801.18	0	0	0
COGENERATI	POINT	384.6732	3742.498	100	14.8	332.1199951	1020006	5910.3	0	0	0

	POINT	385.797	3742.386	203.5	3	1832	30166.4	25407.48	0	0	0
	POINT	385.1724	3742.522	215	2	1832	73.96	25407.48	0	0	0
FLARE	POINT	385.1949	3742.802	161.4	2.5	1832	5115.6	25407.48	0	0	0
M HDS FLARE	POINT	385.6171	3742.522	265	3.5	1832	245226.5	25407.48	0	0	0
	POINT	384.994	3742.751	135	12	530.2700195	402259	3545.468	0	0	0
	POINT	384.994	3742.751	130	10.33	530.7700195	400481	4769.1	0	0	0
JR RECOVERY	POINT	385.457	3742.256	197.18	6	1317.27002	46273.54	1631.4	0	0	0
JR RECOVERY	POINT	385.459	3742.243	200.13	8.9890003	1299.77002	126512.7	1987.2	0	0	0
OGEN PLANT -	POINT	384.9222	3743.127	145	1	149.6000061	4207.373	5340	0	0	0
OGEN PLANT -	POINT	385.3359	3741.869	50	0.7	359.7999878	1100.994	2851.8	0	0	0
BS	POINT	385.3966	3741.643	10	1.4	73	2341.127	1516	0	0	0
AY BOOTH - P/	POINT	384.8459	3742.684	36	0.1	84.91999817	0.015522	1.97	0	0	0
H <250HP	AREA	384.8	3742.65	6	0	0	0	0	2.78999996	1491.64	1491.64
H <250HP	AREA	385.07	3741.8	6	0	0	0	0	2.78999996	1592.16	1592.16
Es	POINT	385.4517	3741.662	28	0.7	600.0800171	193.0349	500	0	0	0
	POINT	385.214	3741.601	28	0.7	600	193.0349	500	0	0	0
H >250HP	POINT	384.846	3742.686	15	0.67	761.7000122	416.4155	5905.512	0	0	0
H >250HP	POINT	385.0495	3742.665	15	0.67	761.7000122	416.4155	5905.512	0	0	0
RN	AREA	385.838	3741.89	35	0	0	0	0	16.2700005	275	1100
ENSING - GATI	POINT	385.7644	3742.668	3	0.125	70	0.030777	2.5	0	0	0
S REMOVAL-Are	AREA	385.0594	3741.883	5	0	0	0	0	2.31999993	600	850
GASSING - NOI	AREA	384.9242	3742.99	100	0	0	0	0	46.5099983	150	200
GASSING - SOU	AREA	385.3418	3742.063	40	0	0	0	0	18.6000004	70	200
	AREA	385.214	3741.601	100	0	0	0	0	46.5099983	150	200
RELEASES - N	AREA	384.9242	3742.99	5	0	0	0	0	2.31999993	6	6
RELEASES - S	AREA	385.3418	3742.063	5	0	0	0	0	2.31999993	6	6
INE HEATER	POINT	385.4575	3742.256	197	6	1408.27002	28733.05	1013	0	0	0
INE HEATER	POINT	385.4585	3742.243	200	9	1295.27002	95282.8	1493	0	0	0
ENSING - GATI	POINT	385.8236	3742.973	3	0.125	70	0.030777	2.5	0	0	0
e Mgmt Yard	AREA	385.7645	3742.33	5	0	0	0	0	2.31999993	127.92	127.92
Pump Slab	AREA	385.0799	3741.982	5	0	0	0	0	2.31999993	167.332	167.332
er Pass	AREA	385.197	3742.374	5	0	0	0	0	2.31999993	328	328
Fugitives - GRN	AREA	384.5663	3741.857	5	0	0	0	0	2.31999993	313.0495	313.0495
oading Rack	AREA	385.7685	3742.223	5	0	0	0	0	2.31999993	95.12	95.12
r 3 -4 DEA	AREA	385.3455	3742.304	5	0	0	0	0	2.31999993	318.16	318.16
r 5 DEA	AREA	385.3455	3742.304	5	0	0	0	0	2.31999993	318.16	318.16
erFlare	AREA	385.7645	3742.33	5	0	0	0	0	2.31999993	127.92	127.92
OCTENE	AREA	385.42	3741.942	5	0	0	0	0	2.31999993	236.16	236.16
Flare	AREA	385.1735	3742.798	5	0	0	0	0	2.31999993	167.28	167.28
f DIB	AREA	384.869	3742.808	5	0	0	0	0	2.31999993	314.88	314.88
f SRD	AREA	384.869	3742.808	5	0	0	0	0	2.31999993	314.88	314.88
y Down Yard	AREA	385.435	3742.622	5	0	0	0	0	2.31999993	474.3416	474.3416
- DEHEX	AREA	385.3054	3741.967	5	0	0	0	0	2.31999993	124.64	124.64
97 (Foamhouse	POINT	385.6606	3741.883	15	0.5	761.7000122	231.9088	5905.512	0	0	0
98 (Sulfur Loadir	POINT	385.459	3742.085	15	0.67	761.7000122	416.4155	5905.512	0	0	0

Appendix B2 Modeled Source Identification Reference Table

Appendix B2 - Modeling Source Identification Reference Table		
Device ID	**Stack ID**	**Source**
70001	90001	70001 - NO. 1 CRUDE HEATER
70002	90002	70002 - NO. 2 CRUDE HEATER (NO. 21)
70003	90003	70003 - NO. 2 CRUDE HEATER (NO. 22)
70004	90004	70004 - NO. 4 CRUDE HEATER
70005	90005	70005 - NO. 51 VACUUM HEATER
70007	90007	70007 - NO. 52 VACUUM HEATER
70008	90008	70008 - SLOP RERUN HEATER
70011	90011	70011 - NO. 1 COKER HEATER (EAST)
70012	90012	70012 - NO. 1 COKER HEATER (WEST)
70013	90013	70013 - NO. 2 COKER HEATER
70014	90014	70014 - FCC FEED HEATER
70016	90016	70016 - NO. 1 REFORMER DESULFURIZER HEATER
70017	90017	70017 - NO. 1 REFORMER HEATER
70018	90018	70018 - NO. 2A REFORMER DESULFURIZER HEATER
70019	90019	70019 - NO. 2B REFORMER DESULFURIZER HEATER
70020	90020	70020 - NO. 2 REFORMER HEATER
70021	90021	70021 - NO. 3 REFORMER HEATER
70022	90022	70022 - FFHDS HEATER
70023	90023	70023 - MID BARREL FEED HEATER
70024	90024	70024 - MID BARREL REBOILER HEATER
70025	90025	70025 - LIGHT HYDRO FEED HEATER
70026	90026	70026 - HYDROCRACKER FRAC REBOILER HEATER
70027	90027	70027 - HYDROCRACKER R1 HEATER
70028	90028	70028 - HYDROCRACKER R4 HEATER
70029	90029	70029 - HYDROCRACKER R2 HEATER
70030	90030	70030 - HYDROCRACKER R3 HEATER
70031	90031	70031 - NO. 1 HYDROGEN PLANT HEATER
70032	90032	70032 - JET TREATER R2 STABILIZER HEATER
70033	90033	70033 - JET TREATER R3 HYDROGENATION HEATER
70034	90034	70034 - JET TREATER R1 DESULF HEATER
70038	90038	70038 - NO. 2 HYDROGEN PLANT HEATER
70039	90039	70039 - NAPHTHA ISOM HDS HEATER
70040	91609	70040 - NO. 1 SRU INLINE HEATER
70041	91610	70041 - NO. 2 SRU INLINE HEATER
70101	90101	70101 - FLUE GAS COGENERATION 91/#1
70102	90102	70102 - FLUE GAS COGENERATION 92/#2
70103	90103	70103 - FLUE GAS COGENERATION 93/#3
70104	90104	70104 - FLUE GAS COGENERATION 94/#4
70301	90301	70301 - FCC FLARE
70302	90302	70302 - COKER FLARE
70303	90303	70303 - FFHDS FLARE
70304	90304	70304 - HYDROCRACKER FLARE
70305	90305	70305 - NAPHTHA ISOM HDS FLARE (#5?)
70401	50401	70401 - NO. 1 COKER COKE DRUM NO. 1
70402	50402	70402 - NO. 1 COKER COKE DRUM NO. 2
70403	50403	70403 - NO. 1 COKER COKE DRUM NO. 3
70404	50404	70404 - NO. 1 COKER COKE DRUM NO. 4
70405	50405	70405 - NO. 2 COKER COKE DRUM NO. 5
70406	50406	70406 - NO. 2 COKER COKE DRUM NO. 6

