ATMOSPHERIC EMISSIONS SCREENING ASSESSMENT
UPGRADED KWINANA LIQUOR BURNER

for

Alcoa World Alumina Australia

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Ref: Kwinana Liquor Burner Screening Assessment (Final)
25 June 2004

ENVIRON

25 June 2004

Alcoa World Alumina Australia
181 – 205 Davy St
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Attention: Lance Whitewood

Dear Lance,

ATMOSPHERIC EMISSIONS SCREENING ASSESSMENT
UPGRADED KWINANA LIQUOR BURNER

We are pleased to present our final report of the Atmospheric Emissions Screening Assessment for the Upgraded Kwinana Liquor Burner. The report has been revised to take account of:

- up-dated emissions estimates for the upgraded Liquor Burner;
- the final Intervention Levels published in the Air Toxics NEPM; and
- the findings of the review undertaken by Dr Roger Drew of Toxikos Pty Ltd (24 May 2004).

Should you require any additional information, please contact the undersigned directly.

Yours faithfully
ENVIRON Australia Pty Ltd

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TITLE: **ATMOSPHERIC EMISSIONS SCREENING ASSESSMENT – UPGRADED KWINANA LIQUOR BURNER**

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EXECUTIVE SUMMARY

An atmospheric emissions screening assessment of emissions from Alcoa's Kwinana Refinery Liquor Burner has been conducted to investigate the potential health risk arising from the emissions. The screening assessment considered the potential health risks associated with a baseline and an upgraded Liquor Burner emissions scenario, defined as follows:

- baseline emissions scenario representative of emissions from the Liquor Burner before it was shut-down (in May 2002); and
- upgraded emissions scenario to reflect the reduction in emissions expected to result from the installation of new air emission control equipment to treat atmospheric emissions from the Liquor Burner.

The screening assessment has been confined to the inhalation pathway as this is expected to represent the most significant exposure route to the Liquor Burner emissions. ENVIRON was provided with ground level concentrations of oxides of nitrogen predicted from air dispersion modelling, and the emission rates of compounds detected in the Liquor Burner emissions representative of both the baseline and upgraded emissions scenarios. These data were used to estimate the exposure concentrations to the suite of compounds (comprising volatile organic compounds [VOCs], semi-volatile organic compounds [SVOCs], products of combustion and metals) detected in the Liquor Burner emissions at 13 receptor locations identified by Alcoa to represent populations that could be exposed.

The potential health effects arising from the predicted short-term (acute) and long-term (chronic) exposure to non-carcinogenic compounds, and potential carcinogenic risks were considered in the screening assessment by comparing the predicted exposure concentrations at the receptor locations with health protective guidelines for ambient air developed by reputable authorities such as the National Environment Protection Council (NEPC), World Health Organisation (WHO) and the U.S Environmental Protection Agency (USEPA).

The Hazard Index (HI) was calculated to evaluate the potential for non-carcinogenic adverse health effects from simultaneous exposure to multiple compounds by summing the ratio of the predicted concentration in air to the health protective guidelines for individual compounds. A HI of less than one is generally considered to represent no cause for concern with respect to adverse health effects.

To assess the potential health effects associated with exposure to carcinogens, the incremental carcinogenic risk was calculated to provide an indication of the incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure to potential carcinogens. The incremental carcinogenic risk that is considered acceptable varies amongst jurisdictions, typically ranging from one in a million ($1x10^{-6}$) to one in ten thousand ($1x10^{-4}$). The most stringent criterion of one in a million represents the USEPA's *de minimis*, or essentially negligible incremental risk level, and has therefore been adopted for this screening assessment as a conservative (i.e. health protective) indicator of acceptable carcinogenic risk.

The results of the health screening assessment of atmospheric emissions from the Kwinana Liquor Burner indicate that:

- the potential for the upgraded Liquor Burner emissions to cause acute or chronic non-carcinogenic health effects is very low;

- a reduction in the acute HI of between approximately 81% and 89% compared to the baseline acute HIs is expected to be achieved as a result of the Liquor Burner upgrade;

- the potential for the upgraded Liquor Burner emissions to contribute significantly to the incidence of cancer in the exposed population is very low; and

- a reduction in the chronic HI and the incremental carcinogenic risk of approximately 99% and 97% respectively compared to the baseline is expected to be achieved as a result of the Liquor Burner upgrade.

As with any risk evaluation, there are areas of uncertainty in this screening assessment. To ensure that potential risks are not underestimated, conservative assumptions have been used to characterize exposure and toxicity where possible. Due to the resultant compounding of conservatism, it is considered likely that the quantitative risk indicators are over-estimates of potential health risks associated with emissions from the Liquor Burner.

ATMOSPHERIC EMISSIONS SCREENING ASSESSMENT
UPGRADED KWINANA LIQUOR BURNER

for

Alcoa World Alumina Australia

1. INTRODUCTION

Alcoa World Alumina Australia (Alcoa) has commissioned ENVIRON to conduct a screening assessment of the potential health risks arising from the Kwinana Liquor Burner atmospheric emissions, assuming that new air emission control equipment will be installed to reduce emissions.

The screening assessment has considered the potential health risks associated with a baseline and an upgraded Liquor Burner emissions scenario, defined as follows:

- baseline emissions scenario being representative of emissions from the Liquor Burner before it was shut-down (in May 2002); and
- upgraded emissions scenario to reflect the reduction in emissions expected to result from the installation of new air emission control equipment to treat atmospheric emissions from the Liquor Burner.

This report outlines the approach used to conduct the health risk screening assessment, and presents the results of potential acute and chronic non-carcinogenic, and carcinogenic health risks arising from the Kwinana Liquor Burner atmospheric emissions at key receptor locations in the vicinity of Alcoa's Kwinana refinery.

2. OVERVIEW OF THE SCREENING ASSESSMENT APPROACH

Risk assessment provides a systematic approach for characterising the nature and magnitude of the risks associated with environmental health hazards, and is an important tool for decision-making (enHealth, 2002). The generic steps involved in health risk assessment include:

Exposure Assessment: defines the amount, frequency, duration and routes of exposure to compounds present in environmental media. In this assessment, exposure is estimated as the concentration of a compound that a person may be exposed to over both short- (i.e. acute) and long-term (i.e. chronic) exposure periods;

Toxicity Assessment: identifies the nature and degree of toxicity of chemical compounds, and characterises the relationship between magnitude of exposure and adverse health effects (i.e. the dose-response relationship);

Risk Characterisation: the combining of exposure and toxicity data to estimate the magnitude of potential health risks associated with exposure periods of interest; and

Uncertainty Assessment: identification of potential sources of uncertainty and qualitative discussion of the magnitude of uncertainty and expected effects on risk estimates.

This health risk assessment conducted of Liquor Burner emissions is considered to be a screening-level assessment in that it makes generally conservative default assumptions regarding the potential magnitude of exposure and uses conservative toxicity criteria. The quantitative health risk indicators calculated for potential acute and chronic health effects are based on the assumption that the health effects arising from exposure to each of the individual compounds emitted from the Liquor Burner are additive.

On account of the conservatism of such a screening assessment, the results are considered more likely to over- than under-estimate the potential health risks associated with atmospheric emissions from the Liquor Burner. The results of the screening assessment are able to be used to assess the effectiveness of the proposed air emission control equipment, and identify the individual compounds exhibiting the highest contribution to potential health risks.

3. EXPOSURE ASSESSMENT

3.1 Compounds Considered

Alcoa provided a list of compounds and corresponding mass emission estimates for the Liquor Burner before it was shut-down and the emissions expected to be released after the Liquor Burner has been upgraded with new air emission control equipment.

Alcoa has identified over 60 individual compounds as being present in the Liquor Burner emissions above the monitoring detection limit, including the following compound classes:

- particulates;
- products of combustion;
- metals;
- volatile organic compounds (VOCs);
- semi-volatile organic compounds (SVOCs);
- carboxylic acids;
- organosulphides; and
- aldehydes and ketones.

Based on the results of various stack emission monitoring programs conducted at the Kwinana refinery, an additional 24 VOCs were tentatively identified to be present in Liquor Burner emissions. However, it was not possible to quantify the mass emission rates of these compounds, since they were not identified with certainty, and since the test methods employed do not allow for quantification of substances outside the validated target group for a method. These VOCs were reported in Alcoa's emissions inventory for completeness in an effort to qualitatively expand Alcoa's knowledge of emissions.

The emissions data provided by Alcoa is based on various stack emission monitoring programs conducted for the Kwinana Liquor Burner emissions between 1996 and 2002, before the equipment was shut-down, and a conservatively estimated efficiency for the emission control equipment for the upgraded Liquor Burner emissions scenario.

For certain compounds Alcoa has specified the maximum emission concentration expected to be emitted from the upgraded Liquor Burner to define mass emissions, as indicated in Table 1. For the remaining compounds Alcoa accepted industrial experience and manufacturer's advice that the new air emission control equipment will reduce emissions by 99.5% for aldehydes and ketones, and 98% for other VOCs, compared to the emissions from the Liquor Burner before it was shut-down.

Table 1: Maximum Emission Concentrations (mg/Nm^3, dry) from the Liquor Burner

Compound	**Baseline** Range of all available data	**Upgraded**
Total Suspended Particulate (TSP)	24 – 200	10
Carbon monoxide (CO)	1,700 – 5,000	200

Oxides of Nitrogen (NOx) (as NO_2)	79 – 135	135
Acetone	63 – 148	5
Acetaldehyde	39	2
Formaldehyde	4.1	0.4
Benzene	32 – 55	2
Toluene	5.9 – 6.2	0.5

Table A.1 lists the individual compounds identified as being present in Liquor Burner emissions, and the corresponding mass emission rate for the baseline and upgraded emissions scenarios.

3.1.1 Dioxins and Furans

The Liquor Burner stack was sampled for dioxins and furans in late 2001 by an independent specialist stack testing consultant and the samples analysed by an independent laboratory. This testing was conducted in accordance with USEPA Test Method 23 which is for the determination of dioxins and furans (1995). Two congeners were detected in the Liquor Burner stack emissions; Non-2378-Tetrachlorodibenzodioxin and Non-2378-Tetrachlorodibenzofuran at 68 and 214 pg/m^3 respectively. All other congeners were below their detection limits which were in the range 7 to 21.5 pg/m^3.

The toxicity of a mixture of dioxins and furans is assessed by multiplying a congeners concentration with its Toxicity Equivalency Factor (TEF) and summing the resulting values to derive the Toxic Equivalent (TEQ) emission. The most toxic congener is 2,3,7,8- Tetrachlorodibenzodioxin which has a factor of one, with all other 2,3,7 and 8-substitued congeners falling between 0.0001 and one. All compounds without this very specific substitution pattern have a toxicity rating of zero and this includes the two groups of congeners detected in the Liquor Burner stack. Therefore the TEQ emission of dioxins and furans from the Liquor Burner has been set equal to zero and as such have not been considered further for this assessment.

3.2 Potential Receptor Locations

Alcoa identified 13 receptor locations to represent the populations that could be potentially exposed to atmospheric emissions from the Liquor Burner, as presented in Table 2.

Table 2: Receptor Locations

Receptor	Address	Type

Receptor	Address	Type
1	17 Lionel St, Naval Base	Residence
2	42 Armstrong Rd, Hope Valley	Residence
3	2 McLaren Ave, Hope Valley	Residence
4	16 Armstrong Rd, Hope Valley	Residence
5	46 Macedonia St, Naval Base	Residence
6	1357 Rockingham Rd, Naval Base	Naval Base Hotel
7	15 Anketell Rd, Hope Valley	Residence
8	42 Hitchcock Pl, Wattleup	Residence
9	14 Collova Wy, Wattleup	Residence
10	71 Wattleup Rd, Wattleup	Residence
11	15 Ashley Rd, Hope Valley	Residence
12	51 Sayer Rd, Hope Valley	Residence
13	Cockburn Rd, Henderson	Caravan Park

The locations of the receptors in relation to the Alcoa refinery site are presented in Figure 1, overlain on a map of the local area.

For purposes of this screening assessment, all receptors are assumed to be residents, including potentially sensitive subpopulations such as children and the elderly. This assumption is inherent in the health protective guidelines selected (refer to Section 4).

3.3 Potentially Complete Exposure Pathways

Volatile compounds make up the vast majority of emissions released from the Liquor Burner. Because inhalation is expected to represent the most significant exposure route for this source, the exposure assessment has been confined to the inhalation pathway.

The California Air Toxics Hot Spots Program Risk Assessment Guidelines (OEHHA, 2000) provides a list of compounds for which multi-pathway exposure needs to be assessed. The list has been developed based on a theoretical model for the portioning of the exchangeable fraction of an airborne compound between the vapour and particulate phases in the ambient air. The compounds tending towards the particulate phase have been identified as the most likely candidates for multi-pathway exposure as they will tend to deposit on to surfaces (e.g. soil and crops) and be available for ingestion. The only compound emitted from the Liquor Burner that appears in the Air Toxics Hot Spots list of compounds requiring multi-pathway exposure assessment is arsenic. Section 5.7.3 discusses the potential health risks associated with arsenic emissions from the Kwinana Liquor Burner.

3.4 Estimated Concentrations in Air

Concentrations in the ambient air have been estimated based on the results of air dispersion modelling of the emissions of oxides of nitrogen (NOx) from the Liquor Burner conducted by Sinclair Knight Merz (SKM, 2003). The model CALPUFF (v5.714) has been run using meteorological data derived from CALMET for the year 1997 to predict the maximum and 99.5th percentile 1-hour and 24-hour average ground level concentrations, and annual average ground level concentrations at each of the receptor locations identified by Alcoa.

The NOx emission estimates provided by Alcoa and the predicted ground level concentrations of NOx provided by SKM were used to calculate predicted ground level concentrations for the remaining compounds, per Equation 1.

$$GLC_{Compound} = GLC_{NOx} \times \frac{m_{Compound}}{m_{NOx}} \qquad \textbf{\textit{Equation 1}}$$

Where:

$GLC_{Compound}$	=	predicted ground level concentration of a given compound (µg/m^3)
GLC_{NOx}	=	predicted ground level concentration of NOx (µg/m^3)
$m_{Compound}$	=	mass emission of given compound (g/s)
m_{NOx}	=	mass emission of NOx (g/s)

NOx emissions comprise oxides of nitrogen (NO) and nitrogen dioxide (NO_2). In the presence of sunlight, NO is oxidised to NO_2, with the rate of oxidation dependant upon a number of factors including the levels of photochemical oxidants in the ambient air and plume travel time. In order to calculate the predicted ground level concentration of NO_2 for comparison to the health protective guideline, it has been assumed that 25% of the NOx emissions are oxidised to NO_2. Given the relatively close proximity of the receptors, less than 25% oxidation is expected to actually occur. This is considered to be a conservative (i.e. health protective) assumption.

Table A.2 presents the predicted ground level concentrations for the compounds in the Liquor Burner emissions for which the mass emission rate has been quantified.

3.4.1 Averaging Period Adjustment

Some acute health protective guidelines refer to an averaging period that do not correspond to the 1-hour or 24-hour averages predicted in the modelling. To ensure consistency between the averaging period corresponding to acute health protective guidelines and the predicted ground level concentration, the power law of Hanna, Briggs and Hosker (Equation 2) has been applied to the predicted ground level concentrations of those compounds for which the health protective guidelines refer to averaging periods other than 1-hour or 24-hours (i.e. carbon monoxide [8-hour], acrolein [30-minute], and styrene [1 week]).

$$GLC_n = GLC_m \times \left[\frac{m}{n}\right]^{0.2} \qquad \textbf{\textit{Equation 2}}$$

Where:

n = averaging period of health protective guideline (hours)

GLC_n = ground level concentration averaged over n hours ($\mu g/m^3$)

m = averaging period of predicted ground level concentration (i.e. 1-hour or 24-hour) (hours)

GLC_m = ground level concentration averaged over m hours ($\mu g/m^3$)

For carbon monoxide and acrolein the 1-hour average predicted ground level concentration was used in Equation 2 (i.e. m = 1-hour), and for styrene the 24-hour average predicted ground level concentration was used in Equation 2 (i.e. m = 24-hours).

4. TOXICITY ASSESSMENT

The toxicity assessment determines the relationship between the magnitude of exposure to a chemical of interest and the nature and severity of adverse health effects that may result from such exposure. Chemical toxicity is divided into two categories for purposes of risk assessment: carcinogenic and non-carcinogenic. Some chemicals exert both types of effects. Whilst all non-carcinogenic effects are assumed to occur only at exposure levels greater than some threshold at which defense mechanisms are overwhelmed, carcinogens are thought to act via both threshold and non-threshold mechanisms. By convention, exposure to even one molecule of a genotoxic carcinogen is assumed to incur some small but finite risk of causing cancer; hence, the action of such compounds is considered to lack a threshold below which adverse effects are not expected to occur. In contrast, the effects of non-genotoxic carcinogens are thought to be manifested only at exposures in excess of compound-specific thresholds. Potential health risks are calculated differently for threshold and non-threshold effects because their toxicity criteria are based on different mechanistic assumptions and expressed in different units.

A number of national and international regulatory agencies have reviewed the toxicity of environmental chemicals and developed acceptable exposure criteria (herein referred to as "health protective guidelines') in accordance with both carcinogenic and non-carcinogenic endpoints. Health protective guidelines from the following reputable authorities were considered for use in the screening assessment:

- National Environment Protection (Ambient Air Quality) Measure (NEPC, 1998);
- National Environment Protection (Air Toxics) Measure (NEPC, 2004);
- World Health Organisation (WHO) Guidelines for Air Quality (WHO, 2000a);
- U.S. Environment Protection Agency's (USEPA) Integrated Risk Information System (IRIS);
- USEPA's National Centre for Environmental Assessment (NCEA);
- U.S. Agency for Toxic Substances and Disease Registry's (ATSDR) Minimal Risk Levels (MRLs) for Hazardous Substances;
- Dutch National Institute of Public Health and the Environment (RIVM) human-toxicological Maximum Permissible Risk Levels (RIVM, 2001);
- Health Canada's health-based Tolerable Daily Intakes/Concentrations and Tumorigenic Doses/Concentrations for priority substances (Health Canada, 1996); and
- California Office of Environmental Health Hazard Assessment's (OEHHA) Toxicity Criteria Database.

Health protective guidelines published by the National Environment Protection Council (NEPC), followed by the WHO, have been applied in preference to the other health protective guidelines listed above. This is consistent with the enHealth Guidelines for Assessing Human Health Risks from Environmental Hazards (2002), and consistent with advice received from the Department of Health (Western Australia) for the Pinjarra Refinery Efficiency Upgrade.

It should be noted that, in the absence of emission estimates of PM_{10} (particles with an aerodynamic diameter of 10 microns or less) and $PM_{2.5}$ (particles with an aerodynamic diameter of 2.5 microns or less) from the Liquor Burner, the Standard for PM_{10} specified in the National Environment Protection (Ambient Air Quality) Measure has been compared to the predicted ground level concentrations for Total Suspended Particulate (TSP). The predicted ground level concentration of TSP is considered to be a conservative, yet still representative, indicator of PM_{10} exposure as a large portion of particulate matter emitted from the Liquor Burner is expected to comprise of fine particulate matter not captured by the air emission control equipment. Consideration has also been given to the potential significance of $PM_{2.5}$ emissions from the Liquor Burner (refer to Section 5.7.1).

For those compounds not covered by the NEPC or WHO, the guidelines for inhalation exposure most recently determined (on an individual compound basis) by the USEPA (IRIS), ATSDR, RIVM and Health Canada have been applied, on the basis that the most recent guidelines are most likely to have been developed from the most up-to-date toxicological information.

For the compounds not covered by the above mentioned health protective guidelines, inhalation exposure guidelines have been taken from other published guidelines including the OEHHA and the NCEA. The other published guidelines have been used in preference to the OEHHA guidelines as these are not applicable at a national level (whilst the other health protective guidelines are), and tend to be based upon values published by other reputable authorities rather than being developed from first principles based on results of actual toxicological studies. Other published guidelines have been used in preference to the NCEA guidelines as these are provisional toxicity values that have been developed specifically for the USEPA's Superfund (i.e. contaminated sites) program and have not undergone the multi-program review and consensus required for toxicity values to be placed in the USEPA's IRIS database.

For those compounds lacking inhalation exposure guidelines, oral exposure guidelines have been extrapolated to represent chronic inhalation exposure in accordance with the USEPA's default method (Equation 3) for a number of compounds (see Table A.3).

$$Gdl_{Inhalation} = \frac{Gdl_{Oral} \times 70}{20} \qquad \textbf{Equation 3}$$

Where:

$Gdl_{Inhalation}$ = health protective guideline for inhalation exposure (mg/m^3);

Gdl_{Oral} = health protective guideline for oral exposure (mg/kg-day);

70 kg is the USEPA's default human body weight.

20 m^3/day is the USEPA's default breathing rate for a 70 kg human.

The health protective guidelines applied for the screening assessment are presented in Table A.3, and briefly discussed in the following sections.

4.1 Non-Carcinogenic Effects

A non-carcinogenic effect is defined as any adverse response to a chemical that does not result in cancer. Any chemical can cause adverse health effects if given at a high enough dose. When the dose is sufficiently low, no adverse effect is observed. Thus, in characterising the non-carcinogenic effects of a chemical, the key parameter is the threshold dose at which an adverse effect first becomes evident. Doses below the threshold are considered to be "safe" (*i.e.*, not associated with adverse effects), while doses above the threshold may cause an adverse effect.

The threshold dose is typically estimated from toxicological or epidemiological data by finding the highest dose level that produces no observable adverse effect (a NOAEL) or the lowest dose level that produces an observable adverse effect (a LOAEL). Where more than one such value is available, preference is given to studies using most sensitive species, strain and sex of experimental animal known, the assumption being that humans are no less sensitive than the most sensitive animal species tested. For the guidelines developed by all the authorities considered, NOAELs or LOAELs are divided by the product of a series of uncertainty factors representing experimental vs. environmental exposure duration, inter- and intra-species variability and the quality and completeness of the toxicological database. This procedure ensures that the resultant health protective guidelines are not higher than (and may be orders of magnitude lower than) the threshold level for adverse effects in the most sensitive potential receptor. Thus, there is a "margin of safety" built into the guideline, and doses equal to or less than that level are nearly certain to be without any adverse effect. The likelihood of an adverse effect at doses higher than the guideline increases, but because of the margin of safety, a greater dose does not mean that such an effect will necessarily occur.

4.1.1 Short-Term (Acute) Exposure

Health protective guidelines for acute non-carcinogenic health effects are expressed as concentrations in air that are not expected to cause any adverse effects as a result of continuous exposure over a defined averaging period (typically 24 hours or less). These guidelines are appropriate for comparison with 1-hour or 24-hour average exposure estimates. Although derived from different sources, the guidelines selected for this assessment are all intended to be protective of continually exposed (i.e. residential) receptors, including potentially sensitive subpopulations.

4.1.2 Long-Term (Chronic) Exposure

Health protective guidelines for chronic non-carcinogenic health effects are expressed as concentrations in air that are not expected to cause any adverse health effects as a result of continuous long-term exposure (a year or more). These guidelines are appropriate for comparison with annual average exposure estimates.

4.2 Carcinogenic Effects

Cancers are generally defined as diseases of mutation affecting cell growth and differentiation. Although many chemicals are known to cause cancer at high doses in studies with experimental animals, relatively few chemicals have been shown to be carcinogenic in humans at doses likely to be encountered in the ambient environment. Cancers are relatively slow to develop, and usually require prolonged exposure to carcinogenic chemicals. As a result, potential carcinogenic risks are only calculated for long-term exposures.

The International Agency for Research on Cancer (IARC) classifies substances according to their potential for human carcinogenicity as indicated in Table 3:

Table 3: IARC Classification Criteria

Group	Description
1	Carcinogenic to humans (sufficient evidence of carcinogenicity to humans)
2A	Probably carcinogenic to humans (sufficient evidence of carcinogenicity in animals, limited evidence of carcinogenicity in humans)
2B	Possibly carcinogenic to humans (less than sufficient evidence of carcinogenicity in animals, limited evidence of carcinogenicity in humans)
3	Not classifiable as to carcinogenicity in humans (inadequate or limited evidence of

Group	Description
	carcinogenicity in animals, inadequate evidence of carcinogenicity in humans)
4	Probably not carcinogenic to humans (evidence suggesting lack of carcinogenicity in animals and humans)

In dealing with carcinogens, WHO has developed a "general rule" stating that for compounds in IARC Groups 1 and 2A, guideline values are derived with the use of quantitative risk assessment with low-dose risk extrapolation. For compounds in Groups 2B, 3 and 4, guideline values are derived with the use of a threshold (uncertainty factor) method (WHO 2000b). Exceptions to this rule include cases where "it can be established with certainty that an increase in exposure to the compound is associated with an increase in cancer incidence only above a certain level of exposure" (i.e., a threshold) (WHO 2000b).

Those compounds present in the Liquor Burner emissions that are classified by the IARC as Group 1, Group 2A or Group 2B are presented in Table 4.

Table 4: IARC Compound Classifications

Compound Name	IARC Classification
Arsenic	1
Benzene	1
Formaldehyde	2A
Acetaldehyde	2B
Ethylbenzene	2B
Methylene chloride	2B
Styrene	2B
Benzofuran	2B
Naphthalene	2B

WHO's general rule has been followed in this screening-level risk assessment, with the exception of formaldehyde and fluoranthene (classified Group 3). Accordingly, health protective guidelines for the Group 1 compounds arsenic and benzene are expressed as unit risk (UR) factors. A UR factor is defined as the theoretical upper bound probability of extra cases of cancer occurring in the exposed population assuming lifetime exposure by inhalation to 1 $\mu g/m^3$ of the chemical (hence units are per $\mu g/m^3$) (WHO 2000b). These guidelines are appropriate for comparison with annual average exposure estimates.

Because irritation occurs at formaldehyde levels associated with very low cancer risk, irritation is considered the more sensitive and hence more appropriate endpoint for guideline development. WHO (2000b) determined that 100 μg/m^3, "over one order of magnitude lower than a presumed threshold for cytotoxic damage to the nasal mucosa…, represents an exposure level at which there is a negligible risk of upper respiratory tract cancer in humans." However, because this value is higher than the draft 24-hour NEPM of 16.9 μg/m^3, ENVIRON has used the ATSDR chronic MRL of 10.7 μg/m^3 for assessment of chronic health risks associated with Liquor Burner emissions.

Like formaldehyde, acetaldehyde (IARC Group 2B) seems to be carcinogenic by means of cytotoxicity. Therefore, ENVIRON considers the annual average tolerable concentration (TC) published by the WHO (2000a) to be the most appropriate health protective guideline for chronic exposure to acetaldehyde.

Appendix A provides a detailed review of the toxicological information that supports the treatment of formaldehyde and acetaldehyde within this screening assessment.

Some individual polycyclic aromatic hydrocarbons (PAHs) are clearly carcinogenic and others appear not to cause cancer, but the majority of this large class of chemicals cannot be classified as to potential carcinogenicity due to lack of sufficient data. Fluoranthene, a common PAH, is among the majority whose carcinogenic potential is unclear; it is classified as Group 3 by IARC and D (not classifiable as to human carcinogenicity) by the USEPA, and was not considered carcinogenic in evaluations of PAHs by authorities in the UK (EPAQS 1999; DEFRA 2003) and Canada (CEPA 1994).

The complex and variable composition and behaviour of PAH mixtures in the environment hinder attribution of health consequences to specific compounds. As a result, no one risk assessment approach is universally accepted. Three principal approaches reviewed by WHO (1998) are (1) toxicity equivalence factors (TEFs), (2) comparative potency, and (3) use of benzo[*a*]pyrene as a surrogate. The UK has adopted the benzo[*a*]pyrene surrogate approach (EQAPS 1999, DEFRA 2003). The USEPA, which uses the TEF approach, does not consider fluoranthene to be carcinogenic (USEPA 1993). However, toxicity equivalency factors (TEFs) relative to benzo[*a*]pyrene of 0.001 to 0.01 have been estimated for fluoranthene based on limited evidence from a small number of studies in a highly susceptible animal model administered large doses of the compound by intraperitoneal injection (summarised in WHO 1998). RIVM (2001) applied the upper end of this range (0.01) to an oral cancer risk value for benzo[*a*]pyrene, but did not attempt to develop inhalation criteria for PAHs. Indeed, since the nature and magnitude of PAH effects vary with exposure route (WHO 1998),

application of a TEF derived from studies utilising intraperitoneal injections to any other exposure route is questionable.

WHO used the benzo[*a*]pyrene surrogate approach in its *Air Quality Guidelines for Europe* (WHO 2000b). Although these TEFs are not applied or explicitly endorsed in WHO (2000b), they are applied to the UR for benzo[*a*]pyrene in the compilation document (WHO 2000a), resulting in a UR range from 8.7×10^{-5} - 87×10^{-5} per $\mu g/m^3$. Given the lack of scientific consensus regarding the potential human carcinogenicity of fluoranthene, the high degree of uncertainty regarding the TEFs noted in WHO (1998), and the questionable validity of extrapolating TEFs derived from intraperitoneal injection of inbred mice to human inhalation exposure, this range represents an extremely conservative and probably unrealistic estimate of potential human health risks associated with inhalation of fluoranthene, but has been adopted in this screening assessment.

4.3 Chemicals Lacking Health Protective Guidelines

There were 21 individual compounds present in the Liquor Burner emissions for which no health protective guidelines have been published by the reputable authorities mentioned above (Table 5). As a result, potential risks associated with these chemicals cannot be quantitatively estimated within this screening assessment. The potential impact of this is discussed in the uncertainty section (see Section 5.7.4). Notwithstanding the lack of health protective guidelines available from the reputable authorities, the potential health risks associated with these chemicals has been qualitatively considered (see Section 5.6)

Table 5: Compounds Lacking Health Protective Guidelines

No	CAS # / ID	Compound Name
6	7429-90-5	Aluminium
7	13463-40-6	Iron
12	87-69-4	Tartaric Acid
13	6915-15-7	Malic Acid
14	110-02-1	Thiophene
19	123-72-8	Butanal
20	4170-30-3	Butenal
23	78-85-3	Methacrolein
27	104-51-8	n-Butylbenzene
28	135-98-8	sec-Butylbenzene
31	120-72-9	1H- Indole
32	95-13-6	1H- Indene
34	99-87-6	p-Isopropyltoluene

No	CAS # / ID	Compound Name
37	103-65-1	n-Propylbenzene
45	208-96-8	Acenaphthylene
47	275-51-4	Azulene
48	100-47-0	Benzonitrile
49	271-89-6	Benzofuran
54	486-25-9	9H-Fluoren-9-one
58	85-01-8	Phenanthrene
61	91-22-5	Quinoline

5. RISK CHARACTERISATION

Screening-level quantitative health risk indicators have been calculated for potential acute and chronic non-carcinogenic health effects, and carcinogenic health effects for the baseline (i.e. before the Liquor Burner was shut-down) and upgraded (i.e. after the installation of air emission control equipment) Liquor Burner emission scenarios.

The quantitative risk indicators are described in Section 5.1, and the findings of the risk characterisation are presented in Sections 5.2 to 5.7. The maximally affected receptors (receptors 1 and 6) and the least affected receptor (receptor 12) are focused on within this section as they represent the range of quantitative health risk indicators calculated for all of the receptor locations. Table A.4 presents the calculated health risk indicators at all 13 receptor locations and for each compound individually.

5.1 Quantitative Risk Indicators

The Hazard Index (HI) is calculated to evaluate the potential for non-carcinogenic adverse health effects from simultaneous exposure to multiple compounds by summing the ratio of the estimated concentration in air to the health protective guidelines for individual compounds. The HI is calculated for acute (Equation 4) and chronic (Equation 5) exposures.

$$HI_{Acute} = \sum^{i} \frac{C_{\leq 24h}}{Gdl_{Acute}} \qquad \textbf{\textit{Equation 4}}$$

$$HI_{Chronic} = \sum^{i} \frac{C_{Annual}}{Gdl_{Chroni}} \qquad \textbf{\textit{Equation 5}}$$

Where:

HI_{Acute} = acute Hazard Index

$C_{\leq 24h}$ = Ground level concentration predicted over an averaging period of typically $\leq$ 24-hours, matching the averaging time of the health protective guideline for compound ($\mu g/m^3$)

Gdl_{Acute} = acute health protective guideline for compound ($\mu g/m^3$)

$HI_{Chronic}$ = chronic Hazard Index

C_{Annual} = annual average ground level concentration for compound ($\mu g/m^3$)

$Gdl_{Chronic}$ = chronic health protective guideline for compound ($\mu g/m^3$)

For the screening assessment the acute air concentration used to calculate the acute HI has been based upon the maximum 1-hour or 24-hour average ground level concentrations predicted by the air dispersion modelling. The maximum 1-hour ground level concentration is predicted to occur once per year under "worst case" meteorological conditions and is therefore a conservative estimate of actual acute exposure. In addition, acute HIs have also been calculated from the 99.5th percentile (44th highest 1-hour average and 2nd highest 24-hour average) ground level concentrations predicted from the air dispersion modelling, representing a more realistic, yet still conservative estimate of actual acute exposures.

The general rule of thumb for interpreting the HI is that:

- values less than one represent no cause for concern;
- values greater than one but less than 10 generally do not represent cause for concern because of the inherent conservatism embedded in the exposure and toxicity assessments; and
- values greater than ten may present some concern with respect to possible health effects (Toxikos, 2003).

A schematic diagram of the general rule of thumb for interpreting the HI is presented in Figure 2.

The incremental carcinogenic risk provides an indication of the incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure to potential carcinogens, and is expressed as a unitless probability. The incremental carcinogenic risk for individual

compounds is summed to calculate the potential total incremental carcinogenic risk from exposure to multiple compounds (Equation 6).

$$Risk = \sum_{1}^{i} C_{i\,Annual} \times \frac{EF \times ED}{AT} \times UR_i \qquad \textbf{Equation 6}$$

Where:

$Risk$	= lifetime incremental total cancer risk
C_{Annual}	= annual average ground level concentration for compound (µg/m^3)
EF	= exposure frequency (365 days/year)
ED	= exposure duration (70 years)
AT	= averaging time (365 days/year x 70 years, or 25,550 days)
UR_i	= Unit Risk factor for compound (per µg/m^3)

The incremental carcinogenic risk that is considered acceptable varies amongst jurisdictions, typically ranging from one in a million ($1x10^{-6}$) to one in ten thousand ($1x10^{-4}$). The most stringent criterion of one in a million represents the USEPA's *de minimis*, or essentially negligible incremental risk level, and has therefore been adopted for this screening assessment as a conservative (i.e. health protective) indicator of acceptable carcinogenic risk.

5.2 Acute Non-Carcinogenic Effects

Acute HIs have been calculated for the baseline and upgraded Liquor Burner emission scenarios. Receptors 1 and 6 exhibit the highest acute HI and receptor 12 exhibits the lowest acute HI, and therefore represent the range of calculated acute HIs for all the receptor locations. Table 6 presents the maximum and 99.5th percentile acute HI calculated for the baseline and upgraded Liquor Burner emission scenarios, and the relative reduction associated with the upgraded Liquor Burner compared to the baseline.

Table 6: Summary of Acute Hazard Indices

Receptor	Hazard Indice	Calculated Cumulative HI		Relative Reduction (%)
		Baseline	Upgrade	

1	Maximum	0.350	0.050	86
	99.5th Percentile	0.264	0.031	88
6	Maximum	0.353	0.066	81
	99.5th Percentile	0.116	0.014	88
12	Maximum	0.100	0.016	84
	99.5th Percentile	0.065	0.007	89

Note:
1. The maximum HI is predicted to occur once per year under "worst case" meteorological conditions.
2. The 99.5th percentile HI is derived from the 44th highest 1-hour average and the 2nd highest 24-hour average predictions of exposure concentration, and is predicted to occur for less than 0.5% of the time.

From Table 6 it can be seen that the maximum acute HIs for both the baseline and upgraded Liquor Burner emission scenarios are less than one, indicating no cause for concern. The maximum acute HI for the upgraded Liquor Burner emissions scenario at the maximally affected receptor (receptor 6) is only 6.6% of the acceptable threshold of one, and therefore the potential for the upgraded Liquor Burner emissions to cause acute health effects is considered to be very low.

From Table 6 it can also be seen that a reduction in the acute HIs of between approximately 81% and 89% compared to the baseline acute HIs is expected to achieved as a result of the Liquor Burner upgrade.

5.3 Chronic Non-Carcinogenic Effects

Chronic HIs have been calculated for the baseline and upgraded Liquor Burner emission scenarios. Receptor 1 exhibits the highest chronic HI and receptor 12 exhibits the lowest chronic HI, and these two receptors therefore represent the range of calculated chronic HIs for all the receptor locations. Table 7 presents the chronic HI calculated for the baseline and upgraded Liquor Burner emission scenarios, and the relative reduction associated with the upgraded Liquor Burner compared to the baseline.

Table 7: Summary of Chronic Hazard Indices

Receptor	**Calculated Cumulative HI**		**Relative Reduction (%)**
	Baseline	**Upgrade**	
1	0.763	0.008	99
12	0.152	0.002	99

From Table 7 it can be seen that the chronic HI for both the baseline and upgraded Liquor Burner emissions scenarios are less than one indicating no cause for concern. The chronic HI for the upgraded Liquor Burner emissions scenario at the maximally affected receptor (receptor 1) is 0.8% of

the threshold of one, and therefore the potential for the upgraded Liquor Burner to cause chronic health effects is considered to be very low.

From Table 7 it can also be seen that a reduction in the chronic HIs of 99% compared to the baseline chronic HIs is expected to be achieved as a result of the Liquor Burner upgrade. Greater reductions in the chronic HIs than the acute HIs are estimated for the upgraded Liquor Burner emissions scenario. This is because the compound contributing most significantly to the chronic HI (acrolein) is expected to be reduced by 99.5% as a result of the new air emission control equipment, whereas the compounds contributing most significantly to the acute HIs comprise of organic compounds and criteria pollutants for which the air emission control equipment is expected to achieve a specified emission concentration (refer to Table 1) rather than a percent reduction.

5.4 Carcinogenic Effects

The incremental carcinogenic risk has been calculated for the baseline and upgraded Liquor Burner emission scenarios. Receptor 1 exhibiting the highest incremental carcinogenic risk and receptor 12, exhibiting the lowest incremental carcinogenic risk, thereby represent the range of calculated incremental carcinogenic risks for all the receptor locations. Table 8 presents the incremental carcinogenic risk calculated for the baseline and upgraded Liquor Burner emission scenarios, and the relative reduction associated with the upgraded Liquor Burner compared to the baseline. The range of calculated incremental carcinogenic risk values presented in Table 8 are based on the upper and lower range of the UR factors published by the WHO for benzene and fluoranthene.

Table 8: Summary of Incremental Carcinogenic Risk

Receptor	Calculated Incremental Carcinogenic Risk		Relative Reduction (%)
	Baseline	Upgrade	
1	$8.27 \times 10^{-7} – 2.37 \times 10^{-6}$	$2.29 \times 10^{-8} – 5.78 \times 10^{-8}$	97 - 98
12	$1.65 \times 10^{-7} – 4.74 \times 10^{-7}$	$4.57 \times 10^{-9} – 1.15 \times 10^{-8}$	97 - 98

The expression of the incremental carcinogenic risk values presented in Table 7 are best explained by way of example, with the incremental carcinogenic risk calculated for receptor 1 for the baseline emissions scenario of 8.27×10^{-7} (0.000000827) can also be interpreted as a risk of 0.8 in a million.

From Table 8 it can be seen that the incremental carcinogenic risk for the upgraded Liquor Burner emissions scenario for the maximally affected receptor (receptor 1) is between 2% and 6% of the *de minimus* threshold of one in a million. Therefore the potential for the upgraded Liquor Burner emissions to contribute to the incidence of cancer in the exposed population is considered to be very low. The range of the incremental carcinogenic risk for the baseline Liquor Burner emissions scenario at the maximally affected receptor (receptor 1) indicates the upper incremental carcinogenic risk only marginally exceeds the *de minimus* threshold of one in a million, and the lower incremental carcinogenic risk complies with the *de minimus* threshold.

From Table 8 it can also be seen that a reduction in the incremental carcinogenic risk of approximately 97% compared to the baseline incremental carcinogenic risk is expected to be achieved as a result of the Liquor Burner upgrade.

5.5 Irritancy

For the purposes of this screening assessment irritancy refers to a direct physiological response arising from short-term exposure to a compound that may result in mild, transient adverse health effects that are reversible upon cessation of exposure. The likelihood that exposure to a compound will result in sensory irritation can be assessed by comparison of the exposure concentration to the irritancy threshold. Acute health protective guidelines are designed to be more stringent (i.e. health protective) than irritancy thresholds, as indicated in Table 9 which presents some examples for compounds that may cause irritation at sufficiently high exposure concentrations.

Table 9: Comparison of Irritancy Thresholds to Acute Health Protective Guidelines

No	CAS # / ID	Compound Name	Irritancy Threshold		Acute Health Protective Guideline [2]	
			µg/m^3	Reference	µg/m^3	Reference
18	107-02-8	Acrolein	250	ERPG [1]	44	WHO
22	50-00-0	Formaldehyde	1,340	ERPG [1]	102	NEPC
25	71-43-2	Benzene	174,360	ERPG [1]	329	ATSDR
35	75-09-2	Methylene Chloride	758,329	ERPG [1]	5,665	WHO
38	100-42-5	Styrene	232,480	ERPG [1]	724	WHO
39	108-88-3	Toluene	205,670	ERPG [1]	7,766	NEPC

Notes:
1. Emergency Response Group Planning Guidelines (ERPGs) have been developed by the American Industrial Hygiene Association (AIHA). The Tier 1 values presented in the table represent the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing other than mild, transient adverse health effects or without perceiving a clearly defined objectionable odour.
2. Acute health protective guidelines converted to an equivalent 1-hour average guideline using the Power Law of Hanna, Briggs and Hosker.

Therefore exposure concentrations that are below the acute health protective guidelines implicitly are also below the irritancy thresholds and hence do not represent a cause for concern with respect to irritancy. As the acute HI for both the baseline and upgraded Liquor Burner emissions scenarios are comfortably less than one, it can be concluded that the potential for emissions from the baseline or upgraded Liquor Burner to cause irritation is very low.

5.6 Chemicals Lacking Health Protective Guidelines

There were 21 individual compounds present in the Liquor Burner emissions for which no health protective guidelines have been published by the reputable authorities referred to in Section 4. The potential health effects associated with these compounds has therefore been qualitatively considered by comparison to the Effects Screening Levels (ESLs) published by the Texas Commission on Environmental Quality (TCEQ) (formerly Texas Natural Resource Conservation Commission [TNRCC]). It is important to note that the TCEQ's ESLs are not ambient standards, but rather are intended to be compared to measured or predicted ambient concentrations of a compound to indicate either:

- if the ESL is not exceeded, then adverse health effects are not expected to occur; or
- if the ESL is exceeded, that a more in-depth impact assessment is required to determine if adverse effects are in fact likely.

As such, the ESLs tend to incorporate a particularly high level of conservatism and are not considered appropriate for use in deriving quantitative risk indicators for the assessment of potential health risks from exposure to multiple compounds. Notwithstanding this however, the ESLs cover a very extensive suite of compounds, including a number of the 21 compounds present in the Liquor Burner emissions lacking health protective guidelines. Therefore, even though the ESLs are not health protective guidelines as such, they have been applied within this assessment to enable the potential health risks associated with these compounds to be qualitatively considered.

Table 10 presents the comparison of the short-term and long-term ESL to the predicted maximum 1-hour and annual average ground level concentration for those compounds lacking health protective guidelines that are covered by the TCEQ's ESLs. The data presented in Table 10 indicates that the predicted ground level concentrations comfortably comply with the ESL for both the baseline and upgraded Liquor Burner emission scenarios, with the exception of the maximum 1-hour average predicted ground level concentration for phenanthrene for the baseline Liquor Burner emission scenario which exceeds the short-term ESL by 70%. However, it should be noted that the 1-hour

average 99.5th percentile ground level concentration predicted for phenanthrene at the maximally affected report (Receptor 1) is less than half of the short-term ESL. Hence the modelling results indicate that the short-term ESL is expected to be complied with for more than 99.5% of the time.

Based on the comparison of the ESLs to the predicted ground level concentrations, and given that the ESLs tend to incorporate a particularly high level of conservatism, it can be concluded that those compounds lacking health protective guidelines that are covered by the TCEQ's ESLs are unlikely to contribute significantly to the potential health risks associated with emissions from the Liquor Burner.

Table 10: Comparison of Predicted Ground Level Concentrations to Effect Screening Levels

No	CAS # / ID	Compound Name	Effect Screening Level (ESL)		Baseline				Upgrade			
			Short-term	Long-term	Maximum Predicted GLC	Percent of ESL	Maximum Predicted GLC	Percent of ESL	Maximum Predicted GLC	Percent of ESL	Maximum Predicted GLC	Percent of ESL
Averaging Period			1-hour	annual	1-hour		annual		1-hour		annual	
Units			µg/m^3	µg/m^3	µg/m^3	%	µg/m^3	%	µg/m^3	%	µg/m^3	%
6	7429-90-5	Aluminium	50	5	1.20	2.40	8.95E-03	0.18	4.68E-02	0.09	3.49E-04	0.01
7	13463-40-6	Iron	8	0.8	0.03	0.32	1.93E-04	0.02	1.01E-03	0.01	7.52E-06	0.001
19	123-72-8	Butanal [1]	14	1.4	0.66	4.74	4.95E-03	0.35	3.32E-03	0.02	2.48E-05	0.002
20	4170-30-3	Butenal	9	0.9	1.25	13.94	9.36E-03	1.04	6.27E-03	0.07	4.68E-05	0.01
23	78-85-3	Methacrolein	4	0.4	0.66	16.60	4.95E-03	1.24	3.32E-03	0.08	2.48E-05	0.01
32	95-13-6	1H- Indene [1]	70	7	0.22	0.32	1.65E-03	0.02	4.43E-03	0.01	3.30E-05	0.0005
34	99-87-6	p-Isopropyltoluene	2750	275	0.01	0.0003	5.50E-05	0.00002	1.48E-04	0.00001	1.10E-06	0.0000004
48	100-47-0	Benzonitrile	500	50	0.41	0.08	3.03E-03	0.01	8.12E-03	0.002	6.06E-05	0.0001
58	85-01-8	Phenanthrene	0.5	0.05	0.85	**170**	6.33E-03	12.66	1.70E-02	3.39	1.27E-04	0.25
61	91-22-5	Quinoline	5	0.5	0.18	3.69	1.38E-03	0.28	3.69E-03	0.07	2.75E-05	0.01

Note:
1. Based on the odour nuisance potential of the compound, but inherently also protective of human health.

5.7 Uncertainties Associated with Calculated Risks

The risk assessment process relies on a set of assumptions and estimates with varying degrees of certainty and variability. Major sources of uncertainty in risk assessment include:

- natural variability (*e.g.*, differences in body weight in a population);
- lack of knowledge about basic physical, chemical, and biological properties and processes;
- assumptions in the models used to estimate key inputs (*e.g.*, air dispersion modelling, dose-response models); and
- measurement error (e.g., used to characterise emissions).

Perhaps the greatest single source of uncertainty in risk assessment is the chemicals' dose-response relationships, particularly carcinogenic unit risks.

For this screening assessment, uniformly conservative assumptions have been used where possible to ensure that potential exposures and associated health risks are over- rather than under-estimated. As a result of the resulting compounding of conservatism, the quantitative risk indicators are considered to be over-estimates, with the actual risk likely to be lower.

5.7.1 Emissions Characterisation and Quantification Uncertainty

There is uncertainty associated with the identification and quantification of atmospheric emissions from the Liquor Burner and the determination of the efficiency of air emission control equipment. As this component was conducted by Alcoa, it is not addressed in detail within this report. Certain VOC compounds were only able to be tentatively identified by Alcoa due to the high level of uncertainty surrounding the analytical results for these compounds. Potential risks associated with these compounds have therefore not been considered within this screening assessment, which may result in the underestimation of the quantitative health risk indicators. It is recommended that a review of the available health protective guidelines for these compounds be conducted to identify the need for additional stack emissions testing of Liquor Burner emissions designed to specifically target the tentatively identified compounds.

In the absence of information on the particle size distribution of TSP emissions from the Liquor Burner, the predicted ground level concentration of TSP has been used as a conservative, yet still representative, indicator of PM_{10} exposure. It is also noteworthy that the predicted ground level concentrations for TSP comfortably comply with the advisory reporting Standards for $PM_{2.5}$ specified in the National Environment Protection (Ambient Air Quality) Measure for both the baseline and upgraded Liquor Burner emissions scenarios.

5.7.2 Estimation of Exposure Concentration Uncertainty

The air dispersion modelling was completed by SKM using the CALPUFF model to predict the concentration of compounds in ambient air at key receptor locations. The assumptions used in the modelling are discussed within SKM's report (2004) and have not been reviewed as part of this screening assessment.

The acute HIs were calculated based on the maximum and 99.5th percentile predicted ground level concentrations. The maximum is predicted to occur once per year under the "worst-case" meteorological conditions and is therefore provides the most conservative estimate of exposure concentrations. Concentrations in air at or above the 99.5th percentile predicted ground level concentration are predicted to occur for less than 0.5% of the time. Therefore, for the vast majority of the year, the potential acute health effects are expected to be less significant than the calculated acute HIs suggest. It should be noted that it is likely that the contributions of nitrogen dioxide to the acute and chronic HIs are likely to be overestimated as it has been conservatively assumed in the exposure assessment that a relatively high percentage of NOx emissions (25%) are oxidised to NO_2.

Stack testing results for dioxins and furans emissions from the Liquor Burner have returned results below detection limit for all 2,3,7 and 8-substituted congeners (i.e. congeners with a TEF of greater than zero), and therefore the TEQ emissions for this class of compounds have been set to zero (refer to Section 3.1.1). As limited testing for dioxins and furans from the Liquor Burner stack has been conducted, it is recommended that an assessment of the potential for formation of dioxins and furans within the Liquor Burner process is undertaken based on a review of the likely presence of precursors and other compounds that act as catalysts within the dioxin and furan formation mechanisms within the Liquor Burner process inputs, and the temperatures and residence times of the combustion chamber of the Liquor Burner.

5.7.3 Exposure Assumptions Uncertainty

To calculate the incremental carcinogenic risk it has been assumed that residences located at the key receptor locations spend every hour of every day outdoors at that location for 70 years. Clearly, these exposure conditions are unlikely to be realised, with the actual exposure concentration in the indoor environment is typically expected to be lower than experienced in outdoor air, and the exposure frequency (i.e. days per year) and exposure duration (years) likely to be considerably lower as people move about.

The screening assessment has been confined to exposure via the inhalation pathway. There is therefore a potential that total exposure to specific compounds has been underestimated. An assessment of the potential exposure via alternative exposure routes is beyond the scope of this assessment. It is worth noting, however, that the only compound emitted from the Liquor Burner that are likely to require multi-pathway exposure assessment (refer to Section 3.3) is arsenic. The results of this screening assessment for exposure to atmospheric emissions from the upgraded Liquor Burner via inhalation for arsenic at the most affected receptors are summarised in Table 11.

Table 11: Summary of Screening Assessment Results for Arsenic– Upgraded Liquor Burner Emissions Scenario

Quantitative Health Risk Indicator	Maximally Affected Receptor	Arsenic
Individual chronic HI	1	1.07×10^{-6}
Contribution to cumulative chronic HI	1	0.01 %
Incremental carcinogenic risk	1	1.61×10^{-9}
Contribution to cumulative incremental carcinogenic risk	1	$\leq$ 7 %

The results presented in Table 11 indicate that exposure to atmospheric emissions from the upgraded Liquor Burner via inhalation for arsenic are very small and represent a small incremental increase to the potential health risks arising from the inhalation pathway.

5.7.4 Toxicity Assessment Uncertainty

The primary uncertainties associated with the toxicity assessment are related to the derivation of the health protective guidelines. Health protective guidelines published by reputable authorities have been applied for this assessment which have been derived by applying various conservative (i.e. health protective) assumptions. The extrapolation of animal bioassay results or occupational exposure studies to human risk at much lower levels of exposure involves a number of assumptions regarding effect threshold, interspecies extrapolation, high- to low-dose extrapolation, and route-to-route extrapolation. The scientific validity of these assumptions is uncertain; because each of the individual extrapolations are intended to prevent underestimation of risk, in concert they result in unquantifiable but potentially very significant overestimation of risk.

Uncertainty associated with the toxicity assessment also arises from the unavailability of published health protective guidelines for all of the compounds present in Liquor Burner emissions. As discussed in Section 4.3, there were 11 compounds for which no health protective guidelines (i.e. acute, chronic or carcinogenic) have been published by the authorities referred to within this assessment. The identification of alternative reputable sources of health protective guidelines or the development of surrogate guidelines is beyond the scope of this assessment. The unavailability of health protective guidelines to quantify the potential health risks associated with exposure to these 11 compounds may result in an underestimate of the quantitative health risk indicators.

5.7.5 Risk Characterisation Uncertainty

It should be noted that the summing of the quantitative risk indicators for individual compounds to calculate the overall risk from exposure to multiple compounds does not take into account that different compounds can target different organs and therefore the potential health risk arising from exposure to multiple compounds is not necessarily additive, nor does it account for potential antagonistic or synergistic effects. However, the additive approach is considered to be appropriate for screening assessment purposes, and is considered to be conservative (i.e. health protective) in most circumstances.

6. SUMMARY

ENVIRON has conducted a screening assessment of the potential health risks arising from the Kwinana Liquor Burner atmospheric emissions, considering the potential risks associated with a baseline (i.e. representative of emissions from the Liquor Burner before it was shut-down) and upgraded (i.e. emissions expected to result from the installation of new air emission control equipment) Liquor Burner emissions scenarios.

Quantitative health risk indicators were calculated for exposure via the inhalation pathway to atmospheric emissions from the Liquor Burner in isolation, and therefore did not take into account the alternative exposure pathways (e.g. ingestion, dermal absorption), nor other sources of atmospheric emissions of these compounds. The following quantitative health risk indicators were calculated for key receptors located in the vicinity of Alcoa's Kwinana refinery:

- acute HI;
- chronic HI; and
- incremental carcinogenic risk.

Based upon the results of the health screening assessment it can be concluded that:

- the potential for the upgraded Liquor Burner emissions to cause acute or chronic non-carcinogenic health effects is very low;

- a reduction in the acute HIs of between approximately 81% and 89% compared to the baseline acute HIs is expected to be achieved as a result of the Liquor Burner upgrade;

- the potential for the upgraded Liquor Burner emissions to contribute significantly to the incidence of cancer in the exposed population is very low; and

- a reduction in the chronic HIs and the incremental carcinogenic risk of approximately 99% and 97% respectively compared to the baseline is expected to be achieved as a result of the Liquor Burner upgrade.

As with any risk evaluation, there are areas of uncertainty in this screening assessment. To ensure that potential risks are not underestimated, conservative assumptions have been used to characterize exposure and toxicity where possible. Due to the resultant compounding of conservatism, it is considered likely that the quantitative risk indicators are over-estimates of potential health risks associated with emissions from the Liquor Burner.