70501	90501	70501 - FCCU_RC-SCR
70502	90502	70502- FCCU-RC(E&W)
70601	90601	70601 - NO. 1 SRU INCINERATOR
70602	90602	70602 - NO. 2 SRU IINCINERATOR
70701	90701	70701 - NO. 1 HYDROGEN PLANT - CATACARB
70702	90702	70702 - NO. 2 HYDROGEN PLANT - DEARATOR
70901	80901	70901 - LIFT STATION NO. 1
70902	80902	70902 - LIFT STATION NO. 4
70903	80903	70903 - LIFT STATION NO. 7
70904	80904	70904 - LIFT STATION NO. 9
70905	80905	70905 - API SEPARATOR NO. 6
70906	80906	70906 - API SEPARATOR NO. 9
70907	80907	70907 - TRAP NO. 5
70910	80910	70910 - IGF NO. 1, 2, 3
70913	80913	70913 - TANK NO. 95
70914	80914	70914 - IGF PITS
71001	91001	71001 - ANALYTICAL LABS
71101	51101	71101 - PROPANE LOADING (TRUCK)
71102	51102	71102 - BUTANE LOADING (TRUCK)
71104	51104	71104 - BUTANE LOADING (RAIL)
71108	51108	71108 - BB LOADING (RAIL)
71109	51109	71109 - SULFUR LOADING (TRUCK)
71114	51114	71114 - PENTANE LOADING (RAIL)
71115	51115	71115 - PROPANE LOADING (RAIL)
71116	51116	71116 - PROPYLENE LOADING (RAIL)
71201	81201	71201 - NO. 1 COOLING TOWER
71203	81203	71203 - NO. 7 COOLING TOWER
71204	81204	71204 - NO. 8 COOLING TOWER
71205	81205	71205 - NO. 9 COOLING TOWER
71206	81206	71206 - NO. 10 COOLING TOWER
71207	81207	71207 - NO. 11 COOLING TOWER
71208	81208	71208 - NO. 12/12A COOLING TOWER
71209	81209	71209 - NO. 13 COOLING TOWER
71210	81210	71210 - NO. 14 COOLING TOWER
71211	81211	71211 - NO. 15/15A COOLING TOWER
71212	81212	71212 - NO. 16/16A COOLING TOWER
71302	91302	71302 - PAINT SPRAY BOOTH - PAINT SHOP
71304	51304	71304 - OUTDOOR PAINTING - NORTH AREA
71305	51305	71305 - OUTDOOR PAINTING - SOUTH AREA
71401	91401	71401 - MAINT ICES (PORTABLE) - NORTH AREA
71402	91402	71402 - MAINT ICES (PORTABLE) - SOUTH AREA
71403	91403	71403 - LAB TEST ICES
71404	91404	71404 - S/H TEST ICES
71405	91405	71405 - PORTABLE ICEs - NORTH >250HP
71406	91406	71406 - PORTABLE ICEs - SOUTH >250HP
71501	91501	71501 - BLUE BARN
71601	91601	71601 - FUEL DISPENSING - GATE 7
71602	91602	71602 - ASBESTOS REMOVAL
71603	91603	71603 - VESSEL DEGASSING - NORTH AREA
71604	91604	71604 - VESSEL DEGASSING - SOUTH AREA
71605	91605	71605 - WELDING
71607	91607	71607 - SPILLS AND RELEASES - NORTH AREA

71608	91608	71608 - SPILLS AND RELEASES - SOUTH AREA
72000	82000	72000 - FIX ROOF TANK NO. 1
72001	82001	72001 - FIX ROOF TANK NO. 11
72002	82002	72002 - EXT FLO TANK NO. 13
72004	82004	72004 - FIX ROOF TANK NO. 16
72005	82005	72005 - FIX ROOF TANK NO. 17
72006	82006	72006 - FIX ROOF TANK NO. 18
72007	82007	72007 - INT FLO TANK NO. 21
72009	82009	72009 - FIX ROOF TANK NO. 23
72010	82010	72010 - FIX ROOF TANK NO. 24
72011	82011	72011 - FIX ROOF TANK NO. 25
72012	82012	72012 - FIX ROOF TANK NO. 26
72015	82015	72015 - FIX ROOF TANK NO. 44
72017	82017	72017 - FIX ROOF TANK NO. 56
72018	82018	72018 - FIX ROOF TANK NO. 58
72019	82019	72019 - FIX ROOF TANK NO. 59
72020	82020	72020 - FIX ROOF TANK NO. 60
72021	82021	72021 - FIX ROOF TANK NO. 61
72022	82022	72022 - FIX ROOF TANK NO. 62
72023	82023	72023 - FIX ROOF TANK NO. 63
72024	82024	72024 - FIX ROOF TANK NO. 83
72025	82025	72025 - FIX ROOF TANK NO. 84
72026	82026	72026 - FIX ROOF TANK NO. 93
72027	82027	72027 - FIX ROOF TANK NO. 103
72029	82029	72029 - FIX ROOF TANK NO. 191
72033	82033	72033 - FIX ROOF TANK NO. 192
72038	82038	72038 - FIX ROOF TANK NO. 22
72040	82040	72040 - FIX ROOF TANK NO. 700
72041	82041	72041 - FIX ROOF TANK NO. 773
72042	82042	72042 - FIX ROOF TANK NO. 776
72043	82043	72043 - FIX ROOF TANK NO. 777
72044	82044	72044 - FIX ROOF TANK NO. 778
72045	82045	72045 - FIX ROOF TANK NO. 905
72046	82046	72046 - FIX ROOF TANK NO. 957
72047	82047	72047 - FIX ROOF TANK NO. 958
72048	82048	72048 - FIX ROOF TANK NO. 959
72049	82049	72049 - FIX ROOF TANK NO. 968
72050	82050	72050 - FIX ROOF TANK NO. 969
72051	82051	72051 - FIX ROOF TANK NO. 90
72052	82052	72052 - FIX ROOF TANK NO. 101
72053	82053	72053 - FIX ROOF TANK NO. 102
72060	82060	72060 - FIX ROOF TANK NO. 956
72061	82061	72061 - EXT FLO TANK NO. 2
72062	82062	72062 - EXT FLO TANK NO. 3
72063	82063	72063 - EXT FLO TANK NO. 4
72064	82064	72064 - EXT FLO TANK NO. 5
72065	82065	72065 - EXT FLO TANK NO. 6
72066	82066	72066 - EXT FLO TANK NO. 8
72068	82068	72068 - EXT FLO TANK NO. 19
72069	82069	72069 - EXT FLO TANK NO. 20
72070	82070	72070 - EXT FLO TANK NO. 31
72071	82071	72071 - EXT FLO TANK NO. 32

72072	82072	72072 - EXT FLO TANK NO. 33
72073	82073	72073 - EXT FLO TANK NO. 34
72074	82074	72074 - EXT FLO TANK NO. 35
72076	82076	72076 - EXT FLO TANK NO. 40
72077	82077	72077 - EXT FLO TANK NO. 41
72078	82078	72078 - EXT FLO TANK NO. 42
72079	82079	72079 - EXT FLO TANK NO. 45
72080	82080	72080 - EXT FLO TANK NO. 50
72081	82081	72081 - EXT FLO TANK NO. 51
72082	82082	72082 - EXT FLO TANK NO. 52
72083	82083	72083 - EXT FLO TANK NO. 53
72084	82084	72084 - EXT FLO TANK NO. 54
72085	82085	72085 - EXT FLO TANK NO. 55
72086	82086	72086 - EXT FLO TANK NO. 57
72087	82087	72087 - EXT FLO TANK NO. 64
72088	82088	72088 - EXT FLO TANK NO. 65
72089	82089	72089 - EXT FLO TANK NO. 66
72090	82090	72090 - EXT FLO TANK NO. 67
72091	82091	72091 - EXT FLO TANK NO. 68
72092	82092	72092 - EXT FLO TANK NO. 69
72093	82093	72093 - EXT FLO TANK NO. 70
72094	82094	72094 - EXT FLO TANK NO. 71
72095	82095	72095 - EXT FLO TANK NO. 152
72096	82096	72096 - EXT FLO TANK NO. 154
72099	82099	72099 - EXT FLO TANK NO. 188
72100	82100	72100 - EXT FLO TANK NO. 189
72101	82101	72101 - EXT FLO TANK NO. 91
72102	82102	72102 - EXT FLO TANK NO. 27
72103	82103	72103 - EXT FLO TANK NO. 28
72104	82104	72104 - EXT FLO TANK NO. 29
72105	82105	72105 - EXT FLO TANK NO. 30
72114	82114	72114 - FIX ROOF TANK NO. 426
72115	82115	72115 - FIX ROOF TANK NO. 501
72116	82116	72116 - FIX ROOF TANK NO. 502
72118	82118	72118 - FIX ROOF TANK NO. 619
72119	82119	72119 - FIX ROOF TANK NO. 620
72122	82122	72122 - EXT FLO TANK NO. 153
72203	82203	72203 - SULFUR DAY PIT D
72220	82220	72220 - EXT FLO TANK NO. 164
72222	82222	72222 - FIX ROOF TANK NO. 49
72223	82223	72223 - FIX ROOF TANK NO. 12
72225	82225	72225 - EXT FLO TANK NO. 96
72226	82226	72226 - EXT FLO TANK NO. 97
72227	82227	72227 - FIX ROOF TANK NO. 173R
72232	82232	72232 - FIX ROOF TANK NO. 284
72236	82236	72236 - INT FLO TANK NO. 14
72237	82237	72237 - EXT FLO TANK NO. 190
72238	82238	72238 - FIX ROOF TANK NO. 157
72239	82239	72239 - FIX ROOF TANK NO. 210
72243	82243	72243 - FIX ROOF TANK NO. 288
72244	82244	72244 - EXT FLO TANK NO. 309
72245	82245	72245 - EXT FLO TANK NO. 310