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FIGURES

Alcoa
KWINANA LIQUOR BURNER
EMISSIONS REDUCTION PROJECT

LOCATION MAP

Figure 1

ENVIRON

Drawn: KH Date: 04/04

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TABLES

TABLE A.1: COMPOUND LIST AND MASS EMISSION ESTIMATES

No	CAS # / ID	Compound Name	Compound Group	Emission Rate - Baseline Liquor Burner Emissions Scenario (g/s)	Emission Rate - Upgraded Liquor Burner Emissions Scenario (g/s)
1	TSP	Total Suspended Particulate	Particulates	3.14E+00	1.23E-01
2	630-08-0	Carbon Monoxide	Products of combustion	7.86E+01	2.45E+00
3	7446-09-5	Sulphur Dioxide	Products of combustion	6.60E-01	6.60E-01
4	10102-44-0	Nitrogen Dioxide	Products of combustion	2.12E+00	2.12E+00
5	7440-38-2	Arsenic	Metals	1.57E-04	6.13E-06
6	7429-90-5	Aluminium	Metals	5.11E-02	1.99E-03
7	13463-40-6	Iron	Metals	1.10E-03	4.29E-05
8	7439-96-5	Manganese	Metals	3.14E-04	1.23E-05
9	7439-97-6	Mercury	Metals	Not Detected	
10	7439-98-7	Molybdenum	Metals	3.14E-04	1.23E-05
11	7782-49-2	Selenium	Metals	1.89E-03	7.36E-05
12	87-69-4	Tartaric Acid	Carboxylic acids	3.30E-01	6.60E-03
13	6915-15-7	Malic Acid	Carboxylic acids	9.90E-01	1.98E-02
14	110-02-1	Thiophene	Organosulphides	3.30E-03	6.60E-05
15	67-64-1	Acetone	Aldehydes and Ketones / VOCs	2.33E+00	6.13E-02
16	75-07-0	Acetaldehyde	Aldehydes and Ketones	6.13E-01	2.45E-02
17	98-86-2	Acetophenone	Aldehydes and Ketones	9.43E-03	4.71E-05
18	107-02-8	Acrolein	Aldehydes and Ketones	8.48E-02	4.24E-04
19	123-72-8	Butanal	Aldehydes and Ketones	2.83E-02	1.41E-04
20	4170-30-3	Butenal	Aldehydes and Ketones	5.34E-02	2.67E-04
21	100-52-7	Benzaldehyde	Aldehydes and Ketones	4.08E-02	2.04E-04
22	50-00-0	Formaldehyde	Aldehydes and Ketones	6.44E-02	4.91E-03
23	78-85-3	Methacrolein	Aldehydes and Ketones	2.83E-02	1.41E-04
24	78-93-3	2-Butanone	Aldehydes and Ketones / VOCs	1.41E-01	7.07E-04
25	71-43-2	Benzene	VOCs	8.64E-01	2.45E-02
26	74-83-9	Bromomethane	VOCs	7.86E-04	1.57E-05
27	104-51-8	n-Butylbenzene	VOCs	1.57E-04	3.14E-06
28	135-98-8	sec-Butylbenzene	VOCs	1.57E-04	3.14E-06
29	74-87-3	Chloromethane	VOCs	2.67E-03	5.34E-05
30	100-41-4	Ethylbenzene	VOCs	1.01E-02	2.01E-04
31	120-72-9	1H- Indole	VOCs	1.57E-03	3.14E-05
32	95-13-6	1H- Indene	VOCs	9.43E-03	1.89E-04
33	98-82-8	Isopropylbenzene	VOCs	9.43E-04	1.89E-05
34	99-87-6	p-Isopropyltoluene	VOCs	3.14E-04	6.28E-06
35	75-09-2	Methylene Chloride	VOCs	4.71E-04	9.43E-06
36	108-10-1	4-Methyl-2-pentanone	VOCs	9.43E-04	1.89E-05
37	103-65-1	n-Propylbenzene	VOCs	9.43E-04	1.89E-05
38	100-42-5	Styrene	VOCs	2.98E-02	5.97E-04
39	108-88-3	Toluene	VOCs	9.74E-02	6.13E-03
40	95-63-6	1,2,4-Trimethylbenzene	VOCs	4.08E-03	8.17E-05
41	108-67-8	1,3,5-Trimethylbenzene	VOCs	3.14E-03	6.28E-05
42	108-38-3 + 106-42-3	m+p-Xylene	VOCs	1.26E-02	2.51E-04
43	95-47-6	o-Xylene	VOCs	5.34E-03	1.07E-04
44	1330-20-7	Xylenes	VOCs	2.36E-02	4.71E-04
45	208-96-8	Acenaphthylene	SVOCs	9.43E-03	1.89E-04
46	83-32-9	Acenaphthene	SVOCs	1.57E-03	3.14E-05
47	275-51-4	Azulene	SVOCs	3.14E-02	6.28E-04
48	100-47-0	Benzonitrile	SVOCs	1.73E-02	3.46E-04
49	271-89-6	Benzofuran	SVOCs	3.14E-02	6.28E-04
50	92-52-4	Biphenyl	SVOCs	7.86E-03	1.57E-04
51	132-64-9	Dibenzofuran	SVOCs	1.41E-02	2.83E-04
52	206-44-0	Fluoranthene	SVOCs	7.86E-03	1.57E-04
53	86-73-7	9H-Fluorene	SVOCs	1.57E-03	3.14E-05
54	486-25-9	9H-Fluoren-9-one	SVOCs	9.43E-03	1.89E-04
55	90-12-0	1-Methylnapthalene	SVOCs	3.14E-03	6.28E-05
56	91-57-6	2-Methylnapthalene	SVOCs	7.86E-03	1.57E-04
57	91-20-3	Napthalene	SVOCs	1.21E-01	2.42E-03
58	85-01-8	Phenanthrene	SVOCs	3.61E-02	7.23E-04
59	129-00-0	Pyrene	SVOCs	4.71E-03	9.43E-05
60	110-86-1	Pyridine	SVOCs	4.08E-02	8.17E-04
61	91-22-5	Quinoline	SVOCs	7.86E-03	1.57E-04

TABLE A.1: COMPOUND LIST AND MASS EMISSION ESTIMATES

No	CAS # / ID	Compound Name	Compound Group	Emission Rate - Baseline Liquor Burner Emissions Scenario (g/s)	Emission Rate - Upgraded Liquor Burner Emissions Scenario (g/s)
62	-	Phenylethyne	VOCs + 20	Tentative ID	
63	115-11-7	2 methyl 1-Propene	VOCs + 20	Tentative ID	
64	115-07-1	Propene	VOCs + 20	Tentative ID	
65	25013-15-4	ethenylmethyl-Benzene	VOCs + 20	Tentative ID	
66	-	1,3-Cyclopentadiene, trimethyl	VOCs + 20	Tentative ID	
67	106-99-0	1,3 Butadiene	VOCs + 20	Tentative ID	
68	-	Cyclohexadiene	VOCs + 20	Tentative ID	
69	542-92-7	1,3-Cyclopentadiene	VOCs + 20	Tentative ID	
70	-	Dimethyl indene	VOCs + 20	Tentative ID	
71	78-79-5	2-methyl-1,3 Butadiene	VOCs + 20	Tentative ID	
72	463-49-0	1,2-Propadiene	VOCs + 20	Tentative ID	
73	96-39-9	1-methyl-1,3-Cyclopentadiene	VOCs + 20	Tentative ID	
74	513-35-9	2-methyl-2-Butene	VOCs + 20	Tentative ID	
75	627-20-3	cis-2-Pentene	VOCs + 20	Tentative ID	
76	-	Cyclopropane, 1,2-dimethyl-c	VOCs + 20	Tentative ID	
77	-	Cyclopropane, 1,2-dimethyl-ci	VOCs + 20	Tentative ID	
78	74-88-4	iodo-Methane	VOCs + 20	Tentative ID	
79	29036-25-7	Methyl indene	VOCs + 20	Tentative ID	
80	-	Hexatriene	VOCs + 20	Tentative ID	
81	-	3-methyl-1,3,5-Hexatriene	VOCs + 20	Tentative ID	
82	-	cyclopropane, 1,2-dimethyl-, t	VOCs + 20	Tentative ID	
83	-	2-Propenylidene-cyclobutene	VOCs + 20	Tentative ID	
84	544-25-2	1,3,5-Cycloheptatriene	VOCs + 20	Tentative ID	
85	592-41-6	1-Hexene	VOCs + 20	Tentative ID	
86	D&Fs	Dioxins and Furans	Dioxins and Furans	Not Detected	

Source: Alcoa World Alumina Australia, 2004

TABLE A.2: PREDICTED GROUND LEVEL CONCENTRATIONS
(µg/m^3)

			Receptor 1					Receptor 2					Receptor 3				
			Baseline Liquor Burner Emissions Scenario					Baseline Liquor Burner Emissions Scenario					Baseline Liquor Burner Emissions Scenario				
No	**CAS # / ID**	**Compound Name**	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual
1	TSP	Total Suspended Particulate	4.50E+01	2.09E+01	9.76E+00	8.94E+00	5.50E-01	5.91E+01	1.05E+01	5.33E+00	4.95E+00	2.50E-01	2.31E+01	6.80E+00	3.89E+00	3.15E+00	1.59E-01
2	630-08-0	Carbon Monoxide	1.13E+03	5.22E+02	2.44E+02	2.24E+02	1.38E+01	1.48E+03	2.62E+02	1.33E+02	1.24E+02	6.26E+00	5.78E+02	1.70E+02	9.73E+01	7.87E+01	3.97E+00
3	7446-09-5	Sulphur Dioxide	9.46E+00	4.39E+00	2.05E+00	1.88E+00	1.16E-01	1.24E+01	2.20E+00	1.12E+00	1.04E+00	5.26E-02	4.85E+00	1.43E+00	8.18E-01	6.61E-01	3.34E-02
4	10102-44-0	Nitrogen Dioxide [1]	3.04E+01	1.41E+01	6.59E+00	6.04E+00	3.72E-01	3.99E+01	7.07E+00	3.59E+00	3.34E+00	1.69E-01	1.56E+01	4.59E+00	2.63E+00	2.13E+00	1.07E-01
5	7440-38-2	Arsenic	2.25E-03	1.04E-03	4.88E-04	4.47E-04	2.75E-05	2.96E-03	5.24E-04	2.66E-04	2.47E-04	1.25E-05	1.16E-03	3.40E-04	1.95E-04	1.57E-04	7.94E-06
6	7429-90-5	Aluminium	7.32E-01	3.39E-01	1.59E-01	1.45E-01	8.95E-03	9.61E-01	1.70E-01	8.65E-02	8.04E-02	4.07E-03	3.76E-01	1.11E-01	6.33E-02	5.12E-02	2.58E-03
7	13463-40-6	Iron	1.58E-02	7.31E-03	3.42E-03	3.13E-03	1.93E-04	2.07E-02	3.67E-03	1.86E-03	1.73E-03	8.77E-05	8.09E-03	2.38E-03	1.36E-03	1.10E-03	5.56E-05
8	7439-96-5	Manganese	4.50E-03	2.09E-03	9.76E-04	8.94E-04	5.50E-05	5.91E-03	1.05E-03	5.33E-04	4.95E-04	2.50E-05	2.31E-03	6.80E-04	3.89E-04	3.15E-04	1.59E-05
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10	7439-98-7	Molybdenum	4.50E-03	2.09E-03	9.76E-04	8.94E-04	5.50E-05	5.91E-03	1.05E-03	5.33E-04	4.95E-04	2.50E-05	2.31E-03	6.80E-04	3.89E-04	3.15E-04	1.59E-05
11	7782-49-2	Selenium	2.70E-02	1.25E-02	5.86E-03	5.36E-03	3.30E-04	3.55E-02	6.28E-03	3.20E-03	2.97E-03	1.50E-04	1.39E-02	4.08E-03	2.34E-03	1.89E-03	9.53E-05
12	87-69-4	Tartaric Acid	4.73E+00	2.19E+00	1.02E+00	9.39E-01	5.78E-02	6.21E+00	1.10E+00	5.59E-01	5.19E-01	2.63E-02	2.43E+00	7.14E-01	4.09E-01	3.31E-01	1.67E-02
13	6915-15-7	Malic Acid	1.42E+01	6.58E+00	3.07E+00	2.82E+00	1.73E-01	1.86E+01	3.30E+00	1.68E+00	1.56E+00	7.89E-02	7.28E+00	2.14E+00	1.23E+00	9.92E-01	5.00E-02
14	110-02-1	Thiophene	4.73E-02	2.19E-02	1.02E-02	9.39E-03	5.78E-04	6.21E-02	1.10E-02	5.59E-03	5.19E-03	2.63E-04	2.43E-02	7.14E-03	4.09E-03	3.31E-03	1.67E-04
15	67-64-1	Acetone	3.33E+01	1.55E+01	7.22E+00	6.62E+00	4.07E-01	4.37E+01	7.75E+00	3.94E+00	3.66E+00	1.85E-01	1.71E+01	5.03E+00	2.88E+00	2.33E+00	1.18E-01
16	75-07-0	Acetaldehyde	8.78E+00	4.07E+00	1.90E+00	1.74E+00	1.07E-01	1.15E+01	2.04E+00	1.04E+00	9.64E-01	4.88E-02	4.51E+00	1.33E+00	7.59E-01	6.14E-01	3.10E-02
17	98-86-2	Acetophenone	1.35E-01	6.27E-02	2.93E-02	2.68E-02	1.65E-03	1.77E-01	3.14E-02	1.60E-02	1.48E-02	7.51E-04	6.93E-02	2.04E-02	1.17E-02	9.45E-03	4.77E-04
18	107-02-8	Acrolein	1.22E+00	5.64E-01	2.64E-01	2.41E-01	1.49E-02	1.60E+00	2.83E-01	1.44E-01	1.34E-01	6.76E-03	6.24E-01	1.84E-01	1.05E-01	8.50E-02	4.29E-03
19	123-72-8	Butanal	4.05E-01	1.88E-01	8.79E-02	8.05E-02	4.95E-03	5.32E-01	9.43E-02	4.79E-02	4.45E-02	2.25E-03	2.08E-01	6.12E-02	3.50E-02	2.83E-02	1.43E-03
20	4170-30-3	Butenal	7.66E-01	3.55E-01	1.66E-01	1.52E-01	9.36E-03	1.00E+00	1.78E-01	9.05E-02	8.41E-02	4.26E-03	3.93E-01	1.16E-01	6.62E-02	5.35E-02	2.70E-03
21	100-52-7	Benzaldehyde	5.85E-01	2.72E-01	1.27E-01	1.16E-01	7.16E-03	7.68E-01	1.36E-01	6.92E-02	6.43E-02	3.26E-03	3.00E-01	8.84E-02	5.06E-02	4.09E-02	2.07E-03
22	50-00-0	Formaldehyde	9.23E-01	4.28E-01	2.00E-01	1.83E-01	1.13E-02	1.21E+00	2.15E-01	1.09E-01	1.01E-01	5.13E-03	4.74E-01	1.39E-01	7.98E-02	6.46E-02	3.26E-03
23	78-85-3	Methacrolein	4.05E-01	1.88E-01	8.79E-02	8.05E-02	4.95E-03	5.32E-01	9.43E-02	4.79E-02	4.45E-02	2.25E-03	2.08E-01	6.12E-02	3.50E-02	2.83E-02	1.43E-03
24	78-93-3	2-Butanone	2.03E+00	9.40E-01	4.39E-01	4.02E-01	2.48E-02	2.66E+00	4.71E-01	2.40E-01	2.23E-01	1.13E-02	1.04E+00	3.06E-01	1.75E-01	1.42E-01	7.15E-03
25	71-43-2	Benzene	1.24E+01	5.74E+00	2.68E+00	2.46E+00	1.51E-01	1.63E+01	2.88E+00	1.46E+00	1.36E+00	6.89E-02	6.36E+00	1.87E+00	1.07E+00	8.66E-01	4.37E-02
26	74-83-9	Bromomethane	1.13E-02	5.22E-03	2.44E-03	2.24E-03	1.38E-04	1.48E-02	2.62E-03	1.33E-03	1.24E-03	6.26E-05	5.78E-03	1.70E-03	9.73E-04	7.87E-04	3.97E-05
27	104-51-8	n-Butylbenzene	2.25E-03	1.04E-03	4.88E-04	4.47E-04	2.75E-05	2.96E-03	5.24E-04	2.66E-04	2.47E-04	1.25E-05	1.16E-03	3.40E-04	1.95E-04	1.57E-04	7.94E-06
28	135-98-8	sec-Butylbenzene	2.25E-03	1.04E-03	4.88E-04	4.47E-04	2.75E-05	2.96E-03	5.24E-04	2.66E-04	2.47E-04	1.25E-05	1.16E-03	3.40E-04	1.95E-04	1.57E-04	7.94E-06
29	74-87-3	Chloromethane	3.83E-02	1.78E-02	8.30E-03	7.60E-03	4.68E-04	5.02E-02	8.90E-03	4.53E-03	4.20E-03	2.13E-04	1.96E-02	5.78E-03	3.31E-03	2.68E-03	1.35E-04
30	100-41-4	Ethylbenzene	1.44E-01	6.68E-02	3.12E-02	2.86E-02	1.76E-03	1.89E-01	3.35E-02	1.70E-02	1.58E-02	8.02E-04	7.40E-02	2.18E-02	1.25E-02	1.01E-02	5.08E-04
31	120-72-9	1H- Indole	2.25E-02	1.04E-02	4.88E-03	4.47E-03	2.75E-04	2.96E-02	5.24E-03	2.66E-03	2.47E-03	1.25E-04	1.16E-02	3.40E-03	1.95E-03	1.57E-03	7.94E-05
32	95-13-6	1H- Indene	1.35E-01	6.27E-02	2.93E-02	2.68E-02	1.65E-03	1.77E-01	3.14E-02	1.60E-02	1.48E-02	7.51E-04	6.93E-02	2.04E-02	1.17E-02	9.45E-03	4.77E-04
33	98-82-8	Isopropylbenzene	1.35E-02	6.27E-03	2.93E-03	2.68E-03	1.65E-04	1.77E-02	3.14E-03	1.60E-03	1.48E-03	7.51E-05	6.93E-03	2.04E-03	1.17E-03	9.45E-04	4.77E-05
34	99-87-6	p-Isopropyltoluene	4.50E-03	2.09E-03	9.76E-04	8.94E-04	5.50E-05	5.91E-03	1.05E-03	5.33E-04	4.95E-04	2.50E-05	2.31E-03	6.80E-04	3.89E-04	3.15E-04	1.59E-05
35	75-09-2	Methylene Chloride	6.76E-03	3.13E-03	1.46E-03	1.34E-03	8.26E-05	8.87E-03	1.57E-03	7.99E-04	7.42E-04	3.76E-05	3.47E-03	1.02E-03	5.84E-04	4.72E-04	2.38E-05
36	108-10-1	4-Methyl-2-pentanone	1.35E-02	6.27E-03	2.93E-03	2.68E-03	1.65E-04	1.77E-02	3.14E-03	1.60E-03	1.48E-03	7.51E-05	6.93E-03	2.04E-03	1.17E-03	9.45E-04	4.77E-05
37	103-65-1	n-Propylbenzene	1.35E-02	6.27E-03	2.93E-03	2.68E-03	1.65E-04	1.77E-02	3.14E-03	1.60E-03	1.48E-03	7.51E-05	6.93E-03	2.04E-03	1.17E-03	9.45E-04	4.77E-05
38	100-42-5	Styrene	4.28E-01	1.98E-01	9.27E-02	8.49E-02	5.23E-03	5.62E-01	9.95E-02	5.06E-02	4.70E-02	2.38E-03	2.20E-01	6.46E-02	3.70E-02	2.99E-02	1.51E-03
39	108-88-3	Toluene	1.40E+00	6.48E-01	3.03E-01	2.77E-01	1.71E-02	1.83E+00	3.25E-01	1.65E-01	1.53E-01	7.76E-03	7.16E-01	2.11E-01	1.21E-01	9.76E-02	4.92E-03
40	95-63-6	1,2,4-Trimethylbenzene	5.85E-02	2.72E-02	1.27E-02	1.16E-02	7.16E-04	7.68E-02	1.36E-02	6.92E-03	6.43E-03	3.26E-04	3.00E-02	8.84E-03	5.06E-03	4.09E-03	2.07E-04
41	108-67-8	1,3,5-Trimethylbenzene	4.50E-02	2.09E-02	9.76E-03	8.94E-03	5.50E-04	5.91E-02	1.05E-02	5.33E-03	4.95E-03	2.50E-04	2.31E-02	6.80E-03	3.89E-03	3.15E-03	1.59E-04
42	108-38-3 + 106-42-3	m+p-Xylene	1.80E-01	8.36E-02	3.90E-02	3.58E-02	2.20E-03	2.36E-01	4.19E-02	2.13E-02	1.98E-02	1.00E-03	9.24E-02	2.72E-02	1.56E-02	1.26E-02	6.35E-04
43	95-47-6	o-Xylene	7.66E-02	3.55E-02	1.66E-02	1.52E-02	9.36E-04	1.00E-01	1.78E-02	9.05E-03	8.41E-03	4.26E-04	3.93E-02	1.16E-02	6.62E-03	5.35E-03	2.70E-04
44	1330-20-7	Xylenes	3.38E-01	1.57E-01	7.32E-02	6.71E-02	4.13E-03	4.43E-01	7.86E-02	3.99E-02	3.71E-02	1.88E-03	1.73E-01	5.10E-02	2.92E-02	2.36E-02	1.19E-03
45	208-96-8	Acenaphthylene	1.35E-01	6.27E-02	2.93E-02	2.68E-02	1.65E-03	1.77E-01	3.14E-02	1.60E-02	1.48E-02	7.51E-04	6.93E-02	2.04E-02	1.17E-02	9.45E-03	4.77E-04
46	83-32-9	Acenaphthene	2.25E-02	1.04E-02	4.88E-03	4.47E-03	2.75E-04	2.96E-02	5.24E-03	2.66E-03	2.47E-03	1.25E-04	1.16E-02	3.40E-03	1.95E-03	1.57E-03	7.94E-05
47	275-51-4	Azulene	4.50E-01	2.09E-01	9.76E-02	8.94E-02	5.50E-03	5.91E-01	1.05E-01	5.33E-02	4.95E-02	2.50E-03	2.31E-01	6.80E-02	3.89E-02	3.15E-02	1.59E-03
48	100-47-0	Benzonitrile	2.48E-01	1.15E-01	5.37E-02	4.92E-02	3.03E-03	3.25E-01	5.76E-02	2.93E-02	2.72E-02	1.38E-03	1.27E-01	3.74E-02	2.14E-02	1.73E-02	8.74E-04
49	271-89-6	Benzofuran	4.50E-01	2.09E-01	9.76E-02	8.94E-02	5.50E-03	5.91E-01	1.05E-01	5.33E-02	4.95E-02	2.50E-03	2.31E-01	6.80E-02	3.89E-02	3.15E-02	1.59E-03
50	92-52-4	Biphenyl	1.13E-01	5.22E-02	2.44E-02	2.24E-02	1.38E-03	1.48E-01	2.62E-02	1.33E-02	1.24E-02	6.26E-04	5.78E-02	1.70E-02	9.73E-03	7.87E-03	3.97E-04
51	132-64-9	Dibenzofuran	2.03E-01	9.40E-02	4.39E-02	4.02E-02	2.48E-03	2.66E-01	4.71E-02	2.40E-02	2.23E-02	1.13E-03	1.04E-01	3.06E-02	1.75E-02	1.42E-02	7.15E-04
52	206-44-0	Fluoranthene	1.13E-01	5.22E-02	2.44E-02	2.24E-02	1.38E-03	1.48E-01	2.62E-02	1.33E-02	1.24E-02	6.26E-04	5.78E-02	1.70E-02	9.73E-03	7.87E-03	3.97E-04
53	86-73-7	9H-Fluorene	2.25E-02	1.04E-02	4.88E-03	4.47E-03	2.75E-04	2.96E-02	5.24E-03	2.66E-03	2.47E-03	1.25E-04	1.16E-02	3.40E-03	1.95E-03	1.57E-03	7.94E-05
54	486-25-9	9H-Fluoren-9-one	1.35E-01	6.27E-02	2.93E-02	2.68E-02	1.65E-03	1.77E-01	3.14E-02	1.60E-02	1.48E-02	7.51E-04	6.93E-02	2.04E-02	1.17E-02	9.45E-03	4.77E-04
55	90-12-0	1-Methylnapthalene	4.50E-02	2.09E-02	9.76E-03	8.94E-03	5.50E-04	5.91E-02	1.05E-02	5.33E-03	4.95E-03	2.50E-04	2.31E-02	6.80E-03	3.89E-03	3.15E-03	1.59E-04
56	91-57-6	2-Methylnapthalene	1.13E-01	5.22E-02	2.44E-02	2.24E-02	1.38E-03	1.48E-01	2.62E-02	1.33E-02	1.24E-02	6.26E-04	5.78E-02	1.70E-02	9.73E-03	7.87E-03	3.97E-04
57	91-20-3	Napthalene	1.73E+00	8.04E-01	3.76E-01	3.44E-01	2.12E-02	2.28E+00	4.03E-01	2.05E-01	1.90E-01	9.64E-03	8.90E-01	2.62E-01	1.50E-01	1.21E-01	6.12E-03
58	85-01-8	Phenanthrene	5.18E-01	2.40E-01	1.12E-01	1.03E-01	6.33E-03	6.80E-01	1.20E-01	6.12E-02	5.69E-02	2.88E-03	2.66E-01	7.82E-02	4.48E-02	3.62E-02	1.83E-03
59	129-00-0	Pyrene	6.76E-02	3.13E-02	1.46E-02	1.34E-02	8.26E-04	8.87E-02	1.57E-02	7.99E-03	7.42E-03	3.76E-04	3.47E-02	1.02E-02	5.84E-03	4.72E-03	2.38E-04
60	110-86-1	Pyridine	5.85E-01	2.72E-01	1.27E-01	1.16E-01	7.16E-03	7.68E-01	1.36E-01	6.92E-02	6.43E-02	3.26E-03	3.00E-01	8.84E-02	5.06E-02	4.09E-02	2.07E-03
61	91-22-5	Quinoline	1.13E-01	5.22E-02	2.44E-02	2.24E-02	1.38E-03	1.48E-01	2.62E-02	1.33E-02	1.24E-02	6.26E-04	5.78E-02	1.70E-02	9.73E-03	7.87E-03	3.97E-04

TABLE A.2: PREDICTED GROUND LEVEL CONCENTRATIONS
(µg/m^3)

			Receptor 4					Receptor 5					Receptor 6				
			Baseline Liquor Burner Emissions Scenario					Baseline Liquor Burner Emissions Scenario					Baseline Liquor Burner Emissions Scenario				
No	**CAS # / ID**	**Compound Name**	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual
1	TSP	Total Suspended Particulate	2.19E+01	7.63E+00	3.33E+00	3.14E+00	1.78E-01	4.98E+01	8.89E+00	5.04E+00	3.80E+00	1.95E-01	7.38E+01	1.03E+01	6.43E+00	3.81E+00	2.66E-01
2	630-08-0	Carbon Monoxide	5.48E+02	1.91E+02	8.32E+01	7.85E+01	4.44E+00	1.24E+03	2.22E+02	1.26E+02	9.50E+01	4.87E+00	1.84E+03	2.57E+02	1.61E+02	9.53E+01	6.65E+00
3	7446-09-5	Sulphur Dioxide	4.60E+00	1.60E+00	6.99E-01	6.59E-01	3.73E-02	1.05E+01	1.87E+00	1.06E+00	7.98E-01	4.09E-02	1.55E+01	2.16E+00	1.35E+00	8.01E-01	5.58E-02
4	10102-44-0	Nitrogen Dioxide [1]	1.48E+01	5.15E+00	2.25E+00	2.12E+00	1.20E-01	3.36E+01	6.00E+00	3.40E+00	2.57E+00	1.31E-01	4.98E+01	6.95E+00	4.34E+00	2.57E+00	1.80E-01
5	7440-38-2	Arsenic	1.10E-03	3.81E-04	1.66E-04	1.57E-04	8.88E-06	2.49E-03	4.44E-04	2.52E-04	1.90E-04	9.73E-06	3.69E-03	5.15E-04	3.21E-04	1.91E-04	1.33E-05
6	7429-90-5	Aluminium	3.56E-01	1.24E-01	5.41E-02	5.10E-02	2.89E-03	8.09E-01	1.44E-01	8.19E-02	6.18E-02	3.16E-03	1.20E+00	1.67E-01	1.04E-01	6.19E-02	4.32E-03
7	13463-40-6	Iron	7.67E-03	2.67E-03	1.17E-03	1.10E-03	6.22E-05	1.74E-02	3.11E-03	1.76E-03	1.33E-03	6.81E-05	2.58E-02	3.60E-03	2.25E-03	1.33E-03	9.31E-05
8	7439-96-5	Manganese	2.19E-03	7.63E-04	3.33E-04	3.14E-04	1.78E-05	4.98E-03	8.89E-04	5.04E-04	3.80E-04	1.95E-05	7.38E-03	1.03E-03	6.43E-04	3.81E-04	2.66E-05
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10	7439-98-7	Molybdenum	2.19E-03	7.63E-04	3.33E-04	3.14E-04	1.78E-05	4.98E-03	8.89E-04	5.04E-04	3.80E-04	1.95E-05	7.38E-03	1.03E-03	6.43E-04	3.81E-04	2.66E-05
11	7782-49-2	Selenium	1.32E-02	4.58E-03	2.00E-03	1.88E-03	1.07E-04	2.99E-02	5.33E-03	3.02E-03	2.28E-03	1.17E-04	4.43E-02	6.18E-03	3.86E-03	2.29E-03	1.60E-04
12	87-69-4	Tartaric Acid	2.30E+00	8.01E-01	3.50E-01	3.30E-01	1.87E-02	5.23E+00	9.33E-01	5.29E-01	3.99E-01	2.04E-02	7.75E+00	1.08E+00	6.75E-01	4.00E-01	2.79E-02
13	6915-15-7	Malic Acid	6.91E+00	2.40E+00	1.05E+00	9.89E-01	5.60E-02	1.57E+01	2.80E+00	1.59E+00	1.20E+00	6.13E-02	2.32E+01	3.24E+00	2.03E+00	1.20E+00	8.38E-02
14	110-02-1	Thiophene	2.30E-02	8.01E-03	3.50E-03	3.30E-03	1.87E-04	5.23E-02	9.33E-03	5.29E-03	3.99E-03	2.04E-04	7.75E-02	1.08E-02	6.75E-03	4.00E-03	2.79E-04
15	67-64-1	Acetone	1.62E+01	5.65E+00	2.46E+00	2.32E+00	1.31E-01	3.68E+01	6.58E+00	3.73E+00	2.81E+00	1.44E-01	5.46E+01	7.62E+00	4.76E+00	2.82E+00	1.97E-01
16	75-07-0	Acetaldehyde	4.28E+00	1.49E+00	6.49E-01	6.12E-01	3.46E-02	9.71E+00	1.73E+00	9.82E-01	7.41E-01	3.79E-02	1.44E+01	2.01E+00	1.25E+00	7.43E-01	5.19E-02
17	98-86-2	Acetophenone	6.58E-02	2.29E-02	9.99E-03	9.42E-03	5.33E-04	1.49E-01	2.67E-02	1.51E-02	1.14E-02	5.84E-04	2.21E-01	3.09E-02	1.93E-02	1.14E-02	7.98E-04
18	107-02-8	Acrolein	5.92E-01	2.06E-01	8.99E-02	8.48E-02	4.80E-03	1.34E+00	2.40E-01	1.36E-01	1.03E-01	5.25E-03	1.99E+00	2.78E-01	1.74E-01	1.03E-01	7.18E-03
19	123-72-8	Butanal	1.97E-01	6.87E-02	3.00E-02	2.83E-02	1.60E-03	4.48E-01	8.00E-02	4.53E-02	3.42E-02	1.75E-03	6.64E-01	9.27E-02	5.79E-02	3.43E-02	2.39E-03
20	4170-30-3	Butenal	3.73E-01	1.30E-01	5.66E-02	5.34E-02	3.02E-03	8.46E-01	1.51E-01	8.56E-02	6.46E-02	3.31E-03	1.25E+00	1.75E-01	1.09E-01	6.48E-02	4.52E-03
21	100-52-7	Benzaldehyde	2.85E-01	9.92E-02	4.33E-02	4.08E-02	2.31E-03	6.47E-01	1.16E-01	6.55E-02	4.94E-02	2.53E-03	9.59E-01	1.34E-01	8.36E-02	4.96E-02	3.46E-03
22	50-00-0	Formaldehyde	4.49E-01	1.56E-01	6.83E-02	6.44E-02	3.64E-03	1.02E+00	1.82E-01	1.03E-01	7.79E-02	3.99E-03	1.51E+00	2.11E-01	1.32E-01	7.81E-02	5.45E-03
23	78-85-3	Methacrolein	1.97E-01	6.87E-02	3.00E-02	2.83E-02	1.60E-03	4.48E-01	8.00E-02	4.53E-02	3.42E-02	1.75E-03	6.64E-01	9.27E-02	5.79E-02	3.43E-02	2.39E-03
24	78-93-3	2-Butanone	9.87E-01	3.43E-01	1.50E-01	1.41E-01	7.99E-03	2.24E+00	4.00E-01	2.27E-01	1.71E-01	8.76E-03	3.32E+00	4.63E-01	2.89E-01	1.72E-01	1.20E-02
25	71-43-2	Benzene	6.03E+00	2.10E+00	9.16E-01	8.63E-01	4.89E-02	1.37E+01	2.44E+00	1.39E+00	1.05E+00	5.35E-02	2.03E+01	2.83E+00	1.77E+00	1.05E+00	7.31E-02
26	74-83-9	Bromomethane	5.48E-03	1.91E-03	8.32E-04	7.85E-04	4.44E-05	1.24E-02	2.22E-03	1.26E-03	9.50E-04	4.87E-05	1.84E-02	2.57E-03	1.61E-03	9.53E-04	6.65E-05
27	104-51-8	n-Butylbenzene	1.10E-03	3.81E-04	1.66E-04	1.57E-04	8.88E-06	2.49E-03	4.44E-04	2.52E-04	1.90E-04	9.73E-06	3.69E-03	5.15E-04	3.21E-04	1.91E-04	1.33E-05
28	135-98-8	sec-Butylbenzene	1.10E-03	3.81E-04	1.66E-04	1.57E-04	8.88E-06	2.49E-03	4.44E-04	2.52E-04	1.90E-04	9.73E-06	3.69E-03	5.15E-04	3.21E-04	1.91E-04	1.33E-05
29	74-87-3	Chloromethane	1.86E-02	6.49E-03	2.83E-03	2.67E-03	1.51E-04	4.23E-02	7.56E-03	4.28E-03	3.23E-03	1.65E-04	6.27E-02	8.75E-03	5.46E-03	3.24E-03	2.26E-04
30	100-41-4	Ethylbenzene	7.02E-02	2.44E-02	1.07E-02	1.00E-02	5.69E-04	1.59E-01	2.84E-02	1.61E-02	1.22E-02	6.23E-04	2.36E-01	3.29E-02	2.06E-02	1.22E-02	8.51E-04
31	120-72-9	1H- Indole	1.10E-02	3.81E-03	1.66E-03	1.57E-03	8.88E-05	2.49E-02	4.44E-03	2.52E-03	1.90E-03	9.73E-05	3.69E-02	5.15E-03	3.21E-03	1.91E-03	1.33E-04
32	95-13-6	1H- Indene	6.58E-02	2.29E-02	9.99E-03	9.42E-03	5.33E-04	1.49E-01	2.67E-02	1.51E-02	1.14E-02	5.84E-04	2.21E-01	3.09E-02	1.93E-02	1.14E-02	7.98E-04
33	98-82-8	Isopropylbenzene	6.58E-03	2.29E-03	9.99E-04	9.42E-04	5.33E-05	1.49E-02	2.67E-03	1.51E-03	1.14E-03	5.84E-05	2.21E-02	3.09E-03	1.93E-03	1.14E-03	7.98E-05
34	99-87-6	p-Isopropyltoluene	2.19E-03	7.63E-04	3.33E-04	3.14E-04	1.78E-05	4.98E-03	8.89E-04	5.04E-04	3.80E-04	1.95E-05	7.38E-03	1.03E-03	6.43E-04	3.81E-04	2.66E-05
35	75-09-2	Methylene Chloride	3.29E-03	1.14E-03	4.99E-04	4.71E-04	2.66E-05	7.47E-03	1.33E-03	7.56E-04	5.70E-04	2.92E-05	1.11E-02	1.54E-03	9.64E-04	5.72E-04	3.99E-05
36	108-10-1	4-Methyl-2-pentanone	6.58E-03	2.29E-03	9.99E-04	9.42E-04	5.33E-05	1.49E-02	2.67E-03	1.51E-03	1.14E-03	5.84E-05	2.21E-02	3.09E-03	1.93E-03	1.14E-03	7.98E-05
37	103-65-1	n-Propylbenzene	6.58E-03	2.29E-03	9.99E-04	9.42E-04	5.33E-05	1.49E-02	2.67E-03	1.51E-03	1.14E-03	5.84E-05	2.21E-02	3.09E-03	1.93E-03	1.14E-03	7.98E-05
38	100-42-5	Styrene	2.08E-01	7.25E-02	3.16E-02	2.98E-02	1.69E-03	4.73E-01	8.44E-02	4.79E-02	3.61E-02	1.85E-03	7.01E-01	9.78E-02	6.11E-02	3.62E-02	2.53E-03
39	108-88-3	Toluene	6.80E-01	2.37E-01	1.03E-01	9.73E-02	5.51E-03	1.54E+00	2.76E-01	1.56E-01	1.18E-01	6.03E-03	2.29E+00	3.19E-01	1.99E-01	1.18E-01	8.24E-03
40	95-63-6	1,2,4-Trimethylbenzene	2.85E-02	9.92E-03	4.33E-03	4.08E-03	2.31E-04	6.47E-02	1.16E-02	6.55E-03	4.94E-03	2.53E-04	9.59E-02	1.34E-02	8.36E-03	4.96E-03	3.46E-04
41	108-67-8	1,3,5-Trimethylbenzene	2.19E-02	7.63E-03	3.33E-03	3.14E-03	1.78E-04	4.98E-02	8.89E-03	5.04E-03	3.80E-03	1.95E-04	7.38E-02	1.03E-02	6.43E-03	3.81E-03	2.66E-04
42	108-38-3 + 106-42-3	m+p-Xylene	8.77E-02	3.05E-02	1.33E-02	1.26E-02	7.11E-04	1.99E-01	3.56E-02	2.02E-02	1.52E-02	7.78E-04	2.95E-01	4.12E-02	2.57E-02	1.52E-02	1.06E-03
43	95-47-6	o-Xylene	3.73E-02	1.30E-02	5.66E-03	5.34E-03	3.02E-04	8.46E-02	1.51E-02	8.56E-03	6.46E-03	3.31E-04	1.25E-01	1.75E-02	1.09E-02	6.48E-03	4.52E-04
44	1330-20-7	Xylenes	1.64E-01	5.72E-02	2.50E-02	2.35E-02	1.33E-03	3.73E-01	6.67E-02	3.78E-02	2.85E-02	1.46E-03	5.53E-01	7.72E-02	4.82E-02	2.86E-02	1.99E-03
45	208-96-8	Acenaphthylene	6.58E-02	2.29E-02	9.99E-03	9.42E-03	5.33E-04	1.49E-01	2.67E-02	1.51E-02	1.14E-02	5.84E-04	2.21E-01	3.09E-02	1.93E-02	1.14E-02	7.98E-04
46	83-32-9	Acenaphthene	1.10E-02	3.81E-03	1.66E-03	1.57E-03	8.88E-05	2.49E-02	4.44E-03	2.52E-03	1.90E-03	9.73E-05	3.69E-02	5.15E-03	3.21E-03	1.91E-03	1.33E-04
47	275-51-4	Azulene	2.19E-01	7.63E-02	3.33E-02	3.14E-02	1.78E-03	4.98E-01	8.89E-02	5.04E-02	3.80E-02	1.95E-03	7.38E-01	1.03E-01	6.43E-02	3.81E-02	2.66E-03
48	100-47-0	Benzonitrile	1.21E-01	4.20E-02	1.83E-02	1.73E-02	9.77E-04	2.74E-01	4.89E-02	2.77E-02	2.09E-02	1.07E-03	4.06E-01	5.66E-02	3.54E-02	2.10E-02	1.46E-03
49	271-89-6	Benzofuran	2.19E-01	7.63E-02	3.33E-02	3.14E-02	1.78E-03	4.98E-01	8.89E-02	5.04E-02	3.80E-02	1.95E-03	7.38E-01	1.03E-01	6.43E-02	3.81E-02	2.66E-03
50	92-52-4	Biphenyl	5.48E-02	1.91E-02	8.32E-03	7.85E-03	4.44E-04	1.24E-01	2.22E-02	1.26E-02	9.50E-03	4.87E-04	1.84E-01	2.57E-02	1.61E-02	9.53E-03	6.65E-04
51	132-64-9	Dibenzofuran	9.87E-02	3.43E-02	1.50E-02	1.41E-02	7.99E-04	2.24E-01	4.00E-02	2.27E-02	1.71E-02	8.76E-04	3.32E-01	4.63E-02	2.89E-02	1.72E-02	1.20E-03
52	206-44-0	Fluoranthene	5.48E-02	1.91E-02	8.32E-03	7.85E-03	4.44E-04	1.24E-01	2.22E-02	1.26E-02	9.50E-03	4.87E-04	1.84E-01	2.57E-02	1.61E-02	9.53E-03	6.65E-04
53	86-73-7	9H-Fluorene	1.10E-02	3.81E-03	1.66E-03	1.57E-03	8.88E-05	2.49E-02	4.44E-03	2.52E-03	1.90E-03	9.73E-05	3.69E-02	5.15E-03	3.21E-03	1.91E-03	1.33E-04
54	486-25-9	9H-Fluoren-9-one	6.58E-02	2.29E-02	9.99E-03	9.42E-03	5.33E-04	1.49E-01	2.67E-02	1.51E-02	1.14E-02	5.84E-04	2.21E-01	3.09E-02	1.93E-02	1.14E-02	7.98E-04
55	90-12-0	1-Methylnapthalene	2.19E-02	7.63E-03	3.33E-03	3.14E-03	1.78E-04	4.98E-02	8.89E-03	5.04E-03	3.80E-03	1.95E-04	7.38E-02	1.03E-02	6.43E-03	3.81E-03	2.66E-04
56	91-57-6	2-Methylnapthalene	5.48E-02	1.91E-02	8.32E-03	7.85E-03	4.44E-04	1.24E-01	2.22E-02	1.26E-02	9.50E-03	4.87E-04	1.84E-01	2.57E-02	1.61E-02	9.53E-03	6.65E-04
57	91-20-3	Napthalene	8.44E-01	2.94E-01	1.28E-01	1.21E-01	6.84E-03	1.92E+00	3.42E-01	1.94E-01	1.46E-01	7.49E-03	2.84E+00	3.96E-01	2.48E-01	1.47E-01	1.02E-02
58	85-01-8	Phenanthrene	2.52E-01	8.77E-02	3.83E-02	3.61E-02	2.04E-03	5.72E-01	1.02E-01	5.79E-02	4.37E-02	2.24E-03	8.48E-01	1.18E-01	7.39E-02	4.38E-02	3.06E-03
59	129-00-0	Pyrene	3.29E-02	1.14E-02	4.99E-03	4.71E-03	2.66E-04	7.47E-02	1.33E-02	7.56E-03	5.70E-03	2.92E-04	1.11E-01	1.54E-02	9.64E-03	5.72E-03	3.99E-04
60	110-86-1	Pyridine	2.85E-01	9.92E-02	4.33E-02	4.08E-02	2.31E-03	6.47E-01	1.16E-01	6.55E-02	4.94E-02	2.53E-03	9.59E-01	1.34E-01	8.36E-02	4.96E-02	3.46E-03
61	91-22-5	Quinoline	5.48E-02	1.91E-02	8.32E-03	7.85E-03	4.44E-04	1.24E-01	2.22E-02	1.26E-02	9.50E-03	4.87E-04	1.84E-01	2.57E-02	1.61E-02	9.53E-03	6.65E-04

TABLE A.2: PREDICTED GROUND LEVEL CONCENTRATIONS
(µg/m^3)

			Receptor 7					Receptor 8					Receptor 9				
			Baseline Liquor Burner Emissions Scenario					Baseline Liquor Burner Emissions Scenario					Baseline Liquor Burner Emissions Scenario				
No	**CAS # / ID**	**Compound Name**	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual
1	TSP	Total Suspended Particulate	5.56E+01	5.69E+00	3.37E+00	2.01E+00	1.10E-01	2.21E+01	9.48E+00	3.96E+00	3.40E+00	2.68E-01	1.64E+01	6.96E+00	2.59E+00	2.42E+00	2.21E-01
2	630-08-0	Carbon Monoxide	1.39E+03	1.42E+02	8.42E+01	5.02E+01	2.76E+00	5.52E+02	2.37E+02	9.91E+01	8.51E+01	6.70E+00	4.11E+02	1.74E+02	6.48E+01	6.05E+01	5.52E+00
3	7446-09-5	Sulphur Dioxide	1.17E+01	1.19E+00	7.07E-01	4.22E-01	2.32E-02	4.64E+00	1.99E+00	8.33E-01	7.15E-01	5.62E-02	3.45E+00	1.46E+00	5.45E-01	5.08E-01	4.64E-02
4	10102-44-0	Nitrogen Dioxide [1]	3.75E+01	3.84E+00	2.27E+00	1.36E+00	7.44E-02	1.49E+01	6.40E+00	2.68E+00	2.30E+00	1.81E-01	1.11E+01	4.70E+00	1.75E+00	1.63E+00	1.49E-01
5	7440-38-2	Arsenic	2.78E-03	2.84E-04	1.68E-04	1.00E-04	5.51E-06	1.10E-03	4.74E-04	1.98E-04	1.70E-04	1.34E-05	8.22E-04	3.48E-04	1.30E-04	1.21E-04	1.10E-05
6	7429-90-5	Aluminium	9.03E-01	9.24E-02	5.47E-02	3.27E-02	1.79E-03	3.59E-01	1.54E-01	6.44E-02	5.53E-02	4.35E-03	2.67E-01	1.13E-01	4.21E-02	3.93E-02	3.59E-03
7	13463-40-6	Iron	1.94E-02	1.99E-03	1.18E-03	7.03E-04	3.86E-05	7.73E-03	3.32E-03	1.39E-03	1.19E-03	9.37E-05	5.76E-03	2.44E-03	9.08E-04	8.47E-04	7.73E-05
8	7439-96-5	Manganese	5.56E-03	5.69E-04	3.37E-04	2.01E-04	1.10E-05	2.21E-03	9.48E-04	3.96E-04	3.40E-04	2.68E-05	1.64E-03	6.96E-04	2.59E-04	2.42E-04	2.21E-05
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10	7439-98-7	Molybdenum	5.56E-03	5.69E-04	3.37E-04	2.01E-04	1.10E-05	2.21E-03	9.48E-04	3.96E-04	3.40E-04	2.68E-05	1.64E-03	6.96E-04	2.59E-04	2.42E-04	2.21E-05
11	7782-49-2	Selenium	3.33E-02	3.41E-03	2.02E-03	1.21E-03	6.62E-05	1.32E-02	5.69E-03	2.38E-03	2.04E-03	1.61E-04	9.87E-03	4.18E-03	1.56E-03	1.45E-03	1.33E-04
12	87-69-4	Tartaric Acid	5.83E+00	5.97E-01	3.54E-01	2.11E-01	1.16E-02	2.32E+00	9.96E-01	4.16E-01	3.57E-01	2.81E-02	1.73E+00	7.31E-01	2.72E-01	2.54E-01	2.32E-02
13	6915-15-7	Malic Acid	1.75E+01	1.79E+00	1.06E+00	6.33E-01	3.47E-02	6.95E+00	2.99E+00	1.25E+00	1.07E+00	8.44E-02	5.18E+00	2.19E+00	8.17E-01	7.63E-01	6.96E-02
14	110-02-1	Thiophene	5.83E-02	5.97E-03	3.54E-03	2.11E-03	1.16E-04	2.32E-02	9.96E-03	4.16E-03	3.57E-03	2.81E-04	1.73E-02	7.31E-03	2.72E-03	2.54E-03	2.32E-04
15	67-64-1	Acetone	4.11E+01	4.21E+00	2.49E+00	1.49E+00	8.16E-02	1.63E+01	7.02E+00	2.93E+00	2.52E+00	1.98E-01	1.22E+01	5.15E+00	1.92E+00	1.79E+00	1.63E-01
16	75-07-0	Acetaldehyde	1.08E+01	1.11E+00	6.57E-01	3.92E-01	2.15E-02	4.30E+00	1.85E+00	7.73E-01	6.64E-01	5.22E-02	3.21E+00	1.36E+00	5.06E-01	4.72E-01	4.31E-02
17	98-86-2	Acetophenone	1.67E-01	1.71E-02	1.01E-02	6.03E-03	3.31E-04	6.62E-02	2.84E-02	1.19E-02	1.02E-02	8.04E-04	4.93E-02	2.09E-02	7.78E-03	7.26E-03	6.63E-04
18	107-02-8	Acrolein	1.50E+00	1.54E-01	9.09E-02	5.43E-02	2.98E-03	5.96E-01	2.56E-01	1.07E-01	9.19E-02	7.23E-03	4.44E-01	1.88E-01	7.00E-02	6.54E-02	5.96E-03
19	123-72-8	Butanal	5.00E-01	5.12E-02	3.03E-02	1.81E-02	9.93E-04	1.99E-01	8.53E-02	3.57E-02	3.06E-02	2.41E-03	1.48E-01	6.27E-02	2.33E-02	2.18E-02	1.99E-03
20	4170-30-3	Butenal	9.44E-01	9.67E-02	5.72E-02	3.42E-02	1.87E-03	3.75E-01	1.61E-01	6.74E-02	5.79E-02	4.55E-03	2.80E-01	1.18E-01	4.41E-02	4.12E-02	3.75E-03
21	100-52-7	Benzaldehyde	7.22E-01	7.40E-02	4.38E-02	2.61E-02	1.43E-03	2.87E-01	1.23E-01	5.15E-02	4.43E-02	3.48E-03	2.14E-01	9.05E-02	3.37E-02	3.15E-02	2.87E-03
22	50-00-0	Formaldehyde	1.14E+00	1.17E-01	6.90E-02	4.12E-02	2.26E-03	4.53E-01	1.94E-01	8.13E-02	6.98E-02	5.49E-03	3.37E-01	1.43E-01	5.32E-02	4.96E-02	4.53E-03
23	78-85-3	Methacrolein	5.00E-01	5.12E-02	3.03E-02	1.81E-02	9.93E-04	1.99E-01	8.53E-02	3.57E-02	3.06E-02	2.41E-03	1.48E-01	6.27E-02	2.33E-02	2.18E-02	1.99E-03
24	78-93-3	2-Butanone	2.50E+00	2.56E-01	1.52E-01	9.04E-02	4.96E-03	9.93E-01	4.27E-01	1.78E-01	1.53E-01	1.21E-02	7.40E-01	3.13E-01	1.17E-01	1.09E-01	9.94E-03
25	71-43-2	Benzene	1.53E+01	1.56E+00	9.26E-01	5.53E-01	3.03E-02	6.07E+00	2.61E+00	1.09E+00	9.36E-01	7.37E-02	4.52E+00	1.91E+00	7.13E-01	6.66E-01	6.07E-02
26	74-83-9	Bromomethane	1.39E-02	1.42E-03	8.42E-04	5.02E-04	2.76E-05	5.52E-03	2.37E-03	9.91E-04	8.51E-04	6.70E-05	4.11E-03	1.74E-03	6.48E-04	6.05E-04	5.52E-05
27	104-51-8	n-Butylbenzene	2.78E-03	2.84E-04	1.68E-04	1.00E-04	5.51E-06	1.10E-03	4.74E-04	1.98E-04	1.70E-04	1.34E-05	8.22E-04	3.48E-04	1.30E-04	1.21E-04	1.10E-05
28	135-98-8	sec-Butylbenzene	2.78E-03	2.84E-04	1.68E-04	1.00E-04	5.51E-06	1.10E-03	4.74E-04	1.98E-04	1.70E-04	1.34E-05	8.22E-04	3.48E-04	1.30E-04	1.21E-04	1.10E-05
29	74-87-3	Chloromethane	4.72E-02	4.84E-03	2.86E-03	1.71E-03	9.37E-05	1.88E-02	8.06E-03	3.37E-03	2.89E-03	2.28E-04	1.40E-02	5.92E-03	2.20E-03	2.06E-03	1.88E-04
30	100-41-4	Ethylbenzene	1.78E-01	1.82E-02	1.08E-02	6.43E-03	3.53E-04	7.06E-02	3.03E-02	1.27E-02	1.09E-02	8.57E-04	5.26E-02	2.23E-02	8.30E-03	7.75E-03	7.07E-04
31	120-72-9	1H- Indole	2.78E-02	2.84E-03	1.68E-03	1.00E-03	5.51E-05	1.10E-02	4.74E-03	1.98E-03	1.70E-03	1.34E-04	8.22E-03	3.48E-03	1.30E-03	1.21E-03	1.10E-04
32	95-13-6	1H- Indene	1.67E-01	1.71E-02	1.01E-02	6.03E-03	3.31E-04	6.62E-02	2.84E-02	1.19E-02	1.02E-02	8.04E-04	4.93E-02	2.09E-02	7.78E-03	7.26E-03	6.63E-04
33	98-82-8	Isopropylbenzene	1.67E-02	1.71E-03	1.01E-03	6.03E-04	3.31E-05	6.62E-03	2.84E-03	1.19E-03	1.02E-03	8.04E-05	4.93E-03	2.09E-03	7.78E-04	7.26E-04	6.63E-05
34	99-87-6	p-Isopropyltoluene	5.56E-03	5.69E-04	3.37E-04	2.01E-04	1.10E-05	2.21E-03	9.48E-04	3.96E-04	3.40E-04	2.68E-05	1.64E-03	6.96E-04	2.59E-04	2.42E-04	2.21E-05
35	75-09-2	Methylene Chloride	8.33E-03	8.53E-04	5.05E-04	3.01E-04	1.65E-05	3.31E-03	1.42E-03	5.95E-04	5.11E-04	4.02E-05	2.47E-03	1.04E-03	3.89E-04	3.63E-04	3.31E-05
36	108-10-1	4-Methyl-2-pentanone	1.67E-02	1.71E-03	1.01E-03	6.03E-04	3.31E-05	6.62E-03	2.84E-03	1.19E-03	1.02E-03	8.04E-05	4.93E-03	2.09E-03	7.78E-04	7.26E-04	6.63E-05
37	103-65-1	n-Propylbenzene	1.67E-02	1.71E-03	1.01E-03	6.03E-04	3.31E-05	6.62E-03	2.84E-03	1.19E-03	1.02E-03	8.04E-05	4.93E-03	2.09E-03	7.78E-04	7.26E-04	6.63E-05
38	100-42-5	Styrene	5.28E-01	5.40E-02	3.20E-02	1.91E-02	1.05E-03	2.10E-01	9.01E-02	3.77E-02	3.23E-02	2.54E-03	1.56E-01	6.61E-02	2.46E-02	2.30E-02	2.10E-03
39	108-88-3	Toluene	1.72E+00	1.76E-01	1.04E-01	6.23E-02	3.42E-03	6.84E-01	2.94E-01	1.23E-01	1.06E-01	8.30E-03	5.10E-01	2.16E-01	8.04E-02	7.51E-02	6.85E-03
40	95-63-6	1,2,4-Trimethylbenzene	7.22E-02	7.40E-03	4.38E-03	2.61E-03	1.43E-04	2.87E-02	1.23E-02	5.15E-03	4.43E-03	3.48E-04	2.14E-02	9.05E-03	3.37E-03	3.15E-03	2.87E-04
41	108-67-8	1,3,5-Trimethylbenzene	5.56E-02	5.69E-03	3.37E-03	2.01E-03	1.10E-04	2.21E-02	9.48E-03	3.96E-03	3.40E-03	2.68E-04	1.64E-02	6.96E-03	2.59E-03	2.42E-03	2.21E-04
42	108-38-3 + 106-42-3	m+p-Xylene	2.22E-01	2.28E-02	1.35E-02	8.04E-03	4.41E-04	8.83E-02	3.79E-02	1.59E-02	1.36E-02	1.07E-03	6.58E-02	2.79E-02	1.04E-02	9.68E-03	8.83E-04
43	95-47-6	o-Xylene	9.44E-02	9.67E-03	5.72E-03	3.42E-03	1.87E-04	3.75E-02	1.61E-02	6.74E-03	5.79E-03	4.55E-04	2.80E-02	1.18E-02	4.41E-03	4.12E-03	3.75E-04
44	1330-20-7	Xylenes	4.17E-01	4.27E-02	2.53E-02	1.51E-02	8.27E-04	1.66E-01	7.11E-02	2.97E-02	2.55E-02	2.01E-03	1.23E-01	5.22E-02	1.94E-02	1.82E-02	1.66E-03
45	208-96-8	Acenaphthylene	1.67E-01	1.71E-02	1.01E-02	6.03E-03	3.31E-04	6.62E-02	2.84E-02	1.19E-02	1.02E-02	8.04E-04	4.93E-02	2.09E-02	7.78E-03	7.26E-03	6.63E-04
46	83-32-9	Acenaphthene	2.78E-02	2.84E-03	1.68E-03	1.00E-03	5.51E-05	1.10E-02	4.74E-03	1.98E-03	1.70E-03	1.34E-04	8.22E-03	3.48E-03	1.30E-03	1.21E-03	1.10E-04
47	275-51-4	Azulene	5.56E-01	5.69E-02	3.37E-02	2.01E-02	1.10E-03	2.21E-01	9.48E-02	3.96E-02	3.40E-02	2.68E-03	1.64E-01	6.96E-02	2.59E-02	2.42E-02	2.21E-03
48	100-47-0	Benzonitrile	3.06E-01	3.13E-02	1.85E-02	1.11E-02	6.07E-04	1.21E-01	5.21E-02	2.18E-02	1.87E-02	1.47E-03	9.04E-02	3.83E-02	1.43E-02	1.33E-02	1.21E-03
49	271-89-6	Benzofuran	5.56E-01	5.69E-02	3.37E-02	2.01E-02	1.10E-03	2.21E-01	9.48E-02	3.96E-02	3.40E-02	2.68E-03	1.64E-01	6.96E-02	2.59E-02	2.42E-02	2.21E-03
50	92-52-4	Biphenyl	1.39E-01	1.42E-02	8.42E-03	5.02E-03	2.76E-04	5.52E-02	2.37E-02	9.91E-03	8.51E-03	6.70E-04	4.11E-02	1.74E-02	6.48E-03	6.05E-03	5.52E-04
51	132-64-9	Dibenzofuran	2.50E-01	2.56E-02	1.52E-02	9.04E-03	4.96E-04	9.93E-02	4.27E-02	1.78E-02	1.53E-02	1.21E-03	7.40E-02	3.13E-02	1.17E-02	1.09E-02	9.94E-04
52	206-44-0	Fluoranthene	1.39E-01	1.42E-02	8.42E-03	5.02E-03	2.76E-04	5.52E-02	2.37E-02	9.91E-03	8.51E-03	6.70E-04	4.11E-02	1.74E-02	6.48E-03	6.05E-03	5.52E-04
53	86-73-7	9H-Fluorene	2.78E-02	2.84E-03	1.68E-03	1.00E-03	5.51E-05	1.10E-02	4.74E-03	1.98E-03	1.70E-03	1.34E-04	8.22E-03	3.48E-03	1.30E-03	1.21E-03	1.10E-04
54	486-25-9	9H-Fluoren-9-one	1.67E-01	1.71E-02	1.01E-02	6.03E-03	3.31E-04	6.62E-02	2.84E-02	1.19E-02	1.02E-02	8.04E-04	4.93E-02	2.09E-02	7.78E-03	7.26E-03	6.63E-04
55	90-12-0	1-Methylnapthalene	5.56E-02	5.69E-03	3.37E-03	2.01E-03	1.10E-04	2.21E-02	9.48E-03	3.96E-03	3.40E-03	2.68E-04	1.64E-02	6.96E-03	2.59E-03	2.42E-03	2.21E-04
56	91-57-6	2-Methylnapthalene	1.39E-01	1.42E-02	8.42E-03	5.02E-03	2.76E-04	5.52E-02	2.37E-02	9.91E-03	8.51E-03	6.70E-04	4.11E-02	1.74E-02	6.48E-03	6.05E-03	5.52E-04
57	91-20-3	Napthalene	2.14E+00	2.19E-01	1.30E-01	7.74E-02	4.25E-03	8.50E-01	3.65E-01	1.53E-01	1.31E-01	1.03E-02	6.33E-01	2.68E-01	9.98E-02	9.32E-02	8.50E-03
58	85-01-8	Phenanthrene	6.39E-01	6.54E-02	3.87E-02	2.31E-02	1.27E-03	2.54E-01	1.09E-01	4.56E-02	3.91E-02	3.08E-03	1.89E-01	8.01E-02	2.98E-02	2.78E-02	2.54E-03
59	129-00-0	Pyrene	8.33E-02	8.53E-03	5.05E-03	3.01E-03	1.65E-04	3.31E-02	1.42E-02	5.95E-03	5.11E-03	4.02E-04	2.47E-02	1.04E-02	3.89E-03	3.63E-03	3.31E-04
60	110-86-1	Pyridine	7.22E-01	7.40E-02	4.38E-02	2.61E-02	1.43E-03	2.87E-01	1.23E-01	5.15E-02	4.43E-02	3.48E-03	2.14E-01	9.05E-02	3.37E-02	3.15E-02	2.87E-03
61	91-22-5	Quinoline	1.39E-01	1.42E-02	8.42E-03	5.02E-03	2.76E-04	5.52E-02	2.37E-02	9.91E-03	8.51E-03	6.70E-04	4.11E-02	1.74E-02	6.48E-03	6.05E-03	5.52E-04