72246	82246	72246 - FIX ROOF TANK NO. 371
72247	82247	72247 - FIX ROOF TANK NO. 372
72250	82250	72250 - EXT FLO TANK NO. 394
72251	82251	72251 - FIX ROOF TANK NO. 5380
72252	82252	72252 - FIX ROOF TANK NO. 5381
72253	82253	72253 - FIX ROOF TANK NO. 596
72254	82254	72254 - FIX ROOF TANK NO. 610
72255	82255	72255 - FIX ROOF TANK NO. 614
72256	82256	72256 - FIX ROOF TANK NO. 617
72257	82257	72257 - FIX ROOF TANK NO. 618
72258	82258	72258 - FIX ROOF TANK NO. 634
72259	82259	72259 - FIX ROOF TANK NO. 635
72265	82265	72265 - FIX ROOF TANK NO. 774
72266	82266	72266 - FIX ROOF TANK NO. 775
72267	82267	72267 - FIX ROOF TANK NO. 824
72268	82268	72268 - FIX ROOF TANK NO. 913
72269	82269	72269 - FIX ROOF TANK NO. 916
72270	82270	72270 - FIX ROOF TANK NO. 917
72271	82271	72271 - FIX ROOF TANK NO. 919
72272	82272	72272 - FIX ROOF TANK NO. 981
72273	82273	72273 - FIX ROOF TANK NO. 2940
72274	82274	72274 - FIX ROOF TANK NO. 2941
72275	82275	72275 - FIX ROOF TANK NO. 2942
72276	82276	72276 - FIX ROOF TANK NO. 2943
72277	82277	72277 - FIX ROOF TANK NO. 2944
72278	82278	72278 - FIX ROOF TANK NO. 5485
72279	82279	72279 - FIX ROOF TANK NO. 5486
78000	58000	78000 - FUGITIVES - #4 STEAM PLANT
78002	58002	78002 - FUGITIVES - 51 VAC
78003	58003	78003 - FUGITIVES - 52 VAC
78014	58014	78014 - FUGITIVES - ALKY
78015	58015	78015 - FUGITIVES - BUTAMER
78016	58016	78016 - FUGITIVES - C3 SPLITTER
78017	58017	78017 - FUGITIVES - CLAUS
78018	58018	78018 - FUGITIVES - COGEN
78019	58019	78019 - FUGITIVES - COKER
78020	58020	78020 - FUGITIVES - CRUDE #1
78021	58021	78021 - FUGITIVES - CRUDE #2
78022	58022	78022 - FUGITIVES - CRUDE #4
78023	58023	78023 - FUGITIVES - FCC
78024	58024	78024 - FUGITIVES - FIRE TRAINING
78025	58025	78025 - FUGITIVES - FLARE - #5
78026	58026	78026 - FUGITIVES - FLARE - HDS
78027	58027	78027 - FUGITIVES - FLARE - FCC
78028	58028	78028 - FUGITIVES - HDS
78029	58029	78029 - FUGITIVES - HYDROCRACKER
78031	58031	78031 - FUGITIVES - NORTH H2 PLANT
78032	58032	78032 - FUGITIVES - SOUTH H2 PLANT
78033	58033	78033 - FUGITIVES - ISOSIV
78036	58036	78036 - FUGITIVES - LRU
78037	58037	78037 - FUGITIVES - MID BBL
78040	58040	78040 - FUGITIVES - NAPH - ISOM

78041	58041	78041 - FUGITIVES - NESHAPS
78042	58042	78042 - FUGITIVES - NO. 4 STOVE OIL
78058	58058	78058 - FUGITIVES - PENTANE
78061	58061	78061 - FUGITIVES - REFORMER #1
78062	58062	78062 - FUGITIVES - REFORMER #2
78063	58063	78063 - FUGITIVES - REFORMER #3
78065	58065	78065 - FUGITIVES - SFIA
78066	58066	78066 - FUGITIVES - SHOPS
78067	58067	78067 - FUGITIVES - SLOP
78068	58068	78068 - FUGITIVES - STORAGE/HANDLING
78069	58069	78069 - FUGITIVES - NE STORAGE/HANDLING
78071	58071	78071 - FUGITIVES - TREATER #1
78073	58073	78073 - FUGITIVES - WWT
78076	91611	78076- FUEL DISPENSING - GATE 60
78077	91612	78077 - Fugitives - Wase Mgmt Yard
78078	91613	78078 - Area 67 N - Fugitives - 1 Pump Slab
78079	91614	78079 - Area 70 - Fugitives - Khyber Pass
78080	91615	78080 - Area 65 (around tank 24)- Fugitives - GRNDWTR Re
78081	91616	78081 - Area 32 - Fugitives - 31 Loading Rack
78082	91617	78082 - Area 43 - Fugitives - Sulfur 3 -4 DEA
78083	91618	78083 - Area 43 - Fugitives - Sulfur 5 DEA
78084	91619	78084 - Area 35 - Fugitives - CokerFlare
78085	91620	78085 - Area 30 - Fugitives - ISOOCTENE
78086	91621	78086 - Area 50 - Fugitives - H/C Flare
78087	91622	78087 - Area 44 - Fugitives - 2 Ref DIB
78088	91623	78088 - Area 44 - Fugitives - 2 Ref SRD
78089	91624	78089 - Area 56 S - Fugitives - Lay Down Yard
78090	91625	78090 - Area 36-37 M - Fugitives - DEHEX
78091	91626	78091- ICE Emergency Fire D1997 (Foamhouse Pump)
78092	91627	78092 - ICE Emergency Fire D1998 (Sulfur Loading)
78093	91628	78093 - ICE Emergency Fire D2416 (Tank 10)
78094	91629	78094 - ICE Emergency Fire D2776/D1970 (Btw 7 & 8CT)
78095	91630	78095 - ICE Emergency Fire D2859 (Carson One)

Appendix B3 Census Tracts Assessed by Population Burden

Appendix B3 - Census Tracts Assessed for Population Burden			
Receptor Group	Receptor Name	UTM Easting (km)	UTM Northing (km)
RES	RES1	383.55403	3740.97989
RES	RES2	383.65403	3740.97989
RES	RES3	383.35403	3741.07989
RES	RES4	383.45403	3741.07989
RES	RES5	383.55403	3741.07989
RES	RES6	383.65403	3741.07989
RES	RES7	383.35403	3741.17989
RES	RES8	383.45403	3741.17989
RES	RES9	383.55403	3741.17989
RES	RES10	383.65403	3741.17989
RES	RES11	387.07423	3741.20392
RES	RES12	387.17423	3741.20392
RES	RES13	387.27423	3741.20392
RES	RES14	387.37423	3741.20392
RES	RES15	383.35403	3741.27989
RES	RES16	383.45403	3741.27989
RES	RES17	383.55403	3741.27989
RES	RES18	383.65403	3741.27989
RES	RES19	388.56712	3741.28488
RES	RES20	388.66712	3741.28488
RES	RES21	388.76712	3741.28488
RES	RES22	388.86712	3741.28488
RES	RES23	388.96712	3741.28488
RES	RES24	389.06712	3741.28488
RES	RES25	387.07423	3741.30392
RES	RES26	387.17423	3741.30392
RES	RES27	387.27423	3741.30392
RES	RES28	387.37423	3741.30392
RES	RES29	387.47423	3741.30392
RES	RES30	387.67423	3741.30392
RES	RES31	387.77423	3741.30392
RES	RES32	387.87423	3741.30392
RES	RES33	387.97423	3741.30392
RES	RES34	388.07423	3741.30392
RES	RES35	388.17423	3741.30392
RES	RES36	383.35403	3741.37989
RES	RES37	383.45403	3741.37989
RES	RES38	383.55403	3741.37989
RES	RES39	383.65403	3741.37989
RES	RES40	383.75403	3741.37989
RES	RES41	388.56712	3741.38488
RES	RES42	388.66712	3741.38488
RES	RES43	388.76712	3741.38488
RES	RES44	388.86712	3741.38488
RES	RES45	388.96712	3741.38488
RES	RES46	389.06712	3741.38488
RES	RES47	387.07423	3741.40392

RES	RES48	387.17423	3741.40392
RES	RES49	387.27423	3741.40392
RES	RES50	387.37423	3741.40392
RES	RES51	387.47423	3741.40392
RES	RES52	387.67423	3741.40392
RES	RES53	387.77423	3741.40392
RES	RES54	387.87423	3741.40392
RES	RES55	387.97423	3741.40392
RES	RES56	388.07423	3741.40392
RES	RES57	388.17423	3741.40392
RES	RES58	383.35403	3741.47989
RES	RES59	383.45403	3741.47989
RES	RES60	383.55403	3741.47989
RES	RES61	383.65403	3741.47989
RES	RES62	383.75403	3741.47989
RES	RES63	388.56712	3741.48488
RES	RES64	388.66712	3741.48488
RES	RES65	388.76712	3741.48488
RES	RES66	388.86712	3741.48488
RES	RES67	388.96712	3741.48488
RES	RES68	389.06712	3741.48488
RES	RES69	387.07423	3741.50392
RES	RES70	387.17423	3741.50392
RES	RES71	387.27423	3741.50392
RES	RES72	387.37423	3741.50392
RES	RES73	387.47423	3741.50392
RES	RES74	387.57423	3741.50392
RES	RES75	387.67423	3741.50392
RES	RES76	387.77423	3741.50392
RES	RES77	387.87423	3741.50392
RES	RES78	387.97423	3741.50392
RES	RES79	388.07423	3741.50392
RES	RES80	388.17423	3741.50392
RES	RES81	388.27423	3741.50392
RES	RES82	383.35403	3741.57989
RES	RES83	383.45403	3741.57989
RES	RES84	383.55403	3741.57989
RES	RES85	383.65403	3741.57989
RES	RES86	383.75403	3741.57989
RES	RES87	388.56712	3741.58488
RES	RES88	388.66712	3741.58488
RES	RES89	388.76712	3741.58488
RES	RES90	388.86712	3741.58488
RES	RES91	388.96712	3741.58488
RES	RES92	389.06712	3741.58488
RES	RES93	387.57423	3741.60392
RES	RES94	387.67423	3741.60392
RES	RES95	387.77423	3741.60392
RES	RES96	387.87423	3741.60392
RES	RES97	387.97423	3741.60392
RES	RES98	388.07423	3741.60392
RES	RES99	388.17423	3741.60392

RES	RES100	388.27423	3741.60392
RES	RES101	388.56712	3741.68488
RES	RES102	388.66712	3741.68488
RES	RES103	388.76712	3741.68488
RES	RES104	388.86712	3741.68488
RES	RES105	388.96712	3741.68488
RES	RES106	389.06712	3741.68488
RES	RES107	386.97708	3741.68644
RES	RES108	387.07708	3741.68644
RES	RES109	387.17708	3741.68644
RES	RES110	387.27708	3741.68644
RES	RES111	387.37708	3741.68644
RES	RES112	387.47708	3741.68644
RES	RES113	387.57708	3741.68644
RES	RES114	387.67708	3741.68644
RES	RES115	387.77708	3741.68644
RES	RES116	387.87708	3741.68644
RES	RES117	387.97708	3741.68644
RES	RES118	388.07708	3741.68644
RES	RES119	388.17708	3741.68644
RES	RES120	388.27708	3741.68644
RES	RES121	388.56712	3741.78488
RES	RES122	388.66712	3741.78488
RES	RES123	388.96712	3741.78488
RES	RES124	389.06712	3741.78488
RES	RES125	386.97708	3741.78644
RES	RES126	387.07708	3741.78644
RES	RES127	387.17708	3741.78644
RES	RES128	387.27708	3741.78644
RES	RES129	387.37708	3741.78644
RES	RES130	387.47708	3741.78644
RES	RES131	387.57708	3741.78644
RES	RES132	387.67708	3741.78644
RES	RES133	387.77708	3741.78644
RES	RES134	387.87708	3741.78644
RES	RES135	387.97708	3741.78644
RES	RES136	388.07708	3741.78644
RES	RES137	388.17708	3741.78644
RES	RES138	388.27708	3741.78644
RES	RES139	388.56712	3741.88488
RES	RES140	388.66712	3741.88488
RES	RES141	388.96712	3741.88488
RES	RES142	389.06712	3741.88488
RES	RES143	386.97708	3741.88644
RES	RES144	387.07708	3741.88644
RES	RES145	387.17708	3741.88644
RES	RES146	387.27708	3741.88644
RES	RES147	387.37708	3741.88644
RES	RES148	387.47708	3741.88644
RES	RES149	387.67708	3741.88644
RES	RES150	387.77708	3741.88644
RES	RES151	387.87708	3741.88644

RES	RES152	387.97708	3741.88644
RES	RES153	388.07708	3741.88644
RES	RES154	388.17708	3741.88644
RES	RES155	388.27708	3741.88644
RES	RES156	388.56712	3741.98488
RES	RES157	388.66712	3741.98488
RES	RES158	388.76712	3741.98488
RES	RES159	388.86712	3741.98488
RES	RES160	388.96712	3741.98488
RES	RES161	389.06712	3741.98488
RES	RES162	386.97708	3741.98644
RES	RES163	387.07708	3741.98644
RES	RES164	387.17708	3741.98644
RES	RES165	387.27708	3741.98644
RES	RES166	387.37708	3741.98644
RES	RES167	387.47708	3741.98644
RES	RES168	387.57708	3741.98644
RES	RES169	387.67708	3741.98644
RES	RES170	387.77708	3741.98644
RES	RES171	387.87708	3741.98644
RES	RES172	388.07708	3741.98644
RES	RES173	388.17708	3741.98644
RES	RES174	388.27708	3741.98644
RES	RES175	388.56712	3742.08488
RES	RES176	388.66712	3742.08488
RES	RES177	388.76712	3742.08488
RES	RES178	388.86712	3742.08488
RES	RES179	388.96712	3742.08488
RES	RES180	389.06712	3742.08488
RES	RES181	386.97708	3742.08644
RES	RES182	387.07708	3742.08644
RES	RES183	387.17708	3742.08644
RES	RES184	387.27708	3742.08644
RES	RES185	387.37708	3742.08644
RES	RES186	387.47708	3742.08644
RES	RES187	387.57708	3742.08644
RES	RES188	387.67708	3742.08644
RES	RES189	387.77708	3742.08644
RES	RES190	387.87708	3742.08644
RES	RES191	388.07708	3742.08644
RES	RES192	388.17708	3742.08644
RES	RES193	388.27708	3742.08644
RES	RES194	388.56712	3742.18488
RES	RES195	387.00622	3742.7709
RES	RES196	387.09327	3742.7709
RES	RES197	387.19327	3742.7709
RES	RES198	387.29327	3742.7709
RES	RES199	387.59327	3742.7709
RES	RES200	387.69327	3742.7709
RES	RES201	387.79327	3742.7709
RES	RES202	387.89327	3742.7709
RES	RES203	387.99327	3742.7709