TABLE A.2: PREDICTED GROUND LEVEL CONCENTRATIONS
(µg/m^3)

			Receptor 10					Receptor 11					Receptor 12				
			Baseline Liquor Burner Emissions Scenario					Baseline Liquor Burner Emissions Scenario					Baseline Liquor Burner Emissions Scenario				
No	**CAS # / ID**	**Compound Name**	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual
1	TSP	Total Suspended Particulate	1.79E+01	7.20E+00	3.04E+00	2.86E+00	2.10E-01	1.66E+01	6.18E+00	3.08E+00	2.51E+00	1.40E-01	1.63E+01	4.59E+00	2.38E+00	2.27E+00	1.10E-01
2	630-08-0	Carbon Monoxide	4.48E+02	1.80E+02	7.60E+01	7.16E+01	5.25E+00	4.15E+02	1.54E+02	7.70E+01	6.29E+01	3.51E+00	4.07E+02	1.15E+02	5.95E+01	5.68E+01	2.75E+00
3	7446-09-5	Sulphur Dioxide	3.76E+00	1.51E+00	6.39E-01	6.01E-01	4.41E-02	3.48E+00	1.30E+00	6.47E-01	5.28E-01	2.95E-02	3.42E+00	9.64E-01	5.00E-01	4.77E-01	2.31E-02
4	10102-44-0	Nitrogen Dioxide [1]	1.21E+01	4.86E+00	2.05E+00	1.93E+00	1.42E-01	1.12E+01	4.17E+00	2.08E+00	1.70E+00	9.48E-02	1.10E+01	3.10E+00	1.61E+00	1.53E+00	7.41E-02
5	7440-38-2	Arsenic	8.96E-04	3.60E-04	1.52E-04	1.43E-04	1.05E-05	8.30E-04	3.09E-04	1.54E-04	1.26E-04	7.02E-06	8.15E-04	2.30E-04	1.19E-04	1.14E-04	5.49E-06
6	7429-90-5	Aluminium	2.91E-01	1.17E-01	4.94E-02	4.65E-02	3.41E-03	2.70E-01	1.00E-01	5.01E-02	4.09E-02	2.28E-03	2.65E-01	7.46E-02	3.87E-02	3.69E-02	1.78E-03
7	13463-40-6	Iron	6.27E-03	2.52E-03	1.06E-03	1.00E-03	7.35E-05	5.81E-03	2.16E-03	1.08E-03	8.80E-04	4.91E-05	5.70E-03	1.61E-03	8.33E-04	7.96E-04	3.84E-05
8	7439-96-5	Manganese	1.79E-03	7.20E-04	3.04E-04	2.86E-04	2.10E-05	1.66E-03	6.18E-04	3.08E-04	2.51E-04	1.40E-05	1.63E-03	4.59E-04	2.38E-04	2.27E-04	1.10E-05
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10	7439-98-7	Molybdenum	1.79E-03	7.20E-04	3.04E-04	2.86E-04	2.10E-05	1.66E-03	6.18E-04	3.08E-04	2.51E-04	1.40E-05	1.63E-03	4.59E-04	2.38E-04	2.27E-04	1.10E-05
11	7782-49-2	Selenium	1.08E-02	4.32E-03	1.82E-03	1.72E-03	1.26E-04	9.96E-03	3.71E-03	1.85E-03	1.51E-03	8.42E-05	9.78E-03	2.76E-03	1.43E-03	1.36E-03	6.59E-05
12	87-69-4	Tartaric Acid	1.88E+00	7.56E-01	3.19E-01	3.01E-01	2.21E-02	1.74E+00	6.49E-01	3.24E-01	2.64E-01	1.47E-02	1.71E+00	4.82E-01	2.50E-01	2.39E-01	1.15E-02
13	6915-15-7	Malic Acid	5.65E+00	2.27E+00	9.58E-01	9.02E-01	6.62E-02	5.23E+00	1.95E+00	9.71E-01	7.92E-01	4.42E-02	5.13E+00	1.45E+00	7.50E-01	7.16E-01	3.46E-02
14	110-02-1	Thiophene	1.88E-02	7.56E-03	3.19E-03	3.01E-03	2.21E-04	1.74E-02	6.49E-03	3.24E-03	2.64E-03	1.47E-04	1.71E-02	4.82E-03	2.50E-03	2.39E-03	1.15E-04
15	67-64-1	Acetone	1.33E+01	5.33E+00	2.25E+00	2.12E+00	1.55E-01	1.23E+01	4.57E+00	2.28E+00	1.86E+00	1.04E-01	1.21E+01	3.40E+00	1.76E+00	1.68E+00	8.13E-02
16	75-07-0	Acetaldehyde	3.50E+00	1.40E+00	5.93E-01	5.58E-01	4.10E-02	3.24E+00	1.20E+00	6.01E-01	4.90E-01	2.74E-02	3.18E+00	8.96E-01	4.64E-01	4.43E-01	2.14E-02
17	98-86-2	Acetophenone	5.38E-02	2.16E-02	9.12E-03	8.59E-03	6.30E-04	4.98E-02	1.85E-02	9.24E-03	7.54E-03	4.21E-04	4.89E-02	1.38E-02	7.14E-03	6.82E-03	3.29E-04
18	107-02-8	Acrolein	4.84E-01	1.94E-01	8.21E-02	7.73E-02	5.67E-03	4.48E-01	1.67E-01	8.32E-02	6.79E-02	3.79E-03	4.40E-01	1.24E-01	6.42E-02	6.14E-02	2.96E-03
19	123-72-8	Butanal	1.61E-01	6.48E-02	2.74E-02	2.58E-02	1.89E-03	1.49E-01	5.56E-02	2.77E-02	2.26E-02	1.26E-03	1.47E-01	4.13E-02	2.14E-02	2.05E-02	9.88E-04
20	4170-30-3	Butenal	3.05E-01	1.22E-01	5.17E-02	4.87E-02	3.57E-03	2.82E-01	1.05E-01	5.24E-02	4.27E-02	2.39E-03	2.77E-01	7.81E-02	4.04E-02	3.86E-02	1.87E-03
21	100-52-7	Benzaldehyde	2.33E-01	9.36E-02	3.95E-02	3.72E-02	2.73E-03	2.16E-01	8.03E-02	4.01E-02	3.27E-02	1.83E-03	2.12E-01	5.97E-02	3.09E-02	2.96E-02	1.43E-03
22	50-00-0	Formaldehyde	3.67E-01	1.48E-01	6.23E-02	5.87E-02	4.31E-03	3.40E-01	1.27E-01	6.32E-02	5.15E-02	2.88E-03	3.34E-01	9.41E-02	4.88E-02	4.66E-02	2.25E-03
23	78-85-3	Methacrolein	1.61E-01	6.48E-02	2.74E-02	2.58E-02	1.89E-03	1.49E-01	5.56E-02	2.77E-02	2.26E-02	1.26E-03	1.47E-01	4.13E-02	2.14E-02	2.05E-02	9.88E-04
24	78-93-3	2-Butanone	8.07E-01	3.24E-01	1.37E-01	1.29E-01	9.46E-03	7.47E-01	2.78E-01	1.39E-01	1.13E-01	6.32E-03	7.33E-01	2.07E-01	1.07E-01	1.02E-01	4.94E-03
25	71-43-2	Benzene	4.93E+00	1.98E+00	8.36E-01	7.87E-01	5.78E-02	4.56E+00	1.70E+00	8.47E-01	6.91E-01	3.86E-02	4.48E+00	1.26E+00	6.54E-01	6.25E-01	3.02E-02
26	74-83-9	Bromomethane	4.48E-03	1.80E-03	7.60E-04	7.16E-04	5.25E-05	4.15E-03	1.54E-03	7.70E-04	6.29E-04	3.51E-05	4.07E-03	1.15E-03	5.95E-04	5.68E-04	2.75E-05
27	104-51-8	n-Butylbenzene	8.96E-04	3.60E-04	1.52E-04	1.43E-04	1.05E-05	8.30E-04	3.09E-04	1.54E-04	1.26E-04	7.02E-06	8.15E-04	2.30E-04	1.19E-04	1.14E-04	5.49E-06
28	135-98-8	sec-Butylbenzene	8.96E-04	3.60E-04	1.52E-04	1.43E-04	1.05E-05	8.30E-04	3.09E-04	1.54E-04	1.26E-04	7.02E-06	8.15E-04	2.30E-04	1.19E-04	1.14E-04	5.49E-06
29	74-87-3	Chloromethane	1.52E-02	6.12E-03	2.58E-03	2.43E-03	1.79E-04	1.41E-02	5.25E-03	2.62E-03	2.14E-03	1.19E-04	1.39E-02	3.90E-03	2.02E-03	1.93E-03	9.33E-05
30	100-41-4	Ethylbenzene	5.74E-02	2.30E-02	9.73E-03	9.16E-03	6.72E-04	5.31E-02	1.98E-02	9.86E-03	8.05E-03	4.49E-04	5.21E-02	1.47E-02	7.61E-03	7.27E-03	3.51E-04
31	120-72-9	1H- Indole	8.96E-03	3.60E-03	1.52E-03	1.43E-03	1.05E-04	8.30E-03	3.09E-03	1.54E-03	1.26E-03	7.02E-05	8.15E-03	2.30E-03	1.19E-03	1.14E-03	5.49E-05
32	95-13-6	1H- Indene	5.38E-02	2.16E-02	9.12E-03	8.59E-03	6.30E-04	4.98E-02	1.85E-02	9.24E-03	7.54E-03	4.21E-04	4.89E-02	1.38E-02	7.14E-03	6.82E-03	3.29E-04
33	98-82-8	Isopropylbenzene	5.38E-03	2.16E-03	9.12E-04	8.59E-04	6.30E-05	4.98E-03	1.85E-03	9.24E-04	7.54E-04	4.21E-05	4.89E-03	1.38E-03	7.14E-04	6.82E-04	3.29E-05
34	99-87-6	p-Isopropyltoluene	1.79E-03	7.20E-04	3.04E-04	2.86E-04	2.10E-05	1.66E-03	6.18E-04	3.08E-04	2.51E-04	1.40E-05	1.63E-03	4.59E-04	2.38E-04	2.27E-04	1.10E-05
35	75-09-2	Methylene Chloride	2.69E-03	1.08E-03	4.56E-04	4.29E-04	3.15E-05	2.49E-03	9.27E-04	4.62E-04	3.77E-04	2.11E-05	2.44E-03	6.89E-04	3.57E-04	3.41E-04	1.65E-05
36	108-10-1	4-Methyl-2-pentanone	5.38E-03	2.16E-03	9.12E-04	8.59E-04	6.30E-05	4.98E-03	1.85E-03	9.24E-04	7.54E-04	4.21E-05	4.89E-03	1.38E-03	7.14E-04	6.82E-04	3.29E-05
37	103-65-1	n-Propylbenzene	5.38E-03	2.16E-03	9.12E-04	8.59E-04	6.30E-05	4.98E-03	1.85E-03	9.24E-04	7.54E-04	4.21E-05	4.89E-03	1.38E-03	7.14E-04	6.82E-04	3.29E-05
38	100-42-5	Styrene	1.70E-01	6.84E-02	2.89E-02	2.72E-02	2.00E-03	1.58E-01	5.87E-02	2.93E-02	2.39E-02	1.33E-03	1.55E-01	4.36E-02	2.26E-02	2.16E-02	1.04E-03
39	108-88-3	Toluene	5.56E-01	2.23E-01	9.43E-02	8.87E-02	6.51E-03	5.14E-01	1.92E-01	9.55E-02	7.79E-02	4.35E-03	5.05E-01	1.42E-01	7.38E-02	7.05E-02	3.40E-03
40	95-63-6	1,2,4-Trimethylbenzene	2.33E-02	9.36E-03	3.95E-03	3.72E-03	2.73E-04	2.16E-02	8.03E-03	4.01E-03	3.27E-03	1.83E-04	2.12E-02	5.97E-03	3.09E-03	2.96E-03	1.43E-04
41	108-67-8	1,3,5-Trimethylbenzene	1.79E-02	7.20E-03	3.04E-03	2.86E-03	2.10E-04	1.66E-02	6.18E-03	3.08E-03	2.51E-03	1.40E-04	1.63E-02	4.59E-03	2.38E-03	2.27E-03	1.10E-04
42	108-38-3 + 106-42-3	m+p-Xylene	7.17E-02	2.88E-02	1.22E-02	1.15E-02	8.41E-04	6.64E-02	2.47E-02	1.23E-02	1.01E-02	5.62E-04	6.52E-02	1.84E-02	9.52E-03	9.09E-03	4.39E-04
43	95-47-6	o-Xylene	3.05E-02	1.22E-02	5.17E-03	4.87E-03	3.57E-04	2.82E-02	1.05E-02	5.24E-03	4.27E-03	2.39E-04	2.77E-02	7.81E-03	4.04E-03	3.86E-03	1.87E-04
44	1330-20-7	Xylenes	1.34E-01	5.40E-02	2.28E-02	2.15E-02	1.58E-03	1.24E-01	4.63E-02	2.31E-02	1.89E-02	1.05E-03	1.22E-01	3.44E-02	1.78E-02	1.71E-02	8.24E-04
45	208-96-8	Acenaphthylene	5.38E-02	2.16E-02	9.12E-03	8.59E-03	6.30E-04	4.98E-02	1.85E-02	9.24E-03	7.54E-03	4.21E-04	4.89E-02	1.38E-02	7.14E-03	6.82E-03	3.29E-04
46	83-32-9	Acenaphthene	8.96E-03	3.60E-03	1.52E-03	1.43E-03	1.05E-04	8.30E-03	3.09E-03	1.54E-03	1.26E-03	7.02E-05	8.15E-03	2.30E-03	1.19E-03	1.14E-03	5.49E-05
47	275-51-4	Azulene	1.79E-01	7.20E-02	3.04E-02	2.86E-02	2.10E-03	1.66E-01	6.18E-02	3.08E-02	2.51E-02	1.40E-03	1.63E-01	4.59E-02	2.38E-02	2.27E-02	1.10E-03
48	100-47-0	Benzonitrile	9.86E-02	3.96E-02	1.67E-02	1.57E-02	1.16E-03	9.13E-02	3.40E-02	1.69E-02	1.38E-02	7.72E-04	8.96E-02	2.53E-02	1.31E-02	1.25E-02	6.04E-04
49	271-89-6	Benzofuran	1.79E-01	7.20E-02	3.04E-02	2.86E-02	2.10E-03	1.66E-01	6.18E-02	3.08E-02	2.51E-02	1.40E-03	1.63E-01	4.59E-02	2.38E-02	2.27E-02	1.10E-03
50	92-52-4	Biphenyl	4.48E-02	1.80E-02	7.60E-03	7.16E-03	5.25E-04	4.15E-02	1.54E-02	7.70E-03	6.29E-03	3.51E-04	4.07E-02	1.15E-02	5.95E-03	5.68E-03	2.75E-04
51	132-64-9	Dibenzofuran	8.07E-02	3.24E-02	1.37E-02	1.29E-02	9.46E-04	7.47E-02	2.78E-02	1.39E-02	1.13E-02	6.32E-04	7.33E-02	2.07E-02	1.07E-02	1.02E-02	4.94E-04
52	206-44-0	Fluoranthene	4.48E-02	1.80E-02	7.60E-03	7.16E-03	5.25E-04	4.15E-02	1.54E-02	7.70E-03	6.29E-03	3.51E-04	4.07E-02	1.15E-02	5.95E-03	5.68E-03	2.75E-04
53	86-73-7	9H-Fluorene	8.96E-03	3.60E-03	1.52E-03	1.43E-03	1.05E-04	8.30E-03	3.09E-03	1.54E-03	1.26E-03	7.02E-05	8.15E-03	2.30E-03	1.19E-03	1.14E-03	5.49E-05
54	486-25-9	9H-Fluoren-9-one	5.38E-02	2.16E-02	9.12E-03	8.59E-03	6.30E-04	4.98E-02	1.85E-02	9.24E-03	7.54E-03	4.21E-04	4.89E-02	1.38E-02	7.14E-03	6.82E-03	3.29E-04
55	90-12-0	1-Methylnapthalene	1.79E-02	7.20E-03	3.04E-03	2.86E-03	2.10E-04	1.66E-02	6.18E-03	3.08E-03	2.51E-03	1.40E-04	1.63E-02	4.59E-03	2.38E-03	2.27E-03	1.10E-04
56	91-57-6	2-Methylnapthalene	4.48E-02	1.80E-02	7.60E-03	7.16E-03	5.25E-04	4.15E-02	1.54E-02	7.70E-03	6.29E-03	3.51E-04	4.07E-02	1.15E-02	5.95E-03	5.68E-03	2.75E-04
57	91-20-3	Napthalene	6.90E-01	2.77E-01	1.17E-01	1.10E-01	8.09E-03	6.39E-01	2.38E-01	1.19E-01	9.68E-02	5.41E-03	6.27E-01	1.77E-01	9.16E-02	8.75E-02	4.23E-03
58	85-01-8	Phenanthrene	2.06E-01	8.28E-02	3.50E-02	3.29E-02	2.42E-03	1.91E-01	7.10E-02	3.54E-02	2.89E-02	1.61E-03	1.87E-01	5.28E-02	2.74E-02	2.61E-02	1.26E-03
59	129-00-0	Pyrene	2.69E-02	1.08E-02	4.56E-03	4.29E-03	3.15E-04	2.49E-02	9.27E-03	4.62E-03	3.77E-03	2.11E-04	2.44E-02	6.89E-03	3.57E-03	3.41E-03	1.65E-04
60	110-86-1	Pyridine	2.33E-01	9.36E-02	3.95E-02	3.72E-02	2.73E-03	2.16E-01	8.03E-02	4.01E-02	3.27E-02	1.83E-03	2.12E-01	5.97E-02	3.09E-02	2.96E-02	1.43E-03
61	91-22-5	Quinoline	4.48E-02	1.80E-02	7.60E-03	7.16E-03	5.25E-04	4.15E-02	1.54E-02	7.70E-03	6.29E-03	3.51E-04	4.07E-02	1.15E-02	5.95E-03	5.68E-03	2.75E-04

TABLE A.2: PREDICTED GROUND LEVEL CONCENTRATIONS
(µg/m^3)

			Receptor 13				
			Baseline Liquor Burner Emissions Scenario				
No	**CAS # / ID**	**Compound Name**	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual
1	TSP	Total Suspended Particulate	3.10E+01	1.53E+01	5.61E+00	4.39E+00	4.62E-01
2	630-08-0	Carbon Monoxide	7.74E+02	3.81E+02	1.40E+02	1.10E+02	1.16E+01
3	7446-09-5	Sulphur Dioxide	6.50E+00	3.20E+00	1.18E+00	9.21E-01	9.71E-02
4	10102-44-0	Nitrogen Dioxide [1]	2.09E+01	1.03E+01	3.79E+00	2.96E+00	3.12E-01
5	7440-38-2	Arsenic	1.55E-03	7.63E-04	2.80E-04	2.19E-04	2.31E-05
6	7429-90-5	Aluminium	5.03E-01	2.48E-01	9.11E-02	7.13E-02	7.51E-03
7	13463-40-6	Iron	1.08E-02	5.34E-03	1.96E-03	1.53E-03	1.62E-04
8	7439-96-5	Manganese	3.10E-03	1.53E-03	5.61E-04	4.39E-04	4.62E-05
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10	7439-98-7	Molybdenum	3.10E-03	1.53E-03	5.61E-04	4.39E-04	4.62E-05
11	7782-49-2	Selenium	1.86E-02	9.16E-03	3.37E-03	2.63E-03	2.77E-04
12	87-69-4	Tartaric Acid	3.25E+00	1.60E+00	5.89E-01	4.60E-01	4.85E-02
13	6915-15-7	Malic Acid	9.75E+00	4.81E+00	1.77E+00	1.38E+00	1.46E-01
14	110-02-1	Thiophene	3.25E-02	1.60E-02	5.89E-03	4.60E-03	4.85E-04
15	67-64-1	Acetone	2.29E+01	1.13E+01	4.15E+00	3.25E+00	3.42E-01
16	75-07-0	Acetaldehyde	6.04E+00	2.98E+00	1.09E+00	8.55E-01	9.01E-02
17	98-86-2	Acetophenone	9.29E-02	4.58E-02	1.68E-02	1.32E-02	1.39E-03
18	107-02-8	Acrolein	8.36E-01	4.12E-01	1.51E-01	1.18E-01	1.25E-02
19	123-72-8	Butanal	2.79E-01	1.37E-01	5.05E-02	3.95E-02	4.16E-03
20	4170-30-3	Butenal	5.26E-01	2.59E-01	9.53E-02	7.46E-02	7.86E-03
21	100-52-7	Benzaldehyde	4.03E-01	1.98E-01	7.29E-02	5.70E-02	6.01E-03
22	50-00-0	Formaldehyde	6.35E-01	3.13E-01	1.15E-01	8.99E-02	9.48E-03
23	78-85-3	Methacrolein	2.79E-01	1.37E-01	5.05E-02	3.95E-02	4.16E-03
24	78-93-3	2-Butanone	1.39E+00	6.87E-01	2.52E-01	1.97E-01	2.08E-02
25	71-43-2	Benzene	8.51E+00	4.20E+00	1.54E+00	1.21E+00	1.27E-01
26	74-83-9	Bromomethane	7.74E-03	3.81E-03	1.40E-03	1.10E-03	1.16E-04
27	104-51-8	n-Butylbenzene	1.55E-03	7.63E-04	2.80E-04	2.19E-04	2.31E-05
28	135-98-8	sec-Butylbenzene	1.55E-03	7.63E-04	2.80E-04	2.19E-04	2.31E-05
29	74-87-3	Chloromethane	2.63E-02	1.30E-02	4.77E-03	3.73E-03	3.93E-04
30	100-41-4	Ethylbenzene	9.91E-02	4.88E-02	1.79E-02	1.40E-02	1.48E-03
31	120-72-9	1H- Indole	1.55E-02	7.63E-03	2.80E-03	2.19E-03	2.31E-04
32	95-13-6	1H- Indene	9.29E-02	4.58E-02	1.68E-02	1.32E-02	1.39E-03
33	98-82-8	Isopropylbenzene	9.29E-03	4.58E-03	1.68E-03	1.32E-03	1.39E-04
34	99-87-6	p-Isopropyltoluene	3.10E-03	1.53E-03	5.61E-04	4.39E-04	4.62E-05
35	75-09-2	Methylene Chloride	4.64E-03	2.29E-03	8.41E-04	6.58E-04	6.93E-05
36	108-10-1	4-Methyl-2-pentanone	9.29E-03	4.58E-03	1.68E-03	1.32E-03	1.39E-04
37	103-65-1	n-Propylbenzene	9.29E-03	4.58E-03	1.68E-03	1.32E-03	1.39E-04
38	100-42-5	Styrene	2.94E-01	1.45E-01	5.33E-02	4.17E-02	4.39E-03
39	108-88-3	Toluene	9.60E-01	4.73E-01	1.74E-01	1.36E-01	1.43E-02
40	95-63-6	1,2,4-Trimethylbenzene	4.03E-02	1.98E-02	7.29E-03	5.70E-03	6.01E-04
41	108-67-8	1,3,5-Trimethylbenzene	3.10E-02	1.53E-02	5.61E-03	4.39E-03	4.62E-04
42	108-38-3 + 106-42-3	m+p-Xylene	1.24E-01	6.10E-02	2.24E-02	1.75E-02	1.85E-03
43	95-47-6	o-Xylene	5.26E-02	2.59E-02	9.53E-03	7.46E-03	7.86E-04
44	1330-20-7	Xylenes	2.32E-01	1.14E-01	4.21E-02	3.29E-02	3.47E-03
45	208-96-8	Acenaphthylene	9.29E-02	4.58E-02	1.68E-02	1.32E-02	1.39E-03
46	83-32-9	Acenaphthene	1.55E-02	7.63E-03	2.80E-03	2.19E-03	2.31E-04
47	275-51-4	Azulene	3.10E-01	1.53E-01	5.61E-02	4.39E-02	4.62E-03
48	100-47-0	Benzonitrile	1.70E-01	8.39E-02	3.08E-02	2.41E-02	2.54E-03
49	271-89-6	Benzofuran	3.10E-01	1.53E-01	5.61E-02	4.39E-02	4.62E-03
50	92-52-4	Biphenyl	7.74E-02	3.81E-02	1.40E-02	1.10E-02	1.16E-03
51	132-64-9	Dibenzofuran	1.39E-01	6.87E-02	2.52E-02	1.97E-02	2.08E-03
52	206-44-0	Fluoranthene	7.74E-02	3.81E-02	1.40E-02	1.10E-02	1.16E-03
53	86-73-7	9H-Fluorene	1.55E-02	7.63E-03	2.80E-03	2.19E-03	2.31E-04
54	486-25-9	9H-Fluoren-9-one	9.29E-02	4.58E-02	1.68E-02	1.32E-02	1.39E-03
55	90-12-0	1-Methylnapthalene	3.10E-02	1.53E-02	5.61E-03	4.39E-03	4.62E-04
56	91-57-6	2-Methylnapthalene	7.74E-02	3.81E-02	1.40E-02	1.10E-02	1.16E-03
57	91-20-3	Napthalene	1.19E+00	5.87E-01	2.16E-01	1.69E-01	1.78E-02
58	85-01-8	Phenanthrene	3.56E-01	1.75E-01	6.45E-02	5.04E-02	5.32E-03
59	129-00-0	Pyrene	4.64E-02	2.29E-02	8.41E-03	6.58E-03	6.93E-04
60	110-86-1	Pyridine	4.03E-01	1.98E-01	7.29E-02	5.70E-02	6.01E-03
61	91-22-5	Quinoline	7.74E-02	3.81E-02	1.40E-02	1.10E-02	1.16E-03

TABLE A.2: PREDICTED GROUND LEVEL CONCENTRATIONS
(µg/m^3)

			Receptor 1					Receptor 2					Receptor 3				
			Upgraded Liquor Burner Emissions Scenario					Upgraded Liquor Burner Emissions Scenario					Upgraded Liquor Burner Emissions Scenario				
No	**CAS # / ID**	**Compound Name**	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual
1	TSP	Total Suspended Particulate	1.76E+00	8.16E-01	3.81E-01	3.49E-01	2.15E-02	2.31E+00	4.09E-01	2.08E-01	1.93E-01	9.78E-03	9.02E-01	2.65E-01	1.52E-01	1.23E-01	6.20E-03
2	630-08-0	Carbon Monoxide	3.52E+01	1.63E+01	7.62E+00	6.98E+00	4.30E-01	4.62E+01	8.18E+00	4.16E+00	3.86E+00	1.96E-01	1.80E+01	5.31E+00	3.04E+00	2.46E+00	1.24E-01
3	7446-09-5	Sulphur Dioxide	9.46E+00	4.39E+00	2.05E+00	1.88E+00	1.16E-01	1.24E+01	2.20E+00	1.12E+00	1.04E+00	5.26E-02	4.85E+00	1.43E+00	8.18E-01	6.61E-01	3.34E-02
4	10102-44-0	Nitrogen Dioxide [1]	3.04E+01	1.41E+01	6.59E+00	6.04E+00	3.72E-01	3.99E+01	7.07E+00	3.59E+00	3.34E+00	1.69E-01	1.56E+01	4.59E+00	2.63E+00	2.13E+00	1.07E-01
5	7440-38-2	Arsenic	8.79E-05	4.08E-05	1.91E-05	1.75E-05	1.07E-06	1.15E-04	2.04E-05	1.04E-05	9.65E-06	4.89E-07	4.51E-05	1.33E-05	7.60E-06	6.15E-06	3.10E-07
6	7429-90-5	Aluminium	2.86E-02	1.33E-02	6.19E-03	5.67E-03	3.49E-04	3.75E-02	6.64E-03	3.38E-03	3.14E-03	1.59E-04	1.47E-02	4.31E-03	2.47E-03	2.00E-03	1.01E-04
7	13463-40-6	Iron	6.15E-04	2.85E-04	1.33E-04	1.22E-04	7.52E-06	8.08E-04	1.43E-04	7.28E-05	6.76E-05	3.42E-06	3.16E-04	9.29E-05	5.32E-05	4.30E-05	2.17E-06
8	7439-96-5	Manganese	1.76E-04	8.16E-05	3.81E-05	3.49E-05	2.15E-06	2.31E-04	4.09E-05	2.08E-05	1.93E-05	9.78E-07	9.02E-05	2.65E-05	1.52E-05	1.23E-05	6.20E-07
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10	7439-98-7	Molybdenum	1.76E-04	8.16E-05	3.81E-05	3.49E-05	2.15E-06	2.31E-04	4.09E-05	2.08E-05	1.93E-05	9.78E-07	9.02E-05	2.65E-05	1.52E-05	1.23E-05	6.20E-07
11	7782-49-2	Selenium	1.05E-03	4.89E-04	2.29E-04	2.09E-04	1.29E-05	1.38E-03	2.45E-04	1.25E-04	1.16E-04	5.87E-06	5.41E-04	1.59E-04	9.12E-05	7.38E-05	3.72E-06
12	87-69-4	Tartaric Acid	9.46E-02	4.39E-02	2.05E-02	1.88E-02	1.16E-03	1.24E-01	2.20E-02	1.12E-02	1.04E-02	5.26E-04	4.85E-02	1.43E-02	8.18E-03	6.61E-03	3.34E-04
13	6915-15-7	Malic Acid	2.84E-01	1.32E-01	6.15E-02	5.63E-02	3.47E-03	3.72E-01	6.60E-02	3.36E-02	3.12E-02	1.58E-03	1.46E-01	4.28E-02	2.45E-02	1.98E-02	1.00E-03
14	110-02-1	Thiophene	9.46E-04	4.39E-04	2.05E-04	1.88E-04	1.16E-05	1.24E-03	2.20E-04	1.12E-04	1.04E-04	5.26E-06	4.85E-04	1.43E-04	8.18E-05	6.61E-05	3.34E-06
15	67-64-1	Acetone	8.79E-01	4.08E-01	1.91E-01	1.75E-01	1.07E-02	1.15E+00	2.04E-01	1.04E-01	9.65E-02	4.89E-03	4.51E-01	1.33E-01	7.60E-02	6.15E-02	3.10E-03
16	75-07-0	Acetaldehyde	3.52E-01	1.63E-01	7.62E-02	6.98E-02	4.30E-03	4.62E-01	8.18E-02	4.16E-02	3.86E-02	1.96E-03	1.80E-01	5.31E-02	3.04E-02	2.46E-02	1.24E-03
17	98-86-2	Acetophenone	6.76E-04	3.13E-04	1.46E-04	1.34E-04	8.26E-06	8.87E-04	1.57E-04	7.99E-05	7.42E-05	3.76E-06	3.47E-04	1.02E-04	5.84E-05	4.72E-05	2.38E-06
18	107-02-8	Acrolein	6.08E-03	2.82E-03	1.32E-03	1.21E-03	7.43E-05	7.98E-03	1.41E-03	7.19E-04	6.68E-04	3.38E-05	3.12E-03	9.18E-04	5.26E-04	4.25E-04	2.14E-05
19	123-72-8	Butanal	2.03E-03	9.40E-04	4.39E-04	4.02E-04	2.48E-05	2.66E-03	4.71E-04	2.40E-04	2.23E-04	1.13E-05	1.04E-03	3.06E-04	1.75E-04	1.42E-04	7.15E-06
20	4170-30-3	Butenal	3.83E-03	1.78E-03	8.30E-04	7.60E-04	4.68E-05	5.02E-03	8.90E-04	4.53E-04	4.20E-04	2.13E-05	1.96E-03	5.78E-04	3.31E-04	2.68E-04	1.35E-05
21	100-52-7	Benzaldehyde	2.93E-03	1.36E-03	6.35E-04	5.81E-04	3.58E-05	3.84E-03	6.81E-04	3.46E-04	3.21E-04	1.63E-05	1.50E-03	4.42E-04	2.53E-04	2.05E-04	1.03E-05
22	50-00-0	Formaldehyde	7.03E-02	3.26E-02	1.52E-02	1.40E-02	8.60E-04	9.23E-02	1.64E-02	8.32E-03	7.72E-03	3.91E-04	3.61E-02	1.06E-02	6.08E-03	4.92E-03	2.48E-04
23	78-85-3	Methacrolein	2.03E-03	9.40E-04	4.39E-04	4.02E-04	2.48E-05	2.66E-03	4.71E-04	2.40E-04	2.23E-04	1.13E-05	1.04E-03	3.06E-04	1.75E-04	1.42E-04	7.15E-06
24	78-93-3	2-Butanone	1.01E-02	4.70E-03	2.20E-03	2.01E-03	1.24E-04	1.33E-02	2.36E-03	1.20E-03	1.11E-03	5.64E-05	5.20E-03	1.53E-03	8.76E-04	7.09E-04	3.57E-05
25	71-43-2	Benzene	3.52E-01	1.63E-01	7.62E-02	6.98E-02	4.30E-03	4.62E-01	8.18E-02	4.16E-02	3.86E-02	1.96E-03	1.80E-01	5.31E-02	3.04E-02	2.46E-02	1.24E-03
26	74-83-9	Bromomethane	2.25E-04	1.04E-04	4.88E-05	4.47E-05	2.75E-06	2.96E-04	5.24E-05	2.66E-05	2.47E-05	1.25E-06	1.16E-04	3.40E-05	1.95E-05	1.57E-05	7.94E-07
27	104-51-8	n-Butylbenzene	4.50E-05	2.09E-05	9.76E-06	8.94E-06	5.50E-07	5.91E-05	1.05E-05	5.33E-06	4.95E-06	2.50E-07	2.31E-05	6.80E-06	3.89E-06	3.15E-06	1.59E-07
28	135-98-8	sec-Butylbenzene	4.50E-05	2.09E-05	9.76E-06	8.94E-06	5.50E-07	5.91E-05	1.05E-05	5.33E-06	4.95E-06	2.50E-07	2.31E-05	6.80E-06	3.89E-06	3.15E-06	1.59E-07
29	74-87-3	Chloromethane	7.66E-04	3.55E-04	1.66E-04	1.52E-04	9.36E-06	1.00E-03	1.78E-04	9.05E-05	8.41E-05	4.26E-06	3.93E-04	1.16E-04	6.62E-05	5.35E-05	2.70E-06
30	100-41-4	Ethylbenzene	2.88E-03	1.34E-03	6.25E-04	5.72E-04	3.52E-05	3.78E-03	6.70E-04	3.41E-04	3.16E-04	1.60E-05	1.48E-03	4.35E-04	2.49E-04	2.02E-04	1.02E-05
31	120-72-9	1H- Indole	4.50E-04	2.09E-04	9.76E-05	8.94E-05	5.50E-06	5.91E-04	1.05E-04	5.33E-05	4.95E-05	2.50E-06	2.31E-04	6.80E-05	3.89E-05	3.15E-05	1.59E-06
32	95-13-6	1H- Indene	2.70E-03	1.25E-03	5.86E-04	5.36E-04	3.30E-05	3.55E-03	6.28E-04	3.20E-04	2.97E-04	1.50E-05	1.39E-03	4.08E-04	2.34E-04	1.89E-04	9.53E-06
33	98-82-8	Isopropylbenzene	2.70E-04	1.25E-04	5.86E-05	5.36E-05	3.30E-06	3.55E-04	6.28E-05	3.20E-05	2.97E-05	1.50E-06	1.39E-04	4.08E-05	2.34E-05	1.89E-05	9.53E-07
34	99-87-6	p-Isopropyltoluene	9.01E-05	4.18E-05	1.95E-05	1.79E-05	1.10E-06	1.18E-04	2.09E-05	1.07E-05	9.89E-06	5.01E-07	4.62E-05	1.36E-05	7.79E-06	6.30E-06	3.18E-07
35	75-09-2	Methylene Chloride	1.35E-04	6.27E-05	2.93E-05	2.68E-05	1.65E-06	1.77E-04	3.14E-05	1.60E-05	1.48E-05	7.51E-07	6.93E-05	2.04E-05	1.17E-05	9.45E-06	4.77E-07
36	108-10-1	4-Methyl-2-pentanone	2.70E-04	1.25E-04	5.86E-05	5.36E-05	3.30E-06	3.55E-04	6.28E-05	3.20E-05	2.97E-05	1.50E-06	1.39E-04	4.08E-05	2.34E-05	1.89E-05	9.53E-07
37	103-65-1	n-Propylbenzene	2.70E-04	1.25E-04	5.86E-05	5.36E-05	3.30E-06	3.55E-04	6.28E-05	3.20E-05	2.97E-05	1.50E-06	1.39E-04	4.08E-05	2.34E-05	1.89E-05	9.53E-07
38	100-42-5	Styrene	8.56E-03	3.97E-03	1.85E-03	1.70E-03	1.05E-04	1.12E-02	1.99E-03	1.01E-03	9.40E-04	4.76E-05	4.39E-03	1.29E-03	7.40E-04	5.98E-04	3.02E-05
39	108-88-3	Toluene	8.79E-02	4.08E-02	1.91E-02	1.75E-02	1.07E-03	1.15E-01	2.04E-02	1.04E-02	9.65E-03	4.89E-04	4.51E-02	1.33E-02	7.60E-03	6.15E-03	3.10E-04
40	95-63-6	1,2,4-Trimethylbenzene	1.17E-03	5.43E-04	2.54E-04	2.32E-04	1.43E-05	1.54E-03	2.72E-04	1.38E-04	1.29E-04	6.51E-06	6.01E-04	1.77E-04	1.01E-04	8.19E-05	4.13E-06
41	108-67-8	1,3,5-Trimethylbenzene	9.01E-04	4.18E-04	1.95E-04	1.79E-04	1.10E-05	1.18E-03	2.09E-04	1.07E-04	9.89E-05	5.01E-06	4.62E-04	1.36E-04	7.79E-05	6.30E-05	3.18E-06
42	108-38-3 + 106-42-3	m+p-Xylene	3.60E-03	1.67E-03	7.81E-04	7.15E-04	4.40E-05	4.73E-03	8.38E-04	4.26E-04	3.96E-04	2.00E-05	1.85E-03	5.44E-04	3.11E-04	2.52E-04	1.27E-05
43	95-47-6	o-Xylene	1.53E-03	7.10E-04	3.32E-04	3.04E-04	1.87E-05	2.01E-03	3.56E-04	1.81E-04	1.68E-04	8.52E-06	7.86E-04	2.31E-04	1.32E-04	1.07E-04	5.40E-06
44	1330-20-7	Xylenes	6.76E-03	3.13E-03	1.46E-03	1.34E-03	8.26E-05	8.87E-03	1.57E-03	7.99E-04	7.42E-04	3.76E-05	3.47E-03	1.02E-03	5.84E-04	4.72E-04	2.38E-05
45	208-96-8	Acenaphthylene	2.70E-03	1.25E-03	5.86E-04	5.36E-04	3.30E-05	3.55E-03	6.28E-04	3.20E-04	2.97E-04	1.50E-05	1.39E-03	4.08E-04	2.34E-04	1.89E-04	9.53E-06
46	83-32-9	Acenaphthene	4.50E-04	2.09E-04	9.76E-05	8.94E-05	5.50E-06	5.91E-04	1.05E-04	5.33E-05	4.95E-05	2.50E-06	2.31E-04	6.80E-05	3.89E-05	3.15E-05	1.59E-06
47	275-51-4	Azulene	9.01E-03	4.18E-03	1.95E-03	1.79E-03	1.10E-04	1.18E-02	2.09E-03	1.07E-03	9.89E-04	5.01E-05	4.62E-03	1.36E-03	7.79E-04	6.30E-04	3.18E-05
48	100-47-0	Benzonitrile	4.95E-03	2.30E-03	1.07E-03	9.84E-04	6.06E-05	6.50E-03	1.15E-03	5.86E-04	5.44E-04	2.76E-05	2.54E-03	7.48E-04	4.28E-04	3.46E-04	1.75E-05
49	271-89-6	Benzofuran	9.01E-03	4.18E-03	1.95E-03	1.79E-03	1.10E-04	1.18E-02	2.09E-03	1.07E-03	9.89E-04	5.01E-05	4.62E-03	1.36E-03	7.79E-04	6.30E-04	3.18E-05
50	92-52-4	Biphenyl	2.25E-03	1.04E-03	4.88E-04	4.47E-04	2.75E-05	2.96E-03	5.24E-04	2.66E-04	2.47E-04	1.25E-05	1.16E-03	3.40E-04	1.95E-04	1.57E-04	7.94E-06
51	132-64-9	Dibenzofuran	4.05E-03	1.88E-03	8.79E-04	8.05E-04	4.95E-05	5.32E-03	9.43E-04	4.79E-04	4.45E-04	2.25E-05	2.08E-03	6.12E-04	3.50E-04	2.83E-04	1.43E-05
52	206-44-0	Fluoranthene	2.25E-03	1.04E-03	4.88E-04	4.47E-04	2.75E-05	2.96E-03	5.24E-04	2.66E-04	2.47E-04	1.25E-05	1.16E-03	3.40E-04	1.95E-04	1.57E-04	7.94E-06
53	86-73-7	9H-Fluorene	4.50E-04	2.09E-04	9.76E-05	8.94E-05	5.50E-06	5.91E-04	1.05E-04	5.33E-05	4.95E-05	2.50E-06	2.31E-04	6.80E-05	3.89E-05	3.15E-05	1.59E-06
54	486-25-9	9H-Fluoren-9-one	2.70E-03	1.25E-03	5.86E-04	5.36E-04	3.30E-05	3.55E-03	6.28E-04	3.20E-04	2.97E-04	1.50E-05	1.39E-03	4.08E-04	2.34E-04	1.89E-04	9.53E-06
55	90-12-0	1-Methylnapthalene	9.01E-04	4.18E-04	1.95E-04	1.79E-04	1.10E-05	1.18E-03	2.09E-04	1.07E-04	9.89E-05	5.01E-06	4.62E-04	1.36E-04	7.79E-05	6.30E-05	3.18E-06
56	91-57-6	2-Methylnapthalene	2.25E-03	1.04E-03	4.88E-04	4.47E-04	2.75E-05	2.96E-03	5.24E-04	2.66E-04	2.47E-04	1.25E-05	1.16E-03	3.40E-04	1.95E-04	1.57E-04	7.94E-06
57	91-20-3	Napthalene	3.47E-02	1.61E-02	7.52E-03	6.88E-03	4.24E-04	4.55E-02	8.07E-03	4.10E-03	3.81E-03	1.93E-04	1.78E-02	5.24E-03	3.00E-03	2.42E-03	1.22E-04
58	85-01-8	Phenanthrene	1.04E-02	4.80E-03	2.25E-03	2.06E-03	1.27E-04	1.36E-02	2.41E-03	1.22E-03	1.14E-03	5.76E-05	5.32E-03	1.56E-03	8.95E-04	7.24E-04	3.65E-05
59	129-00-0	Pyrene	1.35E-03	6.27E-04	2.93E-04	2.68E-04	1.65E-05	1.77E-03	3.14E-04	1.60E-04	1.48E-04	7.51E-06	6.93E-04	2.04E-04	1.17E-04	9.45E-05	4.77E-06
60	110-86-1	Pyridine	1.17E-02	5.43E-03	2.54E-03	2.32E-03	1.43E-04	1.54E-02	2.72E-03	1.38E-03	1.29E-03	6.51E-05	6.01E-03	1.77E-03	1.01E-03	8.19E-04	4.13E-05
61	91-22-5	Quinoline	2.25E-03	1.04E-03	4.88E-04	4.47E-04	2.75E-05	2.96E-03	5.24E-04	2.66E-04	2.47E-04	1.25E-05	1.16E-03	3.40E-04	1.95E-04	1.57E-04	7.94E-06

Source: Sinclair Knight Merz, 2003

Note:
1 Ground Level Concentration of Nitrogen Dioxide (NO_2) derived from ground level concentration of Oxides of Nitrogen (NOx) and assuming 25% NOx present as NO_2.

TABLE A.2: PREDICTED GROUND LEVEL CONCENTRATIONS
(µg/m^3)

			Receptor 4					Receptor 5					Receptor 6				
			Upgraded Liquor Burner Emissions Scenario					Upgraded Liquor Burner Emissions Scenario					Upgraded Liquor Burner Emissions Scenario				
No	**CAS # / ID**	**Compound Name**	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual
1	TSP	Total Suspended Particulate	8.56E-01	2.98E-01	1.30E-01	1.23E-01	6.94E-03	1.94E+00	3.47E-01	1.97E-01	1.48E-01	7.60E-03	2.88E+00	4.02E-01	2.51E-01	1.49E-01	1.04E-02
2	630-08-0	Carbon Monoxide	1.71E+01	5.96E+00	2.60E+00	2.45E+00	1.39E-01	3.89E+01	6.94E+00	3.93E+00	2.97E+00	1.52E-01	5.76E+01	8.04E+00	5.02E+00	2.98E+00	2.08E-01
3	7446-09-5	Sulphur Dioxide	4.60E+00	1.60E+00	6.99E-01	6.59E-01	3.73E-02	1.05E+01	1.87E+00	1.06E+00	7.98E-01	4.09E-02	1.55E+01	2.16E+00	1.35E+00	8.01E-01	5.58E-02
4	10102-44-0	Nitrogen Dioxide [1]	1.48E+01	5.15E+00	2.25E+00	2.12E+00	1.20E-01	3.36E+01	6.00E+00	3.40E+00	2.57E+00	1.31E-01	4.98E+01	6.95E+00	4.34E+00	2.57E+00	1.80E-01
5	7440-38-2	Arsenic	4.28E-05	1.49E-05	6.50E-06	6.13E-06	3.47E-07	9.72E-05	1.74E-05	9.83E-06	7.42E-06	3.80E-07	1.44E-04	2.01E-05	1.25E-05	7.44E-06	5.19E-07
6	7429-90-5	Aluminium	1.39E-02	4.84E-03	2.11E-03	1.99E-03	1.13E-04	3.16E-02	5.64E-03	3.20E-03	2.41E-03	1.23E-04	4.68E-02	6.53E-03	4.08E-03	2.42E-03	1.69E-04
7	13463-40-6	Iron	3.00E-04	1.04E-04	4.55E-05	4.29E-05	2.43E-06	6.80E-04	1.21E-04	6.88E-05	5.19E-05	2.66E-06	1.01E-03	1.41E-04	8.78E-05	5.21E-05	3.63E-06
8	7439-96-5	Manganese	8.56E-05	2.98E-05	1.30E-05	1.23E-05	6.94E-07	1.94E-04	3.47E-05	1.97E-05	1.48E-05	7.60E-07	2.88E-04	4.02E-05	2.51E-05	1.49E-05	1.04E-06
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10	7439-98-7	Molybdenum	8.56E-05	2.98E-05	1.30E-05	1.23E-05	6.94E-07	1.94E-04	3.47E-05	1.97E-05	1.48E-05	7.60E-07	2.88E-04	4.02E-05	2.51E-05	1.49E-05	1.04E-06
11	7782-49-2	Selenium	5.14E-04	1.79E-04	7.80E-05	7.35E-05	4.16E-06	1.17E-03	2.08E-04	1.18E-04	8.91E-05	4.56E-06	1.73E-03	2.41E-04	1.51E-04	8.93E-05	6.23E-06
12	87-69-4	Tartaric Acid	4.60E-02	1.60E-02	6.99E-03	6.59E-03	3.73E-04	1.05E-01	1.87E-02	1.06E-02	7.98E-03	4.09E-04	1.55E-01	2.16E-02	1.35E-02	8.01E-03	5.58E-04
13	6915-15-7	Malic Acid	1.38E-01	4.81E-02	2.10E-02	1.98E-02	1.12E-03	3.14E-01	5.60E-02	3.17E-02	2.40E-02	1.23E-03	4.65E-01	6.49E-02	4.05E-02	2.40E-02	1.68E-03
14	110-02-1	Thiophene	4.60E-04	1.60E-04	6.99E-05	6.59E-05	3.73E-06	1.05E-03	1.87E-04	1.06E-04	7.98E-05	4.09E-06	1.55E-03	2.16E-04	1.35E-04	8.01E-05	5.58E-06
15	67-64-1	Acetone	4.28E-01	1.49E-01	6.50E-02	6.13E-02	3.47E-03	9.72E-01	1.74E-01	9.83E-02	7.42E-02	3.80E-03	1.44E+00	2.01E-01	1.25E-01	7.44E-02	5.19E-03
16	75-07-0	Acetaldehyde	1.71E-01	5.96E-02	2.60E-02	2.45E-02	1.39E-03	3.89E-01	6.94E-02	3.93E-02	2.97E-02	1.52E-03	5.76E-01	8.04E-02	5.02E-02	2.98E-02	2.08E-03
17	98-86-2	Acetophenone	3.29E-04	1.14E-04	4.99E-05	4.71E-05	2.66E-06	7.47E-04	1.33E-04	7.56E-05	5.70E-05	2.92E-06	1.11E-03	1.54E-04	9.64E-05	5.72E-05	3.99E-06
18	107-02-8	Acrolein	2.96E-03	1.03E-03	4.50E-04	4.24E-04	2.40E-05	6.72E-03	1.20E-03	6.80E-04	5.13E-04	2.63E-05	9.96E-03	1.39E-03	8.68E-04	5.15E-04	3.59E-05
19	123-72-8	Butanal	9.87E-04	3.43E-04	1.50E-04	1.41E-04	7.99E-06	2.24E-03	4.00E-04	2.27E-04	1.71E-04	8.76E-06	3.32E-03	4.63E-04	2.89E-04	1.72E-04	1.20E-05
20	4170-30-3	Butenal	1.86E-03	6.49E-04	2.83E-04	2.67E-04	1.51E-05	4.23E-03	7.56E-04	4.28E-04	3.23E-04	1.65E-05	6.27E-03	8.75E-04	5.46E-04	3.24E-04	2.26E-05
21	100-52-7	Benzaldehyde	1.43E-03	4.96E-04	2.16E-04	2.04E-04	1.15E-05	3.24E-03	5.78E-04	3.27E-04	2.47E-04	1.26E-05	4.80E-03	6.69E-04	4.18E-04	2.48E-04	1.73E-05
22	50-00-0	Formaldehyde	3.42E-02	1.19E-02	5.20E-03	4.90E-03	2.77E-04	7.77E-02	1.39E-02	7.87E-03	5.94E-03	3.04E-04	1.15E-01	1.61E-02	1.00E-02	5.95E-03	4.15E-04
23	78-85-3	Methacrolein	9.87E-04	3.43E-04	1.50E-04	1.41E-04	7.99E-06	2.24E-03	4.00E-04	2.27E-04	1.71E-04	8.76E-06	3.32E-03	4.63E-04	2.89E-04	1.72E-04	1.20E-05
24	78-93-3	2-Butanone	4.93E-03	1.72E-03	7.49E-04	7.06E-04	4.00E-05	1.12E-02	2.00E-03	1.13E-03	8.55E-04	4.38E-05	1.66E-02	2.32E-03	1.45E-03	8.58E-04	5.98E-05
25	71-43-2	Benzene	1.71E-01	5.96E-02	2.60E-02	2.45E-02	1.39E-03	3.89E-01	6.94E-02	3.93E-02	2.97E-02	1.52E-03	5.76E-01	8.04E-02	5.02E-02	2.98E-02	2.08E-03
26	74-83-9	Bromomethane	1.10E-04	3.81E-05	1.66E-05	1.57E-05	8.88E-07	2.49E-04	4.44E-05	2.52E-05	1.90E-05	9.73E-07	3.69E-04	5.15E-05	3.21E-05	1.91E-05	1.33E-06
27	104-51-8	n-Butylbenzene	2.19E-05	7.63E-06	3.33E-06	3.14E-06	1.78E-07	4.98E-05	8.89E-06	5.04E-06	3.80E-06	1.95E-07	7.38E-05	1.03E-05	6.43E-06	3.81E-06	2.66E-07
28	135-98-8	sec-Butylbenzene	2.19E-05	7.63E-06	3.33E-06	3.14E-06	1.78E-07	4.98E-05	8.89E-06	5.04E-06	3.80E-06	1.95E-07	7.38E-05	1.03E-05	6.43E-06	3.81E-06	2.66E-07
29	74-87-3	Chloromethane	3.73E-04	1.30E-04	5.66E-05	5.34E-05	3.02E-06	8.46E-04	1.51E-04	8.56E-05	6.46E-05	3.31E-06	1.25E-03	1.75E-04	1.09E-04	6.48E-05	4.52E-06
30	100-41-4	Ethylbenzene	1.40E-03	4.88E-04	2.13E-04	2.01E-04	1.14E-05	3.19E-03	5.69E-04	3.22E-04	2.43E-04	1.25E-05	4.72E-03	6.59E-04	4.11E-04	2.44E-04	1.70E-05
31	120-72-9	1H- Indole	2.19E-04	7.63E-05	3.33E-05	3.14E-05	1.78E-06	4.98E-04	8.89E-05	5.04E-05	3.80E-05	1.95E-06	7.38E-04	1.03E-04	6.43E-05	3.81E-05	2.66E-06
32	95-13-6	1H- Indene	1.32E-03	4.58E-04	2.00E-04	1.88E-04	1.07E-05	2.99E-03	5.33E-04	3.02E-04	2.28E-04	1.17E-05	4.43E-03	6.18E-04	3.86E-04	2.29E-04	1.60E-05
33	98-82-8	Isopropylbenzene	1.32E-04	4.58E-05	2.00E-05	1.88E-05	1.07E-06	2.99E-04	5.33E-05	3.02E-05	2.28E-05	1.17E-06	4.43E-04	6.18E-05	3.86E-05	2.29E-05	1.60E-06
34	99-87-6	p-Isopropyltoluene	4.39E-05	1.53E-05	6.66E-06	6.28E-06	3.55E-07	9.96E-05	1.78E-05	1.01E-05	7.60E-06	3.89E-07	1.48E-04	2.06E-05	1.29E-05	7.62E-06	5.32E-07
35	75-09-2	Methylene Chloride	6.58E-05	2.29E-05	9.99E-06	9.42E-06	5.33E-07	1.49E-04	2.67E-05	1.51E-05	1.14E-05	5.84E-07	2.21E-04	3.09E-05	1.93E-05	1.14E-05	7.98E-07
36	108-10-1	4-Methyl-2-pentanone	1.32E-04	4.58E-05	2.00E-05	1.88E-05	1.07E-06	2.99E-04	5.33E-05	3.02E-05	2.28E-05	1.17E-06	4.43E-04	6.18E-05	3.86E-05	2.29E-05	1.60E-06
37	103-65-1	n-Propylbenzene	1.32E-04	4.58E-05	2.00E-05	1.88E-05	1.07E-06	2.99E-04	5.33E-05	3.02E-05	2.28E-05	1.17E-06	4.43E-04	6.18E-05	3.86E-05	2.29E-05	1.60E-06
38	100-42-5	Styrene	4.17E-03	1.45E-03	6.33E-04	5.97E-04	3.38E-05	9.46E-03	1.69E-03	9.57E-04	7.22E-04	3.70E-05	1.40E-02	1.96E-03	1.22E-03	7.24E-04	5.05E-05
39	108-88-3	Toluene	4.28E-02	1.49E-02	6.50E-03	6.13E-03	3.47E-04	9.72E-02	1.74E-02	9.83E-03	7.42E-03	3.80E-04	1.44E-01	2.01E-02	1.25E-02	7.44E-03	5.19E-04
40	95-63-6	1,2,4-Trimethylbenzene	5.70E-04	1.98E-04	8.66E-05	8.16E-05	4.62E-06	1.29E-03	2.31E-04	1.31E-04	9.88E-05	5.06E-06	1.92E-03	2.68E-04	1.67E-04	9.91E-05	6.91E-06
41	108-67-8	1,3,5-Trimethylbenzene	4.39E-04	1.53E-04	6.66E-05	6.28E-05	3.55E-06	9.96E-04	1.78E-04	1.01E-04	7.60E-05	3.89E-06	1.48E-03	2.06E-04	1.29E-04	7.62E-05	5.32E-06
42	108-38-3 + 106-42-3	m+p-Xylene	1.75E-03	6.10E-04	2.66E-04	2.51E-04	1.42E-05	3.98E-03	7.11E-04	4.03E-04	3.04E-04	1.56E-05	5.90E-03	8.24E-04	5.14E-04	3.05E-04	2.13E-05
43	95-47-6	o-Xylene	7.45E-04	2.59E-04	1.13E-04	1.07E-04	6.04E-06	1.69E-03	3.02E-04	1.71E-04	1.29E-04	6.62E-06	2.51E-03	3.50E-04	2.19E-04	1.30E-04	9.04E-06
44	1330-20-7	Xylenes	3.29E-03	1.14E-03	4.99E-04	4.71E-04	2.66E-05	7.47E-03	1.33E-03	7.56E-04	5.70E-04	2.92E-05	1.11E-02	1.54E-03	9.64E-04	5.72E-04	3.99E-05
45	208-96-8	Acenaphthylene	1.32E-03	4.58E-04	2.00E-04	1.88E-04	1.07E-05	2.99E-03	5.33E-04	3.02E-04	2.28E-04	1.17E-05	4.43E-03	6.18E-04	3.86E-04	2.29E-04	1.60E-05
46	83-32-9	Acenaphthene	2.19E-04	7.63E-05	3.33E-05	3.14E-05	1.78E-06	4.98E-04	8.89E-05	5.04E-05	3.80E-05	1.95E-06	7.38E-04	1.03E-04	6.43E-05	3.81E-05	2.66E-06
47	275-51-4	Azulene	4.39E-03	1.53E-03	6.66E-04	6.28E-04	3.55E-05	9.96E-03	1.78E-03	1.01E-03	7.60E-04	3.89E-05	1.48E-02	2.06E-03	1.29E-03	7.62E-04	5.32E-05
48	100-47-0	Benzonitrile	2.41E-03	8.39E-04	3.66E-04	3.45E-04	1.95E-05	5.48E-03	9.78E-04	5.54E-04	4.18E-04	2.14E-05	8.12E-03	1.13E-03	7.07E-04	4.19E-04	2.93E-05
49	271-89-6	Benzofuran	4.39E-03	1.53E-03	6.66E-04	6.28E-04	3.55E-05	9.96E-03	1.78E-03	1.01E-03	7.60E-04	3.89E-05	1.48E-02	2.06E-03	1.29E-03	7.62E-04	5.32E-05
50	92-52-4	Biphenyl	1.10E-03	3.81E-04	1.66E-04	1.57E-04	8.88E-06	2.49E-03	4.44E-04	2.52E-04	1.90E-04	9.73E-06	3.69E-03	5.15E-04	3.21E-04	1.91E-04	1.33E-05
51	132-64-9	Dibenzofuran	1.97E-03	6.87E-04	3.00E-04	2.83E-04	1.60E-05	4.48E-03	8.00E-04	4.53E-04	3.42E-04	1.75E-05	6.64E-03	9.27E-04	5.79E-04	3.43E-04	2.39E-05
52	206-44-0	Fluoranthene	1.10E-03	3.81E-04	1.66E-04	1.57E-04	8.88E-06	2.49E-03	4.44E-04	2.52E-04	1.90E-04	9.73E-06	3.69E-03	5.15E-04	3.21E-04	1.91E-04	1.33E-05
53	86-73-7	9H-Fluorene	2.19E-04	7.63E-05	3.33E-05	3.14E-05	1.78E-06	4.98E-04	8.89E-05	5.04E-05	3.80E-05	1.95E-06	7.38E-04	1.03E-04	6.43E-05	3.81E-05	2.66E-06
54	486-25-9	9H-Fluoren-9-one	1.32E-03	4.58E-04	2.00E-04	1.88E-04	1.07E-05	2.99E-03	5.33E-04	3.02E-04	2.28E-04	1.17E-05	4.43E-03	6.18E-04	3.86E-04	2.29E-04	1.60E-05
55	90-12-0	1-Methylnapthalene	4.39E-04	1.53E-04	6.66E-05	6.28E-05	3.55E-06	9.96E-04	1.78E-04	1.01E-04	7.60E-05	3.89E-06	1.48E-03	2.06E-04	1.29E-04	7.62E-05	5.32E-06
56	91-57-6	2-Methylnapthalene	1.10E-03	3.81E-04	1.66E-04	1.57E-04	8.88E-06	2.49E-03	4.44E-04	2.52E-04	1.90E-04	9.73E-06	3.69E-03	5.15E-04	3.21E-04	1.91E-04	1.33E-05
57	91-20-3	Napthalene	1.69E-02	5.87E-03	2.56E-03	2.42E-03	1.37E-04	3.83E-02	6.84E-03	3.88E-03	2.93E-03	1.50E-04	5.68E-02	7.93E-03	4.95E-03	2.94E-03	2.05E-04
58	85-01-8	Phenanthrene	5.04E-03	1.75E-03	7.66E-04	7.22E-04	4.09E-05	1.14E-02	2.04E-03	1.16E-03	8.74E-04	4.48E-05	1.70E-02	2.37E-03	1.48E-03	8.77E-04	6.12E-05
59	129-00-0	Pyrene	6.58E-04	2.29E-04	9.99E-05	9.42E-05	5.33E-06	1.49E-03	2.67E-04	1.51E-04	1.14E-04	5.84E-06	2.21E-03	3.09E-04	1.93E-04	1.14E-04	7.98E-06
60	110-86-1	Pyridine	5.70E-03	1.98E-03	8.66E-04	8.16E-04	4.62E-05	1.29E-02	2.31E-03	1.31E-03	9.88E-04	5.06E-05	1.92E-02	2.68E-03	1.67E-03	9.91E-04	6.91E-05
61	91-22-5	Quinoline	1.10E-03	3.81E-04	1.66E-04	1.57E-04	8.88E-06	2.49E-03	4.44E-04	2.52E-04	1.90E-04	9.73E-06	3.69E-03	5.15E-04	3.21E-04	1.91E-04	1.33E-05