RES	RES204	388.09327	3742.7709
RES	RES205	388.19327	3742.7709
RES	RES206	388.56712	3742.78488
RES	RES207	388.66712	3742.78488
RES	RES208	388.78655	3742.78488
RES	RES209	388.86712	3742.78488
RES	RES210	388.96712	3742.78488
RES	RES211	389.06712	3742.78488
RES	RES212	387.09327	3742.8709
RES	RES213	387.19327	3742.8709
RES	RES214	387.29327	3742.8709
RES	RES215	387.39327	3742.8709
RES	RES216	387.59327	3742.8709
RES	RES217	387.69327	3742.8709
RES	RES218	387.79327	3742.8709
RES	RES219	387.89327	3742.8709
RES	RES220	387.99327	3742.8709
RES	RES221	388.09327	3742.8709
RES	RES222	388.19327	3742.8709
RES	RES223	388.76712	3742.88488
RES	RES224	388.86712	3742.88488
RES	RES225	388.96712	3742.88488
RES	RES226	389.06712	3742.88488
RES	RES227	387.10662	3742.96883
RES	RES228	387.19327	3742.9709
RES	RES229	387.29327	3742.9709
RES	RES230	387.39327	3742.9709
RES	RES231	387.59327	3742.9709
RES	RES232	387.69327	3742.9709
RES	RES233	387.79327	3742.9709
RES	RES234	387.89327	3742.9709
RES	RES235	387.99327	3742.9709
RES	RES236	388.09327	3742.9709
RES	RES237	388.19327	3742.9709
RES	RES238	388.76712	3742.98488
RES	RES239	388.86712	3742.98488
RES	RES240	388.96712	3742.98488
RES	RES241	389.06712	3742.98488
RES	RES242	386.64353	3743.01416
RES	RES243	386.74353	3743.01416
RES	RES244	386.84353	3743.01416
RES	RES245	386.94353	3743.01416
RES	RES246	387.04353	3743.01416
RES	RES247	387.14548	3743.05626
RES	RES248	387.24548	3743.05626
RES	RES249	387.34548	3743.05626
RES	RES250	387.44548	3743.05626
RES	RES251	387.70817	3743.05626
RES	RES252	387.80817	3743.05626
RES	RES253	387.90817	3743.05626
RES	RES254	388.00817	3743.05626
RES	RES255	388.10817	3743.05626

RES	RES256	388.20817	3743.05626
RES	RES257	388.76712	3743.08488
RES	RES258	388.86712	3743.08488
RES	RES259	388.96712	3743.08488
RES	RES260	389.06712	3743.08488
RES	RES261	386.64353	3743.11416
RES	RES262	386.74353	3743.11416
RES	RES263	386.84353	3743.11416
RES	RES264	386.94353	3743.11416
RES	RES265	387.04353	3743.11416
RES	RES266	387.24548	3743.15626
RES	RES267	387.34548	3743.15626
RES	RES268	387.44548	3743.15626
RES	RES269	387.60817	3743.15626
RES	RES270	387.80817	3743.15626
RES	RES271	387.90817	3743.15626
RES	RES272	388.00817	3743.15626
RES	RES273	388.10817	3743.15626
RES	RES274	388.20817	3743.15626
RES	RES275	388.76712	3743.18488
RES	RES276	388.86712	3743.18488
RES	RES277	388.96712	3743.18488
RES	RES278	386.64353	3743.21416
RES	RES279	386.74353	3743.21416
RES	RES280	386.84353	3743.21416
RES	RES281	386.94353	3743.21416
RES	RES282	387.04353	3743.21416
RES	RES283	387.14353	3743.21416
RES	RES284	387.24548	3743.25626
RES	RES285	387.34548	3743.25626
RES	RES286	387.44548	3743.25626
RES	RES287	387.60817	3743.25626
RES	RES288	387.70817	3743.25626
RES	RES289	387.80817	3743.25626
RES	RES290	387.90817	3743.25626
RES	RES291	388.00817	3743.25626
RES	RES292	388.10817	3743.25626
RES	RES293	388.20817	3743.25626
RES	RES294	386.64353	3743.32711
RES	RES295	386.74353	3743.32711
RES	RES296	386.84353	3743.32711
RES	RES297	386.94353	3743.32711
RES	RES298	388.00817	3743.35626
RES	RES299	388.10817	3743.35626
RES	RES300	388.20817	3743.35626
RES	RES301	384.09686	3743.42243
RES	RES302	384.19686	3743.42243
RES	RES303	384.29686	3743.42243
RES	RES304	384.39686	3743.42243
RES	RES305	386.57974	3743.43696
RES	RES306	386.67974	3743.43696
RES	RES307	386.77974	3743.43696

RES	RES308	386.87974	3743.43696
RES	RES309	386.97974	3743.43696
RES	RES310	387.07974	3743.43696
RES	RES311	387.17974	3743.43696
RES	RES312	387.27974	3743.43696
RES	RES313	388.03926	3743.44163
RES	RES314	384.19686	3743.52243
RES	RES315	384.29686	3743.52243
RES	RES316	384.39686	3743.52243
RES	RES317	384.75898	3743.5898
RES	RES318	384.85898	3743.5898
RES	RES319	384.95898	3743.5898
RES	RES320	385.05898	3743.5898
RES	RES321	384.19686	3743.62243
RES	RES322	384.29686	3743.62243
RES	RES323	384.55898	3743.6898
RES	RES324	384.65898	3743.6898
RES	RES325	384.75898	3743.6898
RES	RES326	384.85898	3743.6898
RES	RES327	384.95898	3743.6898
RES	RES328	385.05898	3743.6898
RES	RES329	384.35898	3743.7898
RES	RES330	384.45898	3743.7898
RES	RES331	384.55898	3743.7898
RES	RES332	384.65898	3743.7898
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RES	RES356	384.75898	3743.9898
RES	RES357	384.85898	3743.9898
RES	RES358	384.95898	3743.9898
RES	RES359	385.05898	3743.9898

RES	RES360	385.15898	3743.9898
RES	RES361	384.75898	3744.0898
RES	RES362	384.85898	3744.0898
RES	RES363	388.66712	3742.18488
RES	RES364	388.76712	3742.18488
RES	RES365	388.86712	3742.18488
RES	RES366	388.96712	3742.18488
RES	RES367	389.06712	3742.18488
RES	RES368	386.97708	3742.18644
RES	RES369	387.07708	3742.18644
RES	RES370	387.17708	3742.18644
RES	RES371	387.27708	3742.18644
RES	RES372	387.37708	3742.18644
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RES	RES385	388.96712	3742.28488
RES	RES386	389.06712	3742.28488
RES	RES387	386.97708	3742.28644
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RES	RES389	387.17708	3742.28644
RES	RES390	387.27708	3742.28644
RES	RES391	387.37708	3742.28644
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RES	RES400	388.96712	3742.38488
RES	RES401	389.06712	3742.38488
RES	RES402	386.97708	3742.38644
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RES	RES404	387.27708	3742.38644
RES	RES405	387.37708	3742.38644
RES	RES406	387.47708	3742.38644
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RES	RES408	387.67708	3742.38644
RES	RES409	387.77708	3742.38644
RES	RES410	387.87708	3742.38644
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RES	RES414	388.27708	3742.38644
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RES	RES416	388.66712	3742.48488
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RES	RES420	389.06712	3742.48488
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RES	RES423	387.57708	3742.48644
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RES	RES425	387.77708	3742.48644
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RES	RES432	388.66712	3742.58488
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RES	RES437	386.97708	3742.58644
RES	RES438	387.07708	3742.58644
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RES	RES453	387.89327	3742.6709
RES	RES454	387.99327	3742.6709
RES	RES455	388.09327	3742.6709
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RES	RES457	388.56712	3742.68488
RES	RES458	388.66712	3742.68488
RES	RES459	388.76712	3742.68488
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RES	RES462	389.06712	3742.68488
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WRK	WRK3	384.00351	3739.92584
WRK	WRK4	384.10351	3739.92584
WRK	WRK5	384.20351	3739.92584
WRK	WRK6	385.10351	3739.92584
WRK	WRK7	385.20351	3739.92584
WRK	WRK8	385.30351	3739.92584
WRK	WRK9	385.40351	3739.92584
WRK	WRK10	385.50351	3739.92584
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WRK	WRK214	388.06279	3741.23954
WRK	WRK215	388.16279	3741.23954
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WRK	WRK309	383.80351	3740.92584
WRK	WRK310	383.90351	3740.92584
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WRK	WRK516	385.21241	3743.42011
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WRK	WRK754	386.89591	3742.48755
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WRK	WRK756	383.59976	3742.50592
WRK	WRK757	383.69976	3742.50592
WRK	WRK758	383.79976	3742.50592
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WRK	WRK778	386.89591	3742.58755
WRK	WRK779	383.59976	3742.60592
WRK	WRK780	383.69976	3742.60592
WRK	WRK781	383.79976	3742.60592
WRK	WRK782	383.89976	3742.60592
WRK	WRK783	383.99976	3742.60592
WRK	WRK784	384.09976	3742.60592
WRK	WRK785	384.19976	3742.60592
WRK	WRK786	384.29976	3742.60592
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WRK	WRK788	387.26934	3742.63632
WRK	WRK789	387.36934	3742.63632
WRK	WRK790	387.46934	3742.63632
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WRK	WRK793	386.19591	3742.68755
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WRK	WRK795	386.39591	3742.68755
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WRK	WRK798	386.69591	3742.68755
WRK	WRK799	386.79591	3742.68755
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WRK	WRK801	383.59976	3742.70592
WRK	WRK802	383.69976	3742.70592
WRK	WRK803	383.79976	3742.70592