Source: Sinclair Knight Merz, 2003

TABLE A.2: PREDICTED GROUND LEVEL CONCENTRATIONS
(µg/m^3)

			Receptor 7					Receptor 8					Receptor 9				
			Upgraded Liquor Burner Emissions Scenario					Upgraded Liquor Burner Emissions Scenario					Upgraded Liquor Burner Emissions Scenario				
No	**CAS # / ID**	**Compound Name**	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual
1	TSP	Total Suspended Particulate	2.17E+00	2.22E-01	1.31E-01	7.85E-02	4.31E-03	8.62E-01	3.70E-01	1.55E-01	1.33E-01	1.05E-02	6.42E-01	2.72E-01	1.01E-01	9.45E-02	8.62E-03
2	630-08-0	Carbon Monoxide	4.34E+01	4.44E+00	2.63E+00	1.57E+00	8.61E-02	1.72E+01	7.40E+00	3.10E+00	2.66E+00	2.09E-01	1.28E+01	5.44E+00	2.02E+00	1.89E+00	1.72E-01
3	7446-09-5	Sulphur Dioxide	1.17E+01	1.19E+00	7.07E-01	4.22E-01	2.32E-02	4.64E+00	1.99E+00	8.33E-01	7.15E-01	5.62E-02	3.45E+00	1.46E+00	5.45E-01	5.08E-01	4.64E-02
4	10102-44-0	Nitrogen Dioxide [1]	3.75E+01	3.84E+00	2.27E+00	1.36E+00	7.44E-02	1.49E+01	6.40E+00	2.68E+00	2.30E+00	1.81E-01	1.11E+01	4.70E+00	1.75E+00	1.63E+00	1.49E-01
5	7440-38-2	Arsenic	1.08E-04	1.11E-05	6.57E-06	3.92E-06	2.15E-07	4.31E-05	1.85E-05	7.74E-06	6.64E-06	5.23E-07	3.21E-05	1.36E-05	5.06E-06	4.73E-06	4.31E-07
6	7429-90-5	Aluminium	3.52E-02	3.61E-03	2.14E-03	1.27E-03	7.00E-05	1.40E-02	6.02E-03	2.52E-03	2.16E-03	1.70E-04	1.04E-02	4.42E-03	1.64E-03	1.54E-03	1.40E-04
7	13463-40-6	Iron	7.59E-04	7.77E-05	4.60E-05	2.75E-05	1.51E-06	3.02E-04	1.30E-04	5.42E-05	4.65E-05	3.66E-06	2.25E-04	9.51E-05	3.54E-05	3.31E-05	3.02E-06
8	7439-96-5	Manganese	2.17E-04	2.22E-05	1.31E-05	7.85E-06	4.31E-07	8.62E-05	3.70E-05	1.55E-05	1.33E-05	1.05E-06	6.42E-05	2.72E-05	1.01E-05	9.45E-06	8.62E-07
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10	7439-98-7	Molybdenum	2.17E-04	2.22E-05	1.31E-05	7.85E-06	4.31E-07	8.62E-05	3.70E-05	1.55E-05	1.33E-05	1.05E-06	6.42E-05	2.72E-05	1.01E-05	9.45E-06	8.62E-07
11	7782-49-2	Selenium	1.30E-03	1.33E-04	7.89E-05	4.71E-05	2.58E-06	5.17E-04	2.22E-04	9.29E-05	7.97E-05	6.27E-06	3.85E-04	1.63E-04	6.07E-05	5.67E-05	5.17E-06
12	87-69-4	Tartaric Acid	1.17E-01	1.19E-02	7.07E-03	4.22E-03	2.32E-04	4.64E-02	1.99E-02	8.33E-03	7.15E-03	5.62E-04	3.45E-02	1.46E-02	5.45E-03	5.08E-03	4.64E-04
13	6915-15-7	Malic Acid	3.50E-01	3.58E-02	2.12E-02	1.27E-02	6.95E-04	1.39E-01	5.97E-02	2.50E-02	2.14E-02	1.69E-03	1.04E-01	4.39E-02	1.63E-02	1.53E-02	1.39E-03
14	110-02-1	Thiophene	1.17E-03	1.19E-04	7.07E-05	4.22E-05	2.32E-06	4.64E-04	1.99E-04	8.33E-05	7.15E-05	5.62E-06	3.45E-04	1.46E-04	5.45E-05	5.08E-05	4.64E-06
15	67-64-1	Acetone	1.08E+00	1.11E-01	6.57E-02	3.92E-02	2.15E-03	4.31E-01	1.85E-01	7.74E-02	6.64E-02	5.23E-03	3.21E-01	1.36E-01	5.06E-02	4.73E-02	4.31E-03
16	75-07-0	Acetaldehyde	4.34E-01	4.44E-02	2.63E-02	1.57E-02	8.61E-04	1.72E-01	7.40E-02	3.10E-02	2.66E-02	2.09E-03	1.28E-01	5.44E-02	2.02E-02	1.89E-02	1.72E-03
17	98-86-2	Acetophenone	8.33E-04	8.53E-05	5.05E-05	3.01E-05	1.65E-06	3.31E-04	1.42E-04	5.95E-05	5.11E-05	4.02E-06	2.47E-04	1.04E-04	3.89E-05	3.63E-05	3.31E-06
18	107-02-8	Acrolein	7.50E-03	7.68E-04	4.55E-04	2.71E-04	1.49E-05	2.98E-03	1.28E-03	5.35E-04	4.60E-04	3.62E-05	2.22E-03	9.40E-04	3.50E-04	3.27E-04	2.98E-05
19	123-72-8	Butanal	2.50E-03	2.56E-04	1.52E-04	9.04E-05	4.96E-06	9.93E-04	4.27E-04	1.78E-04	1.53E-04	1.21E-05	7.40E-04	3.13E-04	1.17E-04	1.09E-04	9.94E-06
20	4170-30-3	Butenal	4.72E-03	4.84E-04	2.86E-04	1.71E-04	9.37E-06	1.88E-03	8.06E-04	3.37E-04	2.89E-04	2.28E-05	1.40E-03	5.92E-04	2.20E-04	2.06E-04	1.88E-05
21	100-52-7	Benzaldehyde	3.61E-03	3.70E-04	2.19E-04	1.31E-04	7.17E-06	1.43E-03	6.16E-04	2.58E-04	2.21E-04	1.74E-05	1.07E-03	4.53E-04	1.69E-04	1.57E-04	1.44E-05
22	50-00-0	Formaldehyde	8.68E-02	8.88E-03	5.26E-03	3.14E-03	1.72E-04	3.45E-02	1.48E-02	6.19E-03	5.32E-03	4.18E-04	2.57E-02	1.09E-02	4.05E-03	3.78E-03	3.45E-04
23	78-85-3	Methacrolein	2.50E-03	2.56E-04	1.52E-04	9.04E-05	4.96E-06	9.93E-04	4.27E-04	1.78E-04	1.53E-04	1.21E-05	7.40E-04	3.13E-04	1.17E-04	1.09E-04	9.94E-06
24	78-93-3	2-Butanone	1.25E-02	1.28E-03	7.58E-04	4.52E-04	2.48E-05	4.97E-03	2.13E-03	8.92E-04	7.66E-04	6.03E-05	3.70E-03	1.57E-03	5.83E-04	5.45E-04	4.97E-05
25	71-43-2	Benzene	4.34E-01	4.44E-02	2.63E-02	1.57E-02	8.61E-04	1.72E-01	7.40E-02	3.10E-02	2.66E-02	2.09E-03	1.28E-01	5.44E-02	2.02E-02	1.89E-02	1.72E-03
26	74-83-9	Bromomethane	2.78E-04	2.84E-05	1.68E-05	1.00E-05	5.51E-07	1.10E-04	4.74E-05	1.98E-05	1.70E-05	1.34E-06	8.22E-05	3.48E-05	1.30E-05	1.21E-05	1.10E-06
27	104-51-8	n-Butylbenzene	5.56E-05	5.69E-06	3.37E-06	2.01E-06	1.10E-07	2.21E-05	9.48E-06	3.96E-06	3.40E-06	2.68E-07	1.64E-05	6.96E-06	2.59E-06	2.42E-06	2.21E-07
28	135-98-8	sec-Butylbenzene	5.56E-05	5.69E-06	3.37E-06	2.01E-06	1.10E-07	2.21E-05	9.48E-06	3.96E-06	3.40E-06	2.68E-07	1.64E-05	6.96E-06	2.59E-06	2.42E-06	2.21E-07
29	74-87-3	Chloromethane	9.44E-04	9.67E-05	5.72E-05	3.42E-05	1.87E-06	3.75E-04	1.61E-04	6.74E-05	5.79E-05	4.55E-06	2.80E-04	1.18E-04	4.41E-05	4.12E-05	3.75E-06
30	100-41-4	Ethylbenzene	3.56E-03	3.64E-04	2.16E-04	1.29E-04	7.06E-06	1.41E-03	6.07E-04	2.54E-04	2.18E-04	1.71E-05	1.05E-03	4.46E-04	1.66E-04	1.55E-04	1.41E-05
31	120-72-9	1H- Indole	5.56E-04	5.69E-05	3.37E-05	2.01E-05	1.10E-06	2.21E-04	9.48E-05	3.96E-05	3.40E-05	2.68E-06	1.64E-04	6.96E-05	2.59E-05	2.42E-05	2.21E-06
32	95-13-6	1H- Indene	3.33E-03	3.41E-04	2.02E-04	1.21E-04	6.62E-06	1.32E-03	5.69E-04	2.38E-04	2.04E-04	1.61E-05	9.87E-04	4.18E-04	1.56E-04	1.45E-04	1.33E-05
33	98-82-8	Isopropylbenzene	3.33E-04	3.41E-05	2.02E-05	1.21E-05	6.62E-07	1.32E-04	5.69E-05	2.38E-05	2.04E-05	1.61E-06	9.87E-05	4.18E-05	1.56E-05	1.45E-05	1.33E-06
34	99-87-6	p-Isopropyltoluene	1.11E-04	1.14E-05	6.74E-06	4.02E-06	2.21E-07	4.41E-05	1.90E-05	7.93E-06	6.81E-06	5.36E-07	3.29E-05	1.39E-05	5.19E-06	4.84E-06	4.42E-07
35	75-09-2	Methylene Chloride	1.67E-04	1.71E-05	1.01E-05	6.03E-06	3.31E-07	6.62E-05	2.84E-05	1.19E-05	1.02E-05	8.04E-07	4.93E-05	2.09E-05	7.78E-06	7.26E-06	6.63E-07
36	108-10-1	4-Methyl-2-pentanone	3.33E-04	3.41E-05	2.02E-05	1.21E-05	6.62E-07	1.32E-04	5.69E-05	2.38E-05	2.04E-05	1.61E-06	9.87E-05	4.18E-05	1.56E-05	1.45E-05	1.33E-06
37	103-65-1	n-Propylbenzene	3.33E-04	3.41E-05	2.02E-05	1.21E-05	6.62E-07	1.32E-04	5.69E-05	2.38E-05	2.04E-05	1.61E-06	9.87E-05	4.18E-05	1.56E-05	1.45E-05	1.33E-06
38	100-42-5	Styrene	1.06E-02	1.08E-03	6.40E-04	3.82E-04	2.10E-05	4.19E-03	1.80E-03	7.53E-04	6.47E-04	5.09E-05	3.12E-03	1.32E-03	4.93E-04	4.60E-04	4.20E-05
39	108-88-3	Toluene	1.08E-01	1.11E-02	6.57E-03	3.92E-03	2.15E-04	4.31E-02	1.85E-02	7.74E-03	6.64E-03	5.23E-04	3.21E-02	1.36E-02	5.06E-03	4.73E-03	4.31E-04
40	95-63-6	1,2,4-Trimethylbenzene	1.44E-03	1.48E-04	8.76E-05	5.22E-05	2.87E-06	5.74E-04	2.47E-04	1.03E-04	8.85E-05	6.96E-06	4.28E-04	1.81E-04	6.74E-05	6.30E-05	5.74E-06
41	108-67-8	1,3,5-Trimethylbenzene	1.11E-03	1.14E-04	6.74E-05	4.02E-05	2.21E-06	4.41E-04	1.90E-04	7.93E-05	6.81E-05	5.36E-06	3.29E-04	1.39E-04	5.19E-05	4.84E-05	4.42E-06
42	108-38-3 + 106-42-3	m+p-Xylene	4.44E-03	4.55E-04	2.69E-04	1.61E-04	8.82E-06	1.77E-03	7.59E-04	3.17E-04	2.72E-04	2.14E-05	1.32E-03	5.57E-04	2.07E-04	1.94E-04	1.77E-05
43	95-47-6	o-Xylene	1.89E-03	1.93E-04	1.14E-04	6.83E-05	3.75E-06	7.51E-04	3.22E-04	1.35E-04	1.16E-04	9.11E-06	5.59E-04	2.37E-04	8.82E-05	8.23E-05	7.51E-06
44	1330-20-7	Xylenes	8.33E-03	8.53E-04	5.05E-04	3.01E-04	1.65E-05	3.31E-03	1.42E-03	5.95E-04	5.11E-04	4.02E-05	2.47E-03	1.04E-03	3.89E-04	3.63E-04	3.31E-05
45	208-96-8	Acenaphthylene	3.33E-03	3.41E-04	2.02E-04	1.21E-04	6.62E-06	1.32E-03	5.69E-04	2.38E-04	2.04E-04	1.61E-05	9.87E-04	4.18E-04	1.56E-04	1.45E-04	1.33E-05
46	83-32-9	Acenaphthene	5.56E-04	5.69E-05	3.37E-05	2.01E-05	1.10E-06	2.21E-04	9.48E-05	3.96E-05	3.40E-05	2.68E-06	1.64E-04	6.96E-05	2.59E-05	2.42E-05	2.21E-06
47	275-51-4	Azulene	1.11E-02	1.14E-03	6.74E-04	4.02E-04	2.21E-05	4.41E-03	1.90E-03	7.93E-04	6.81E-04	5.36E-05	3.29E-03	1.39E-03	5.19E-04	4.84E-04	4.42E-05
48	100-47-0	Benzonitrile	6.11E-03	6.26E-04	3.70E-04	2.21E-04	1.21E-05	2.43E-03	1.04E-03	4.36E-04	3.74E-04	2.95E-05	1.81E-03	7.66E-04	2.85E-04	2.66E-04	2.43E-05
49	271-89-6	Benzofuran	1.11E-02	1.14E-03	6.74E-04	4.02E-04	2.21E-05	4.41E-03	1.90E-03	7.93E-04	6.81E-04	5.36E-05	3.29E-03	1.39E-03	5.19E-04	4.84E-04	4.42E-05
50	92-52-4	Biphenyl	2.78E-03	2.84E-04	1.68E-04	1.00E-04	5.51E-06	1.10E-03	4.74E-04	1.98E-04	1.70E-04	1.34E-05	8.22E-04	3.48E-04	1.30E-04	1.21E-04	1.10E-05
51	132-64-9	Dibenzofuran	5.00E-03	5.12E-04	3.03E-04	1.81E-04	9.93E-06	1.99E-03	8.53E-04	3.57E-04	3.06E-04	2.41E-05	1.48E-03	6.27E-04	2.33E-04	2.18E-04	1.99E-05
52	206-44-0	Fluoranthene	2.78E-03	2.84E-04	1.68E-04	1.00E-04	5.51E-06	1.10E-03	4.74E-04	1.98E-04	1.70E-04	1.34E-05	8.22E-04	3.48E-04	1.30E-04	1.21E-04	1.10E-05
53	86-73-7	9H-Fluorene	5.56E-04	5.69E-05	3.37E-05	2.01E-05	1.10E-06	2.21E-04	9.48E-05	3.96E-05	3.40E-05	2.68E-06	1.64E-04	6.96E-05	2.59E-05	2.42E-05	2.21E-06
54	486-25-9	9H-Fluoren-9-one	3.33E-03	3.41E-04	2.02E-04	1.21E-04	6.62E-06	1.32E-03	5.69E-04	2.38E-04	2.04E-04	1.61E-05	9.87E-04	4.18E-04	1.56E-04	1.45E-04	1.33E-05
55	90-12-0	1-Methylnapthalene	1.11E-03	1.14E-04	6.74E-05	4.02E-05	2.21E-06	4.41E-04	1.90E-04	7.93E-05	6.81E-05	5.36E-06	3.29E-04	1.39E-04	5.19E-05	4.84E-05	4.42E-06
56	91-57-6	2-Methylnapthalene	2.78E-03	2.84E-04	1.68E-04	1.00E-04	5.51E-06	1.10E-03	4.74E-04	1.98E-04	1.70E-04	1.34E-05	8.22E-04	3.48E-04	1.30E-04	1.21E-04	1.10E-05
57	91-20-3	Napthalene	4.28E-02	4.38E-03	2.59E-03	1.55E-03	8.49E-05	1.70E-02	7.30E-03	3.05E-03	2.62E-03	2.06E-04	1.27E-02	5.36E-03	2.00E-03	1.86E-03	1.70E-04
58	85-01-8	Phenanthrene	1.28E-02	1.31E-03	7.75E-04	4.62E-04	2.54E-05	5.08E-03	2.18E-03	9.12E-04	7.83E-04	6.16E-05	3.78E-03	1.60E-03	5.96E-04	5.57E-04	5.08E-05
59	129-00-0	Pyrene	1.67E-03	1.71E-04	1.01E-04	6.03E-05	3.31E-06	6.62E-04	2.84E-04	1.19E-04	1.02E-04	8.04E-06	4.93E-04	2.09E-04	7.78E-05	7.26E-05	6.63E-06
60	110-86-1	Pyridine	1.44E-02	1.48E-03	8.76E-04	5.22E-04	2.87E-05	5.74E-03	2.47E-03	1.03E-03	8.85E-04	6.96E-05	4.28E-03	1.81E-03	6.74E-04	6.30E-04	5.74E-05
61	91-22-5	Quinoline	2.78E-03	2.84E-04	1.68E-04	1.00E-04	5.51E-06	1.10E-03	4.74E-04	1.98E-04	1.70E-04	1.34E-05	8.22E-04	3.48E-04	1.30E-04	1.21E-04	1.10E-05

Source: Sinclair Knight Merz, 2003

TABLE A.2: PREDICTED GROUND LEVEL CONCENTRATIONS
(µg/m^3)