WRK	WRK804	383.89976	3742.70592
WRK	WRK805	383.99976	3742.70592
WRK	WRK806	384.09976	3742.70592
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WRK	WRK809	384.39976	3742.70592
WRK	WRK810	384.49976	3742.70592
WRK	WRK811	387.36934	3742.73632
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WRK	WRK813	385.99591	3742.78755
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WRK	WRK864	386.69897	3742.99538
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WRK	WRK866	388.54292	3742.99698
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WRK	WRK868	386.7858	3742.99972
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WRK	WRK874	384.29976	3743.10592
WRK	WRK875	384.39976	3743.10592
WRK	WRK876	384.49976	3743.10592
WRK	WRK877	385.41878	3743.12598
WRK	WRK878	385.69984	3743.12924
WRK	WRK879	385.59853	3743.13251
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WRK	WRK881	386.19591	3743.18755
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WRK	WRK891	384.19976	3743.20592
WRK	WRK892	384.29976	3743.20592
WRK	WRK893	384.39976	3743.20592
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WRK	WRK895	385.3142	3743.21422
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WRK	WRK897	385.49721	3743.22075
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WRK	WRK899	385.70311	3743.22402
WRK	WRK900	385.79788	3743.22402
WRK	WRK901	385.87305	3743.2567
WRK	WRK902	388.54292	3743.29698
WRK	WRK903	388.64292	3743.29698
WRK	WRK904	383.99976	3743.30592
WRK	WRK905	384.09976	3743.30592
WRK	WRK906	384.19976	3743.30592
WRK	WRK907	384.29976	3743.30592

WRK	WRK908	384.39976	3743.30592
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SEN	Robinson (Jackie) School	389.628	3741.3412
SEN	Oakwood Academy	389.8893	3741.8369
SEN	Muir Elementary School	387.9126	3742.0287
SEN	Broad Avenue Elementary School	383.1575	3740.8003
SEN	Phineas Banning Senior High School	383.2876	3740.0319
SEN	Webster Elementary School	387.4599	3742.4369
SEN	Long Beach Brethren Elementary School	390.1426	3743.1897
SEN	Long Beach Head Start	391.1248	3741.6948
SEN	Long Beach Unified School District	391.2148	3742.2994
SEN	Holy Family School	384.3988	3739.3647
SEN	Wilmington Christian School	383.004	3740.6583
SEN	Old King Cole Day Care	388.8477	3742.5275
SEN	Pacific Hospital of Long Beach	389.5867	3741.419
SEN	Miller Children's Hospital	390.1205	3741.5215
SEN	Santa Fe Convalescent Hospital	387.5417	3742.485
SEN	Hillcrest Care Center	389.3433	3742.8181
SEN	The Palmcrest Grand Care Center, Inc	389.2793	3742.9796
SEN	Memorial Heart Institute	390.1205	3741.5215
SEN	Jonathan Jaques Children's Center	390.3453	3741.55
SEN	Royal Care Skilled Nursing	389.48	3741.3568
SEN	Medical Sisters-Saint Joseph	390.9124	3743.1734
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WRK	WRK913	384.69976	3743.00592
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WRK	WRK917	384.59976	3743.20529
WRK	WRK918	384.69976	3743.20592
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WRK	WRK920	384.59976	3743.30592
WRK	WRK921	384.69976	3743.30592
WRK	WRK922	384.79976	3743.30592
WRK	WRK923	384.89976	3743.30592

Modeling Files Contained on CD

Fifth Train HRA
Refinery HRA

Appendix B

Soils and Water Resources
Stormwater Runoff Calculations

APPENDIX B Stormwater Runoff Calculations

Kiewit Power Engineers developed stormwater calculations to determine the pre-development and post-development peak discharge for the BP Watson Cogeneration facility (the Project plus the existing facility).

Pre-development conditions were established based on site visits and available documents; the exact location and dimensions of the existing stormwater system were not available at the time of this study. Features depicted on Figure B-1 are an approximation of current site conditions.

The addition of the Project (fifth train) is expected to slightly increase the current (pre-development) stormwater conditions. The site is currently graveled and will be paved post-construction.

Quality requirements for stormwater will be addressed by using an existing oil/water separator and by installing Best Management Practices (BMP) measures during construction.

Pre-development peak discharge for BP Watson Cogeneration facility is 66.8 cubic feet per second (cfs) and 104.1 cfs for the 10-year and 100-year events, respectively. These values correspond to 21.72 acres which were subdivided into drainage areas according to Figure B-1. The runoff volume for pre-development is 310,900 cubic feet and 490,100 cubic feet for the 10-year and 100-year events, respectively.

Post-development peak discharge is expected to slightly increase to 68.9 cfs and 106.0 cfs for the 10-year and 100-year events, respectively. This is due to 2.36 acres having a higher runoff coefficient due to being paved instead of graveled. Figure B-1 shows areas 1 and 8 as the addition of the fifth power train. The runoff volumes are also expected to increase to 322,700 cubic feet and 503,200 cubic feet for the 10-year and 100-year events, respectively.

Pre- and Post-Development Stormwater Results

	Area (ac)	Runoff Coefficient	10-Year Discharge (cfs)	100-Year Discharge (cfs)	10-Year Volume (cf)	100-Year Volume (cf)
Pre-development	21.72	98(#1-4)-85(#5)	66.8	104.1	310,900	490,100
Post development	21.72	98	68.9	106.0	322,700	503,200

Source: Kiewit Power Engineers, Co., 2009.

Notes:

ac = acre

cfs = cubic feet per second

Calculations from Hydraflow Software are attached with Figure B-1 showing the sub-areas and size.

Description of Hydraflow Summary Report Terms

Term	Description
SCS Runoff	SCS method was used to calculate hydrograph
Combine	Hydrographs added to route through site to the outlet
Peak Flow	Peak Discharge
Hyd. Volume	Runoff Volume
Inflow Hyd(s)	Individual hydrographs added to create a new hydrograph

Source: Kiewit Power Engineers, Co., 2009.

Notes:

Hyd = hydrograph SCS = Soil Complex Curve

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	3.040	1	597	13,154	----	------	------	Area 1
2	SCS Runoff	3.655	1	596	16,982	----	------	------	Area 2
3	SCS Runoff	3.688	1	596	17,132	----	------	------	Area 3
4	SCS Runoff	3.688	1	596	17,132	----	------	------	Area 4
5	SCS Runoff	3.688	1	596	17,132	----	------	------	Area 5
6	SCS Runoff	4.949	1	596	22,993	----	------	------	Area 6
7	SCS Runoff	4.496	1	596	20,889	----	------	------	Area 7
8	SCS Runoff	2.437	1	597	10,543	----	------	------	Area 8
9	SCS Runoff	3.494	1	596	16,230	----	------	------	Area 9
10	SCS Runoff	3.494	1	596	16,230	----	------	------	Area 10
11	SCS Runoff	3.494	1	596	16,230	----	------	------	Area 11
12	SCS Runoff	3.364	1	596	15,629	----	------	------	Area 12
13	SCS Runoff	4.852	1	596	22,542	----	------	------	Area 13
14	SCS Runoff	3.688	1	596	17,132	----	------	------	Area 14
15	SCS Runoff	5.013	1	597	23,870	----	------	------	Area 15
16	SCS Runoff	5.133	1	597	24,439	----	------	------	Area 16
17	SCS Runoff	4.745	1	597	22,591	----	------	------	Area 17
18	Combine	15.38	1	597	71,138	1, 2, 3, 15,	------	------	North Inlet 1
19	Combine	12.49	1	597	58,703	4, 5, 16,	------	------	North, Inlet 2
20	Combine	9.680	1	597	45,585	6, 17,	------	------	North, Inlet 3
21	Combine	9.404	1	596	43,004	8, 9, 10,	------	------	South, Inlet 1
22	Combine	11.71	1	596	54,402	11, 12, 13,	------	------	South, Inlet 2
23	Combine	8.184	1	596	38,021	7, 14,	------	------	East Inlet
24	Combine	66.78	1	597	310,853	18, 19, 20, 21, 22, 23	------	------	Outlet

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	5.420	1	597	23,421	----	------	------	Area 1
2	SCS Runoff	5.623	1	596	26,486	----	------	------	Area 2
3	SCS Runoff	5.673	1	596	26,720	----	------	------	Area 3
4	SCS Runoff	5.673	1	596	26,720	----	------	------	Area 4
5	SCS Runoff	5.673	1	596	26,720	----	------	------	Area 5
6	SCS Runoff	7.613	1	596	35,862	----	------	------	Area 6
7	SCS Runoff	6.917	1	596	32,580	----	------	------	Area 7
8	SCS Runoff	4.344	1	597	18,772	----	------	------	Area 8
9	SCS Runoff	5.374	1	596	25,314	----	------	------	Area 9
10	SCS Runoff	5.374	1	596	25,314	----	------	------	Area 10
11	SCS Runoff	5.374	1	596	25,314	----	------	------	Area 11
12	SCS Runoff	5.175	1	596	24,377	----	------	------	Area 12
13	SCS Runoff	7.464	1	596	35,158	----	------	------	Area 13
14	SCS Runoff	5.673	1	596	26,720	----	------	------	Area 14
15	SCS Runoff	7.712	1	597	37,230	----	------	------	Area 15
16	SCS Runoff	7.895	1	597	38,116	----	------	------	Area 16
17	SCS Runoff	7.299	1	597	35,235	----	------	------	Area 17
18	Combine	24.39	1	597	113,857	1, 2, 3, 15,	------	------	North Inlet 1
19	Combine	19.21	1	597	91,557	4, 5, 16,	------	------	North, Inlet 2
20	Combine	14.89	1	597	71,097	6, 17,	------	------	North, Inlet 3
21	Combine	15.08	1	596	69,401	8, 9, 10,	------	------	South, Inlet 1
22	Combine	18.01	1	596	84,849	11, 12, 13,	------	------	South, Inlet 2
23	Combine	12.59	1	596	59,301	7, 14,	------	------	East Inlet
24	Combine	104.05	1	597	490,061	18, 19, 20, 21, 22, 23	------	------	Outlet

Hydrograph Summary Report

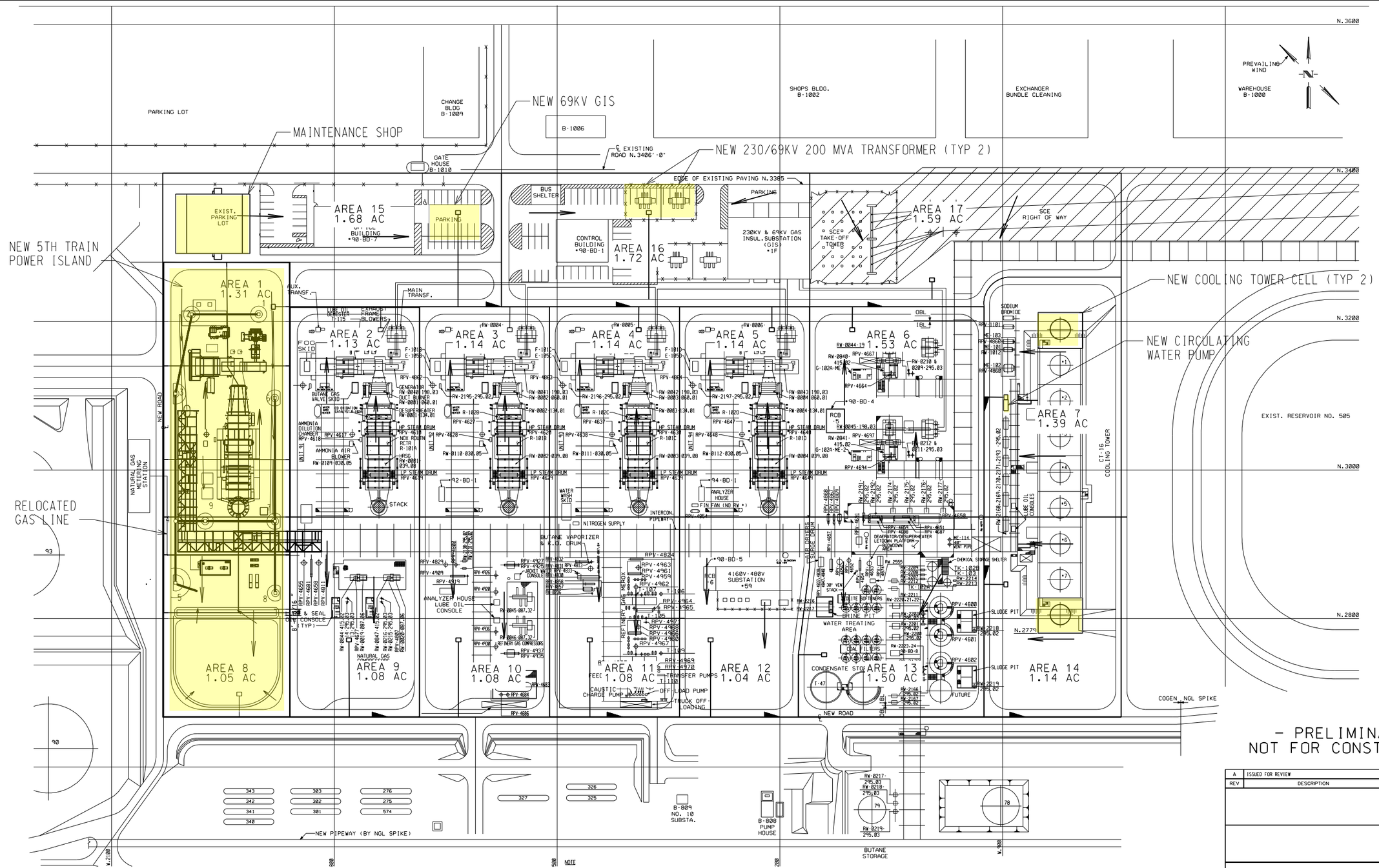
Hydraflow Hydrographs by Intelisolve v9.23

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	4.238	1	596	19,687	----	------	------	Area 1
2	SCS Runoff	3.655	1	596	16,982	----	------	------	Area 2
3	SCS Runoff	3.688	1	596	17,132	----	------	------	Area 3
4	SCS Runoff	3.688	1	596	17,132	----	------	------	Area 4
5	SCS Runoff	3.688	1	596	17,132	----	------	------	Area 5
6	SCS Runoff	4.949	1	596	22,993	----	------	------	Area 6
7	SCS Runoff	4.496	1	596	20,889	----	------	------	Area 7
8	SCS Runoff	3.397	1	596	15,780	----	------	------	Area 8
9	SCS Runoff	3.494	1	596	16,230	----	------	------	Area 9
10	SCS Runoff	3.494	1	596	16,230	----	------	------	Area 10
11	SCS Runoff	3.494	1	596	16,230	----	------	------	Area 11
12	SCS Runoff	3.364	1	596	15,629	----	------	------	Area 12
13	SCS Runoff	4.852	1	596	22,542	----	------	------	Area 13
14	SCS Runoff	3.688	1	596	17,132	----	------	------	Area 14
15	SCS Runoff	5.013	1	597	23,870	----	------	------	Area 15
16	SCS Runoff	5.133	1	597	24,439	----	------	------	Area 16
17	SCS Runoff	4.745	1	597	22,591	----	------	------	Area 17
18	Combine	16.56	1	597	77,671	1, 2, 3, 15,	------	------	North Inlet 1
19	Combine	12.49	1	597	58,703	4, 5, 16,	------	------	North, Inlet 2
20	Combine	9.680	1	597	45,585	6, 17,	------	------	North, Inlet 3
21	Combine	10.38	1	596	48,240	8, 9, 10,	------	------	South, Inlet 1
22	Combine	11.71	1	596	54,402	11, 12, 13,	------	------	South, Inlet 2
23	Combine	8.184	1	596	38,021	7, 14,	------	------	East Inlet
24	Combine	68.92	1	597	322,622	18, 19, 20, 21, 22, 23		------	Outlet

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	6.519	1	596	30,705	----	------	------	Area 1
2	SCS Runoff	5.623	1	596	26,486	----	------	------	Area 2
3	SCS Runoff	5.673	1	596	26,720	----	------	------	Area 3
4	SCS Runoff	5.673	1	596	26,720	----	------	------	Area 4
5	SCS Runoff	5.673	1	596	26,720	----	------	------	Area 5
6	SCS Runoff	7.613	1	596	35,862	----	------	------	Area 6
7	SCS Runoff	6.917	1	596	32,580	----	------	------	Area 7
8	SCS Runoff	5.225	1	596	24,611	----	------	------	Area 8
9	SCS Runoff	5.374	1	596	25,314	----	------	------	Area 9
10	SCS Runoff	5.374	1	596	25,314	----	------	------	Area 10
11	SCS Runoff	5.374	1	596	25,314	----	------	------	Area 11
12	SCS Runoff	5.175	1	596	24,377	----	------	------	Area 12
13	SCS Runoff	7.464	1	596	35,158	----	------	------	Area 13
14	SCS Runoff	5.673	1	596	26,720	----	------	------	Area 14
15	SCS Runoff	7.712	1	597	37,230	----	------	------	Area 15
16	SCS Runoff	7.895	1	597	38,116	----	------	------	Area 16
17	SCS Runoff	7.299	1	597	35,235	----	------	------	Area 17
18	Combine	25.47	1	597	121,141	1, 2, 3, 15,	------	------	North Inlet 1
19	Combine	19.21	1	597	91,557	4, 5, 16,	------	------	North, Inlet 2
20	Combine	14.89	1	597	71,097	6, 17,	------	------	North, Inlet 3
21	Combine	15.97	1	596	75,239	8, 9, 10,	------	------	South, Inlet 1
22	Combine	18.01	1	596	84,849	11, 12, 13,	------	------	South, Inlet 2
23	Combine	12.59	1	596	59,301	7, 14,	------	------	East Inlet
24	Combine	106.00	1	597	503,183	18, 19, 20, 21, 22, 23	------	------	Outlet



PROJECT COMPONENTS

- PRELIMINARY -
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DWN	CHK	APP	DATE
A	ISSUED FOR REVIEW	DAD	SMG	SMG	05-29-08

WATSON COGENERATION
STEAM AND ELECTRIC RELIABILITY PROJECT

Kiewit

Kiewit Power
8455 Lenexa Drive
Lenexa, Kansas 66214

WATSON COGENERATION FACILITY
(PROJECT PLUS EXISTING FACILITY)
DRAINAGE AREAS AND ACREAGES
FIGURE B-1

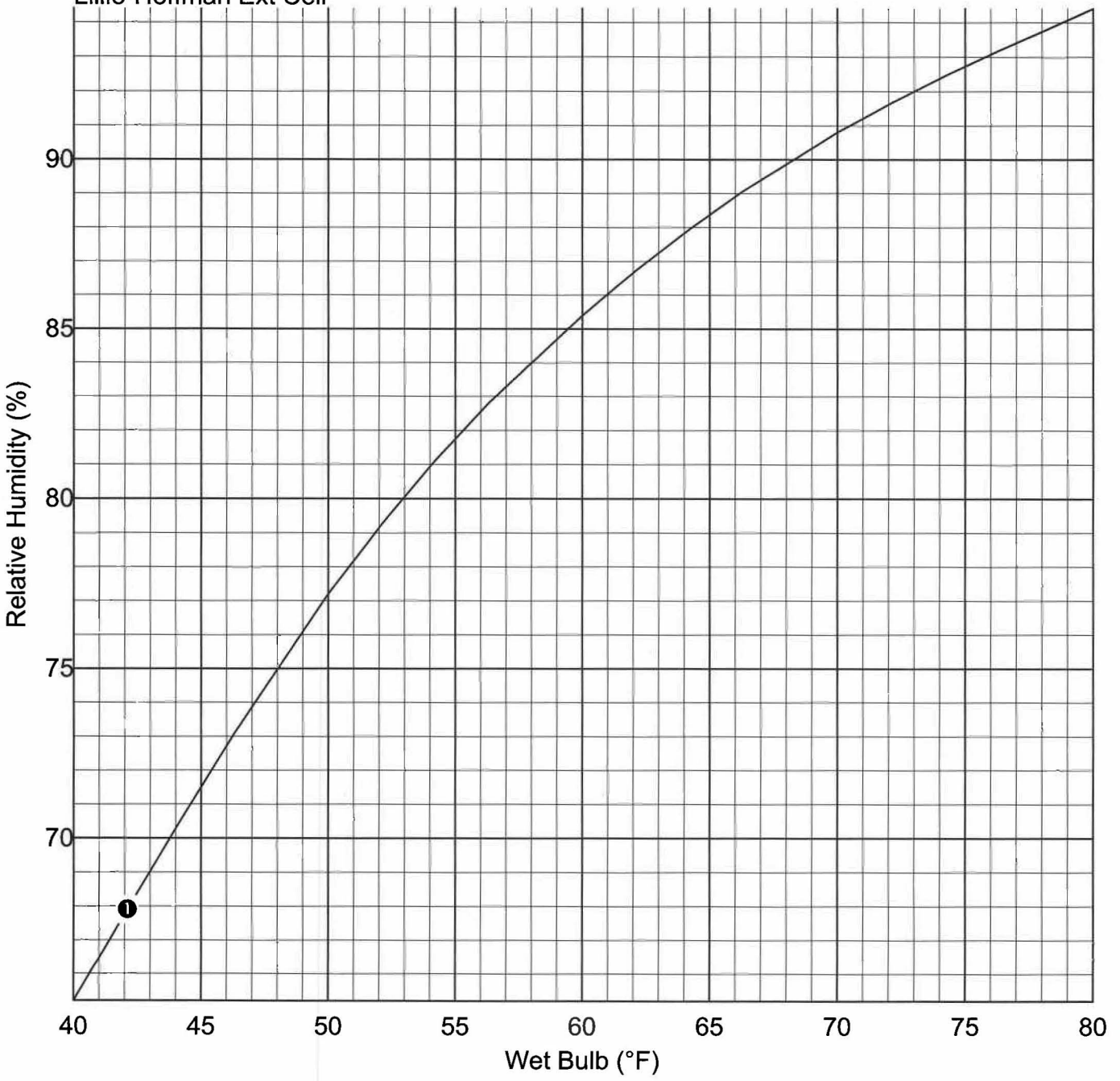
	by	date
DESIGNED	DAD	05-29-08
DRAWN	DAD	05-29-08
CHECKED		
APPROVED		

DRAWING NUMBER
2007-047-SP-001

Appendix C

Visual Resources
Fogging Frequency Curve

Fogging Frequency Estimate for
Carson Cogen
Lillie-Hoffman Ext Cell



SPX Cooling Technologies
TRACS Version 04-AUG-06

Model	F498-6.0-01
Number of Cells	1
Motor Output	99HP
Motor RPM	1800
Fan	336HP7-7
Fan RPM (Full Speed)	121

Design Conditions:

Flow Rate	8857GPM
Hot Water	90.50°F
Cold Water	75.00°F
Wet-Bulb	69.00°F

Curve Conditions:

Fan Pitch	Constant
Dry Dampers	Closed
Flow Rate (100% Design Flow)	8857GPM

Tangency 100.0%

FOGGING FREQUENCY CURVE: The curve shown to the left is referred to as a 'Fogging Freqency Curve'. The Fogging Freqency Curve separates entering cooling tower conditions that produce fog at the discharge (Top-Left region of chart) from those that do not produce fog (Bottom-Right region of chart)

❶ 15.5 °F Range

Time: 15:10:17 Date: 06-05-2008 Drawn By: CAB

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION
FOR THE *WATSON COGENERATION STEAM AND ELECTRICITY RELIABILITY PROJECT*

Docket No. 09-AFC-1

PROOF OF SERVICE LIST
(Revised 9/23/09)

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*indicates change

DECLARATION OF SERVICE

I, Cindy Kyle-Fischer, declare that on October 23, 2009, I shipped by Federal Express from Denver, Colorado copies of the attached, *Remainder of Responses to CEC Data Requests #1-39 Application for Certification 09-AFC-1 for Watson Cogeneration Steam and Electric Reliability Project*, fully prepaid and addressed to the California Energy Commission. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: **[www.energy.ca.gov/sitingcases/watson]**.

The documents have been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(*Check all that Apply*)

FOR SERVICE TO ALL OTHER PARTIES:

X sent electronically to all email addresses on the Proof of Service list who indicated "email preferred";

X by personal delivery or by depositing in the United States mail at Sacramento, California with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

AND

FOR FILING WITH THE ENERGY COMMISSION:

sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (***preferred method***);

OR

X depositing in the mail (Federal Express)* an original and 19 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 09-AFC-1
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.

Cindy Kyle-Fischer

* indicates change