			Receptor 10					Receptor 11					Receptor 12				
			Upgraded Liquor Burner Emissions Scenario					Upgraded Liquor Burner Emissions Scenario					Upgraded Liquor Burner Emissions Scenario				
No	**CAS # / ID**	**Compound Name**	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual
1	TSP	Total Suspended Particulate	7.00E-01	2.81E-01	1.19E-01	1.12E-01	8.20E-03	6.48E-01	2.41E-01	1.20E-01	9.82E-02	5.48E-03	6.36E-01	1.79E-01	9.29E-02	8.88E-02	4.29E-03
2	630-08-0	Carbon Monoxide	1.40E+01	5.62E+00	2.37E+00	2.24E+00	1.64E-01	1.30E+01	4.82E+00	2.41E+00	1.96E+00	1.10E-01	1.27E+01	3.59E+00	1.86E+00	1.78E+00	8.57E-02
3	7446-09-5	Sulphur Dioxide	3.76E+00	1.51E+00	6.39E-01	6.01E-01	4.41E-02	3.48E+00	1.30E+00	6.47E-01	5.28E-01	2.95E-02	3.42E+00	9.64E-01	5.00E-01	4.77E-01	2.31E-02
4	10102-44-0	Nitrogen Dioxide [1]	1.21E+01	4.86E+00	2.05E+00	1.93E+00	1.42E-01	1.12E+01	4.17E+00	2.08E+00	1.70E+00	9.48E-02	1.10E+01	3.10E+00	1.61E+00	1.53E+00	7.41E-02
5	7440-38-2	Arsenic	3.50E-05	1.41E-05	5.94E-06	5.59E-06	4.10E-07	3.24E-05	1.21E-05	6.01E-06	4.91E-06	2.74E-07	3.18E-05	8.96E-06	4.64E-06	4.44E-06	2.14E-07
6	7429-90-5	Aluminium	1.14E-02	4.57E-03	1.93E-03	1.82E-03	1.33E-04	1.05E-02	3.92E-03	1.95E-03	1.60E-03	8.91E-05	1.03E-02	2.91E-03	1.51E-03	1.44E-03	6.97E-05
7	13463-40-6	Iron	2.45E-04	9.84E-05	4.15E-05	3.91E-05	2.87E-06	2.27E-04	8.44E-05	4.21E-05	3.44E-05	1.92E-06	2.23E-04	6.28E-05	3.25E-05	3.11E-05	1.50E-06
8	7439-96-5	Manganese	7.00E-05	2.81E-05	1.19E-05	1.12E-05	8.20E-07	6.48E-05	2.41E-05	1.20E-05	9.82E-06	5.48E-07	6.36E-05	1.79E-05	9.29E-06	8.88E-06	4.29E-07
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10	7439-98-7	Molybdenum	7.00E-05	2.81E-05	1.19E-05	1.12E-05	8.20E-07	6.48E-05	2.41E-05	1.20E-05	9.82E-06	5.48E-07	6.36E-05	1.79E-05	9.29E-06	8.88E-06	4.29E-07
11	7782-49-2	Selenium	4.20E-04	1.69E-04	7.12E-05	6.71E-05	4.92E-06	3.89E-04	1.45E-04	7.22E-05	5.89E-05	3.29E-06	3.82E-04	1.08E-04	5.57E-05	5.33E-05	2.57E-06
12	87-69-4	Tartaric Acid	3.76E-02	1.51E-02	6.39E-03	6.01E-03	4.41E-04	3.48E-02	1.30E-02	6.47E-03	5.28E-03	2.95E-04	3.42E-02	9.64E-03	5.00E-03	4.77E-03	2.31E-04
13	6915-15-7	Malic Acid	1.13E-01	4.54E-02	1.92E-02	1.80E-02	1.32E-03	1.05E-01	3.89E-02	1.94E-02	1.58E-02	8.84E-04	1.03E-01	2.89E-02	1.50E-02	1.43E-02	6.92E-04
14	110-02-1	Thiophene	3.76E-04	1.51E-04	6.39E-05	6.01E-05	4.41E-06	3.48E-04	1.30E-04	6.47E-05	5.28E-05	2.95E-06	3.42E-04	9.64E-05	5.00E-05	4.77E-05	2.31E-06
15	67-64-1	Acetone	3.50E-01	1.41E-01	5.94E-02	5.59E-02	4.10E-03	3.24E-01	1.21E-01	6.01E-02	4.91E-02	2.74E-03	3.18E-01	8.96E-02	4.64E-02	4.44E-02	2.14E-03
16	75-07-0	Acetaldehyde	1.40E-01	5.62E-02	2.37E-02	2.24E-02	1.64E-03	1.30E-01	4.82E-02	2.41E-02	1.96E-02	1.10E-03	1.27E-01	3.59E-02	1.86E-02	1.78E-02	8.57E-04
17	98-86-2	Acetophenone	2.69E-04	1.08E-04	4.56E-05	4.29E-05	3.15E-06	2.49E-04	9.27E-05	4.62E-05	3.77E-05	2.11E-06	2.44E-04	6.89E-05	3.57E-05	3.41E-05	1.65E-06
18	107-02-8	Acrolein	2.42E-03	9.72E-04	4.11E-04	3.86E-04	2.84E-05	2.24E-03	8.34E-04	4.16E-04	3.39E-04	1.90E-05	2.20E-03	6.20E-04	3.21E-04	3.07E-04	1.48E-05
19	123-72-8	Butanal	8.07E-04	3.24E-04	1.37E-04	1.29E-04	9.46E-06	7.47E-04	2.78E-04	1.39E-04	1.13E-04	6.32E-06	7.33E-04	2.07E-04	1.07E-04	1.02E-04	4.94E-06
20	4170-30-3	Butenal	1.52E-03	6.12E-04	2.58E-04	2.43E-04	1.79E-05	1.41E-03	5.25E-04	2.62E-04	2.14E-04	1.19E-05	1.39E-03	3.90E-04	2.02E-04	1.93E-04	9.33E-06
21	100-52-7	Benzaldehyde	1.17E-03	4.68E-04	1.98E-04	1.86E-04	1.37E-05	1.08E-03	4.02E-04	2.00E-04	1.63E-04	9.13E-06	1.06E-03	2.99E-04	1.55E-04	1.48E-04	7.14E-06
22	50-00-0	Formaldehyde	2.80E-02	1.12E-02	4.75E-03	4.47E-03	3.28E-04	2.59E-02	9.65E-03	4.81E-03	3.93E-03	2.19E-04	2.54E-02	7.17E-03	3.72E-03	3.55E-03	1.71E-04
23	78-85-3	Methacrolein	8.07E-04	3.24E-04	1.37E-04	1.29E-04	9.46E-06	7.47E-04	2.78E-04	1.39E-04	1.13E-04	6.32E-06	7.33E-04	2.07E-04	1.07E-04	1.02E-04	4.94E-06
24	78-93-3	2-Butanone	4.03E-03	1.62E-03	6.84E-04	6.44E-04	4.73E-05	3.73E-03	1.39E-03	6.93E-04	5.66E-04	3.16E-05	3.67E-03	1.03E-03	5.35E-04	5.12E-04	2.47E-05
25	71-43-2	Benzene	1.40E-01	5.62E-02	2.37E-02	2.24E-02	1.64E-03	1.30E-01	4.82E-02	2.41E-02	1.96E-02	1.10E-03	1.27E-01	3.59E-02	1.86E-02	1.78E-02	8.57E-04
26	74-83-9	Bromomethane	8.96E-05	3.60E-05	1.52E-05	1.43E-05	1.05E-06	8.30E-05	3.09E-05	1.54E-05	1.26E-05	7.02E-07	8.15E-05	2.30E-05	1.19E-05	1.14E-05	5.49E-07
27	104-51-8	n-Butylbenzene	1.79E-05	7.20E-06	3.04E-06	2.86E-06	2.10E-07	1.66E-05	6.18E-06	3.08E-06	2.51E-06	1.40E-07	1.63E-05	4.59E-06	2.38E-06	2.27E-06	1.10E-07
28	135-98-8	sec-Butylbenzene	1.79E-05	7.20E-06	3.04E-06	2.86E-06	2.10E-07	1.66E-05	6.18E-06	3.08E-06	2.51E-06	1.40E-07	1.63E-05	4.59E-06	2.38E-06	2.27E-06	1.10E-07
29	74-87-3	Chloromethane	3.05E-04	1.22E-04	5.17E-05	4.87E-05	3.57E-06	2.82E-04	1.05E-04	5.24E-05	4.27E-05	2.39E-06	2.77E-04	7.81E-05	4.04E-05	3.86E-05	1.87E-06
30	100-41-4	Ethylbenzene	1.15E-03	4.61E-04	1.95E-04	1.83E-04	1.34E-05	1.06E-03	3.95E-04	1.97E-04	1.61E-04	8.99E-06	1.04E-03	2.94E-04	1.52E-04	1.45E-04	7.03E-06
31	120-72-9	1H- Indole	1.79E-04	7.20E-05	3.04E-05	2.86E-05	2.10E-06	1.66E-04	6.18E-05	3.08E-05	2.51E-05	1.40E-06	1.63E-04	4.59E-05	2.38E-05	2.27E-05	1.10E-06
32	95-13-6	1H- Indene	1.08E-03	4.32E-04	1.82E-04	1.72E-04	1.26E-05	9.96E-04	3.71E-04	1.85E-04	1.51E-04	8.42E-06	9.78E-04	2.76E-04	1.43E-04	1.36E-04	6.59E-06
33	98-82-8	Isopropylbenzene	1.08E-04	4.32E-05	1.82E-05	1.72E-05	1.26E-06	9.96E-05	3.71E-05	1.85E-05	1.51E-05	8.42E-07	9.78E-05	2.76E-05	1.43E-05	1.36E-05	6.59E-07
34	99-87-6	p-Isopropyltoluene	3.59E-05	1.44E-05	6.08E-06	5.73E-06	4.20E-07	3.32E-05	1.24E-05	6.16E-06	5.03E-06	2.81E-07	3.26E-05	9.19E-06	4.76E-06	4.55E-06	2.20E-07
35	75-09-2	Methylene Chloride	5.38E-05	2.16E-05	9.12E-06	8.59E-06	6.30E-07	4.98E-05	1.85E-05	9.24E-06	7.54E-06	4.21E-07	4.89E-05	1.38E-05	7.14E-06	6.82E-06	3.29E-07
36	108-10-1	4-Methyl-2-pentanone	1.08E-04	4.32E-05	1.82E-05	1.72E-05	1.26E-06	9.96E-05	3.71E-05	1.85E-05	1.51E-05	8.42E-07	9.78E-05	2.76E-05	1.43E-05	1.36E-05	6.59E-07
37	103-65-1	n-Propylbenzene	1.08E-04	4.32E-05	1.82E-05	1.72E-05	1.26E-06	9.96E-05	3.71E-05	1.85E-05	1.51E-05	8.42E-07	9.78E-05	2.76E-05	1.43E-05	1.36E-05	6.59E-07
38	100-42-5	Styrene	3.41E-03	1.37E-03	5.78E-04	5.44E-04	3.99E-05	3.15E-03	1.17E-03	5.85E-04	4.78E-04	2.67E-05	3.10E-03	8.73E-04	4.52E-04	4.32E-04	2.09E-05
39	108-88-3	Toluene	3.50E-02	1.41E-02	5.94E-03	5.59E-03	4.10E-04	3.24E-02	1.21E-02	6.01E-03	4.91E-03	2.74E-04	3.18E-02	8.96E-03	4.64E-03	4.44E-03	2.14E-04
40	95-63-6	1,2,4-Trimethylbenzene	4.66E-04	1.87E-04	7.91E-05	7.44E-05	5.46E-06	4.31E-04	1.61E-04	8.01E-05	6.54E-05	3.65E-06	4.24E-04	1.19E-04	6.19E-05	5.91E-05	2.85E-06
41	108-67-8	1,3,5-Trimethylbenzene	3.59E-04	1.44E-04	6.08E-05	5.73E-05	4.20E-06	3.32E-04	1.24E-04	6.16E-05	5.03E-05	2.81E-06	3.26E-04	9.19E-05	4.76E-05	4.55E-05	2.20E-06
42	108-38-3 + 106-42-3	m+p-Xylene	1.43E-03	5.76E-04	2.43E-04	2.29E-04	1.68E-05	1.33E-03	4.94E-04	2.46E-04	2.01E-04	1.12E-05	1.30E-03	3.67E-04	1.90E-04	1.82E-04	8.78E-06
43	95-47-6	o-Xylene	6.09E-04	2.45E-04	1.03E-04	9.73E-05	7.14E-06	5.64E-04	2.10E-04	1.05E-04	8.55E-05	4.77E-06	5.54E-04	1.56E-04	8.09E-05	7.73E-05	3.73E-06
44	1330-20-7	Xylenes	2.69E-03	1.08E-03	4.56E-04	4.29E-04	3.15E-05	2.49E-03	9.27E-04	4.62E-04	3.77E-04	2.11E-05	2.44E-03	6.89E-04	3.57E-04	3.41E-04	1.65E-05
45	208-96-8	Acenaphthylene	1.08E-03	4.32E-04	1.82E-04	1.72E-04	1.26E-05	9.96E-04	3.71E-04	1.85E-04	1.51E-04	8.42E-06	9.78E-04	2.76E-04	1.43E-04	1.36E-04	6.59E-06
46	83-32-9	Acenaphthene	1.79E-04	7.20E-05	3.04E-05	2.86E-05	2.10E-06	1.66E-04	6.18E-05	3.08E-05	2.51E-05	1.40E-06	1.63E-04	4.59E-05	2.38E-05	2.27E-05	1.10E-06
47	275-51-4	Azulene	3.59E-03	1.44E-03	6.08E-04	5.73E-04	4.20E-05	3.32E-03	1.24E-03	6.16E-04	5.03E-04	2.81E-05	3.26E-03	9.19E-04	4.76E-04	4.55E-04	2.20E-05
48	100-47-0	Benzonitrile	1.97E-03	7.92E-04	3.34E-04	3.15E-04	2.31E-05	1.83E-03	6.80E-04	3.39E-04	2.77E-04	1.54E-05	1.79E-03	5.05E-04	2.62E-04	2.50E-04	1.21E-05
49	271-89-6	Benzofuran	3.59E-03	1.44E-03	6.08E-04	5.73E-04	4.20E-05	3.32E-03	1.24E-03	6.16E-04	5.03E-04	2.81E-05	3.26E-03	9.19E-04	4.76E-04	4.55E-04	2.20E-05
50	92-52-4	Biphenyl	8.96E-04	3.60E-04	1.52E-04	1.43E-04	1.05E-05	8.30E-04	3.09E-04	1.54E-04	1.26E-04	7.02E-06	8.15E-04	2.30E-04	1.19E-04	1.14E-04	5.49E-06
51	132-64-9	Dibenzofuran	1.61E-03	6.48E-04	2.74E-04	2.58E-04	1.89E-05	1.49E-03	5.56E-04	2.77E-04	2.26E-04	1.26E-05	1.47E-03	4.13E-04	2.14E-04	2.05E-04	9.88E-06
52	206-44-0	Fluoranthene	8.96E-04	3.60E-04	1.52E-04	1.43E-04	1.05E-05	8.30E-04	3.09E-04	1.54E-04	1.26E-04	7.02E-06	8.15E-04	2.30E-04	1.19E-04	1.14E-04	5.49E-06
53	86-73-7	9H-Fluorene	1.79E-04	7.20E-05	3.04E-05	2.86E-05	2.10E-06	1.66E-04	6.18E-05	3.08E-05	2.51E-05	1.40E-06	1.63E-04	4.59E-05	2.38E-05	2.27E-05	1.10E-06
54	486-25-9	9H-Fluoren-9-one	1.08E-03	4.32E-04	1.82E-04	1.72E-04	1.26E-05	9.96E-04	3.71E-04	1.85E-04	1.51E-04	8.42E-06	9.78E-04	2.76E-04	1.43E-04	1.36E-04	6.59E-06
55	90-12-0	1-Methylnapthalene	3.59E-04	1.44E-04	6.08E-05	5.73E-05	4.20E-06	3.32E-04	1.24E-04	6.16E-05	5.03E-05	2.81E-06	3.26E-04	9.19E-05	4.76E-05	4.55E-05	2.20E-06
56	91-57-6	2-Methylnapthalene	8.96E-04	3.60E-04	1.52E-04	1.43E-04	1.05E-05	8.30E-04	3.09E-04	1.54E-04	1.26E-04	7.02E-06	8.15E-04	2.30E-04	1.19E-04	1.14E-04	5.49E-06
57	91-20-3	Napthalene	1.38E-02	5.54E-03	2.34E-03	2.20E-03	1.62E-04	1.28E-02	4.76E-03	2.37E-03	1.94E-03	1.08E-04	1.25E-02	3.54E-03	1.83E-03	1.75E-03	8.46E-05
58	85-01-8	Phenanthrene	4.12E-03	1.66E-03	6.99E-04	6.58E-04	4.83E-05	3.82E-03	1.42E-03	7.09E-04	5.78E-04	3.23E-05	3.75E-03	1.06E-03	5.47E-04	5.23E-04	2.53E-05
59	129-00-0	Pyrene	5.38E-04	2.16E-04	9.12E-05	8.59E-05	6.30E-06	4.98E-04	1.85E-04	9.24E-05	7.54E-05	4.21E-06	4.89E-04	1.38E-04	7.14E-05	6.82E-05	3.29E-06
60	110-86-1	Pyridine	4.66E-03	1.87E-03	7.91E-04	7.44E-04	5.46E-05	4.31E-03	1.61E-03	8.01E-04	6.54E-04	3.65E-05	4.24E-03	1.19E-03	6.19E-04	5.91E-04	2.85E-05
61	91-22-5	Quinoline	8.96E-04	3.60E-04	1.52E-04	1.43E-04	1.05E-05	8.30E-04	3.09E-04	1.54E-04	1.26E-04	7.02E-06	8.15E-04	2.30E-04	1.19E-04	1.14E-04	5.49E-06

Source: Sinclair Knight Merz, 2003

TABLE A.2: PREDICTED GROUND LEVEL CONCENTRATIONS
(µg/m^3)

			Receptor 13				
			Upgraded Liquor Burner Emissions Scenario				
No	**CAS # / ID**	**Compound Name**	Max 1 h	99.5th 1 h	Max 24 h	99.5th 24 h	Annual
1	TSP	Total Suspended Particulate	1.21E+00	5.96E-01	2.19E-01	1.71E-01	1.80E-02
2	630-08-0	Carbon Monoxide	2.42E+01	1.19E+01	4.38E+00	3.42E+00	3.61E-01
3	7446-09-5	Sulphur Dioxide	6.50E+00	3.20E+00	1.18E+00	9.21E-01	9.71E-02
4	10102-44-0	Nitrogen Dioxide [1]	2.09E+01	1.03E+01	3.79E+00	2.96E+00	3.12E-01
5	7440-38-2	Arsenic	6.04E-05	2.98E-05	1.09E-05	8.56E-06	9.02E-07
6	7429-90-5	Aluminium	1.96E-02	9.68E-03	3.56E-03	2.78E-03	2.93E-04
7	13463-40-6	Iron	4.23E-04	2.09E-04	7.66E-05	5.99E-05	6.32E-06
8	7439-96-5	Manganese	1.21E-04	5.96E-05	2.19E-05	1.71E-05	1.80E-06
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10	7439-98-7	Molybdenum	1.21E-04	5.96E-05	2.19E-05	1.71E-05	1.80E-06
11	7782-49-2	Selenium	7.25E-04	3.57E-04	1.31E-04	1.03E-04	1.08E-05
12	87-69-4	Tartaric Acid	6.50E-02	3.20E-02	1.18E-02	9.21E-03	9.71E-04
13	6915-15-7	Malic Acid	1.95E-01	9.61E-02	3.53E-02	2.76E-02	2.91E-03
14	110-02-1	Thiophene	6.50E-04	3.20E-04	1.18E-04	9.21E-05	9.71E-06
15	67-64-1	Acetone	6.04E-01	2.98E-01	1.09E-01	8.56E-02	9.02E-03
16	75-07-0	Acetaldehyde	2.42E-01	1.19E-01	4.38E-02	3.42E-02	3.61E-03
17	98-86-2	Acetophenone	4.64E-04	2.29E-04	8.41E-05	6.58E-05	6.93E-06
18	107-02-8	Acrolein	4.18E-03	2.06E-03	7.57E-04	5.92E-04	6.24E-05
19	123-72-8	Butanal	1.39E-03	6.87E-04	2.52E-04	1.97E-04	2.08E-05
20	4170-30-3	Butenal	2.63E-03	1.30E-03	4.77E-04	3.73E-04	3.93E-05
21	100-52-7	Benzaldehyde	2.01E-03	9.92E-04	3.65E-04	2.85E-04	3.00E-05
22	50-00-0	Formaldehyde	4.84E-02	2.38E-02	8.76E-03	6.85E-03	7.22E-04
23	78-85-3	Methacrolein	1.39E-03	6.87E-04	2.52E-04	1.97E-04	2.08E-05
24	78-93-3	2-Butanone	6.97E-03	3.43E-03	1.26E-03	9.87E-04	1.04E-04
25	71-43-2	Benzene	2.42E-01	1.19E-01	4.38E-02	3.42E-02	3.61E-03
26	74-83-9	Bromomethane	1.55E-04	7.63E-05	2.80E-05	2.19E-05	2.31E-06
27	104-51-8	n-Butylbenzene	3.10E-05	1.53E-05	5.61E-06	4.39E-06	4.62E-07
28	135-98-8	sec-Butylbenzene	3.10E-05	1.53E-05	5.61E-06	4.39E-06	4.62E-07
29	74-87-3	Chloromethane	5.26E-04	2.59E-04	9.53E-05	7.46E-05	7.86E-06
30	100-41-4	Ethylbenzene	1.98E-03	9.77E-04	3.59E-04	2.81E-04	2.96E-05
31	120-72-9	1H- Indole	3.10E-04	1.53E-04	5.61E-05	4.39E-05	4.62E-06
32	95-13-6	1H- Indene	1.86E-03	9.16E-04	3.37E-04	2.63E-04	2.77E-05
33	98-82-8	Isopropylbenzene	1.86E-04	9.16E-05	3.37E-05	2.63E-05	2.77E-06
34	99-87-6	p-Isopropyltoluene	6.19E-05	3.05E-05	1.12E-05	8.77E-06	9.25E-07
35	75-09-2	Methylene Chloride	9.29E-05	4.58E-05	1.68E-05	1.32E-05	1.39E-06
36	108-10-1	4-Methyl-2-pentanone	1.86E-04	9.16E-05	3.37E-05	2.63E-05	2.77E-06
37	103-65-1	n-Propylbenzene	1.86E-04	9.16E-05	3.37E-05	2.63E-05	2.77E-06
38	100-42-5	Styrene	5.88E-03	2.90E-03	1.07E-03	8.33E-04	8.78E-05
39	108-88-3	Toluene	6.04E-02	2.98E-02	1.09E-02	8.56E-03	9.02E-04
40	95-63-6	1,2,4-Trimethylbenzene	8.05E-04	3.97E-04	1.46E-04	1.14E-04	1.20E-05
41	108-67-8	1,3,5-Trimethylbenzene	6.19E-04	3.05E-04	1.12E-04	8.77E-05	9.25E-06
42	108-38-3 + 106-42-3	m+p-Xylene	2.48E-03	1.22E-03	4.49E-04	3.51E-04	3.70E-05
43	95-47-6	o-Xylene	1.05E-03	5.19E-04	1.91E-04	1.49E-04	1.57E-05
44	1330-20-7	Xylenes	4.64E-03	2.29E-03	8.41E-04	6.58E-04	6.93E-05
45	208-96-8	Acenaphthylene	1.86E-03	9.16E-04	3.37E-04	2.63E-04	2.77E-05
46	83-32-9	Acenaphthene	3.10E-04	1.53E-04	5.61E-05	4.39E-05	4.62E-06
47	275-51-4	Azulene	6.19E-03	3.05E-03	1.12E-03	8.77E-04	9.25E-05
48	100-47-0	Benzonitrile	3.41E-03	1.68E-03	6.17E-04	4.82E-04	5.09E-05
49	271-89-6	Benzofuran	6.19E-03	3.05E-03	1.12E-03	8.77E-04	9.25E-05
50	92-52-4	Biphenyl	1.55E-03	7.63E-04	2.80E-04	2.19E-04	2.31E-05
51	132-64-9	Dibenzofuran	2.79E-03	1.37E-03	5.05E-04	3.95E-04	4.16E-05
52	206-44-0	Fluoranthene	1.55E-03	7.63E-04	2.80E-04	2.19E-04	2.31E-05
53	86-73-7	9H-Fluorene	3.10E-04	1.53E-04	5.61E-05	4.39E-05	4.62E-06
54	486-25-9	9H-Fluoren-9-one	1.86E-03	9.16E-04	3.37E-04	2.63E-04	2.77E-05
55	90-12-0	1-Methylnapthalene	6.19E-04	3.05E-04	1.12E-04	8.77E-05	9.25E-06
56	91-57-6	2-Methylnapthalene	1.55E-03	7.63E-04	2.80E-04	2.19E-04	2.31E-05
57	91-20-3	Napthalene	2.38E-02	1.17E-02	4.32E-03	3.38E-03	3.56E-04
58	85-01-8	Phenanthrene	7.12E-03	3.51E-03	1.29E-03	1.01E-03	1.06E-04
59	129-00-0	Pyrene	9.29E-04	4.58E-04	1.68E-04	1.32E-04	1.39E-05
60	110-86-1	Pyridine	8.05E-03	3.97E-03	1.46E-03	1.14E-03	1.20E-04
61	91-22-5	Quinoline	1.55E-03	7.63E-04	2.80E-04	2.19E-04	2.31E-05

Source: Sinclair Knight Merz, 2003

TABLE A.3: HEALTH PROTECTIVE GUIDELINES

			Acute Health Effects				Chronic Health Effects				Carcinogenic Health Effects		
No	**CAS # / ID**	**Compound Name**	Guideline	Units	Averaging Period	Reference	Guideline	Units	Averaging Period	Reference	Guideline	Units	Reference
1	TSP	Total Suspended Particulate	50	µg/m3	24 h	NEPC							
2	630-08-0	Carbon Monoxide	11,250	µg/m3	8 h	NEPC							
3	7446-09-5	Sulphur Dioxide	228	µg/m3	24 h	NEPC	57	µg/m3	Annual	NEPC			
4	10102-44-0	Nitrogen Dioxide	246	µg/m3	1 h	NEPC	62	µg/m3	Annual	NEPC			
5	7440-38-2	Arsenic					1	µg/m3	Annual	RIVM	1.5E-03	per µg/m^3	WHO
8	7439-96-5	Manganese					0.15	µg/m3	Annual	WHO			
9	7439-97-6	Mercury	1.8	µg/m3	1 h	OEHHA	1	µg/m3	Annual	WHO			
10	7439-98-7	Molybdenum					12	µg/m3	Annual	RIVM			
11	7782-49-2	Selenium					17.5	µg/m3	Annual	IRIS (oral)			
15	67-64-1	Acetone	26	ppm	≤ 24 h	ATSDR	13	ppm	Annual	ATSDR			
16	75-07-0	Acetaldehyde	2,000	µg/m3	24 h	WHO	50	µg/m3	Annual	WHO			
17	98-86-2	Acetophenone					350	µg/m3	Annual	IRIS (oral)			
18	107-02-8	Acrolein	50	µg/m3	30 min	WHO	0.00002	mg/m3	Annual	IRIS			
21	100-52-7	Benzaldehyde					350	µg/m3	Annual	IRIS (oral)			
22	50-00-0	Formaldehyde	0.04	ppm	24 h	NEPC	0.008	ppm	Annual	ATSDR			
24	78-93-3	2-Butanone	13,000	µg/m3	1 h	OEHHA	5	mg/m3	Annual	IRIS			
25	71-43-2	Benzene	0.05	ppm	≤ 24 h	ATSDR	0.03	mg/m3	Annual	IRIS	4.4E-06 - 7.5E-06	per µg/m^3	WHO
26	74-83-9	Bromomethane	0.05	ppm	≤ 24 h	ATSDR	0.005	mg/m3	Annual	IRIS			
29	74-87-3	Chloromethane	0.5	ppm	≤ 24 h	ATSDR	0.09	mg/m3	Annual	IRIS			
30	100-41-4	Ethylbenzene					22000	µg/m3	Annual	WHO			
33	98-82-8	Isopropylbenzene					0.4	mg/m3	Annual	IRIS			
35	75-09-2	Methylene Chloride	3,000	µg/m3	24 h	WHO	0.3	ppm	Annual	ATSDR			
36	108-10-1	4-Methyl-2-pentanone					3	mg/m3	Annual	IRIS			
38	100-42-5	Styrene	260	µg/m3	1 week	WHO	900	µg/m3	Annual	RIVM			
39	108-88-3	Toluene	1	ppm	24 h	NEPC	0.08	ppm	Annual	ATSDR			
40	95-63-6	1,2,4-Trimethylbenzene					0.006	mg/m3	Annual	NCEA			
41	108-67-8	1,3,5-Trimethylbenzene					0.006	mg/m3	Annual	NCEA			
44	1330-20-7	Xylenes	0.25	ppm	24 h	NEPC	870	µg/m3	Annual	WHO			
46	83-32-9	Acenaphthene					210.000	µg/m3	Annual	IRIS (oral)			
50	92-52-4	Biphenyl					175	µg/m3	Annual	IRIS (oral)			
51	132-64-9	Dibenzofuran					0.0140	mg/m3	Annual	NCEA (oral)			
52	206-44-0	Fluoranthene									8.7E-05 - 87E-05	per µg/m^3	WHO
53	86-73-7	9H-Fluorene					140.000	µg/m3	Annual	IRIS (oral)			
55	90-12-0	1-Methylnapthalene					0.245	mg/m3	Annual	ATSDR (oral)			
56	91-57-6	2-Methylnapthalene					14.0000	µg/m3	Annual	IRIS (oral)			
57	91-20-3	Napthalene					0.003	mg/m3	Annual	IRIS			
59	129-00-0	Pyrene					105.0000	µg/m3	Annual	IRIS (oral)			
60	110-86-1	Pyridine					120	µg/m3	Annual	RIVM			

TABLE A.4: QUANTITATIVE HEALTH RISK INDICATORS FOR INDIVIDUAL COMPOUNDS AT ALL RECEPTOR LOCATIONS

			Acute HI					
			Receptor 1		Receptor 2		Receptor 3	
			Baseline Liquor Burner Emissions Scenario		Baseline Liquor Burner Emissions Scenario		Baseline Liquor Burner Emissions Scenario	
No	**CAS # / ID**	**Compound Name**	Max	99.5th Percentile	Max	99.5th Percentile	Max	99.5th Percentile
1	TSP	Total Suspended Particulate	1.95E-01	1.79E-01	1.07E-01	9.89E-02	7.79E-02	6.30E-02
2	630-08-0	Carbon Monoxide	6.60E-02	3.06E-02	8.67E-02	1.54E-02	3.39E-02	9.97E-03
3	7446-09-5	Sulphur Dioxide	8.99E-03	8.24E-03	4.91E-03	4.55E-03	3.59E-03	2.90E-03
4	10102-44-0	Nitrogen Dioxide	3.09E-02	1.43E-02	4.05E-02	7.18E-03	1.59E-02	4.66E-03
15	67-64-1	Acetone	1.07E-04	9.83E-05	5.85E-05	5.44E-05	4.28E-05	3.46E-05
16	75-07-0	Acetaldehyde	9.52E-04	8.72E-04	5.19E-04	4.82E-04	3.80E-04	3.07E-04
18	107-02-8	Acrolein	2.79E-02	1.30E-02	3.67E-02	6.50E-03	1.43E-02	4.22E-03
22	50-00-0	Formaldehyde	3.71E-03	3.39E-03	2.02E-03	1.88E-03	1.48E-03	1.20E-03
24	78-93-3	2-Butanone	1.56E-04	7.23E-05	2.05E-04	3.63E-05	8.00E-05	2.35E-05
25	71-43-2	Benzene	1.54E-02	1.41E-02	8.41E-03	7.81E-03	6.15E-03	4.97E-03
26	74-83-9	Bromomethane	1.15E-05	1.05E-05	6.28E-06	5.83E-06	4.59E-06	3.71E-06
29	74-87-3	Chloromethane	7.36E-06	6.74E-06	4.02E-06	3.73E-06	2.94E-06	2.37E-06
35	75-09-2	Methylene Chloride	4.88E-07	4.47E-07	2.66E-07	2.47E-07	1.95E-07	1.57E-07
38	100-42-5	Styrene	2.42E-04	2.21E-04	1.32E-04	1.22E-04	9.64E-05	7.80E-05
39	108-88-3	Toluene	7.36E-05	6.74E-05	4.01E-05	3.73E-05	2.93E-05	2.37E-05
44	1330-20-7	Xylenes	6.19E-05	5.67E-05	3.38E-05	3.14E-05	2.47E-05	2.00E-05
		Total	*0.350*	*0.264*	*0.287*	*0.143*	*0.154*	*0.091*

			Acute HI					
			Receptor 1		Receptor 2		Receptor 3	
			Upgraded Liquor Burner Emissions Scenario		Upgraded Liquor Burner Emissions Scenario		Upgraded Liquor Burner Emissions Scenario	
No	**CAS # / ID**	**Compound Name**	Max	99.5th Percentile	Max	99.5th Percentile	Max	99.5th Percentile
1	TSP	Total Suspended Particulate	7.62E-03	6.98E-03	4.16E-03	3.86E-03	3.04E-03	2.46E-03
2	630-08-0	Carbon Monoxide	2.06E-03	9.57E-04	2.71E-03	4.80E-04	1.06E-03	3.11E-04
3	7446-09-5	Sulphur Dioxide	8.99E-03	8.24E-03	4.91E-03	4.55E-03	3.59E-03	2.90E-03
4	10102-44-0	Nitrogen Dioxide	3.09E-02	1.43E-02	4.05E-02	7.18E-03	1.59E-02	4.66E-03
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
15	67-64-1	Acetone	2.83E-06	2.59E-06	1.54E-06	1.43E-06	1.13E-06	9.13E-07
16	75-07-0	Acetaldehyde	3.81E-05	3.49E-05	2.08E-05	1.93E-05	1.52E-05	1.23E-05
18	107-02-8	Acrolein	1.40E-04	6.48E-05	1.83E-04	3.25E-05	7.17E-05	2.11E-05
22	50-00-0	Formaldehyde	2.82E-04	2.59E-04	1.54E-04	1.43E-04	1.13E-04	9.11E-05
24	78-93-3	2-Butanone	7.79E-07	3.62E-07	1.02E-06	1.81E-07	4.00E-07	1.18E-07
25	71-43-2	Benzene	4.38E-04	4.01E-04	2.39E-04	2.22E-04	1.75E-04	1.41E-04
26	74-83-9	Bromomethane	2.30E-07	2.11E-07	1.26E-07	1.17E-07	9.18E-08	7.43E-08
29	74-87-3	Chloromethane	1.47E-07	1.35E-07	8.03E-08	7.46E-08	5.87E-08	4.75E-08
35	75-09-2	Methylene Chloride	9.76E-09	8.94E-09	5.33E-09	4.95E-09	3.89E-09	3.15E-09
38	100-42-5	Styrene	4.83E-06	4.43E-06	2.64E-06	2.45E-06	1.93E-06	1.56E-06
39	108-88-3	Toluene	4.63E-06	4.24E-06	2.53E-06	2.35E-06	1.85E-06	1.49E-06
44	1330-20-7	Xylenes	1.24E-06	1.13E-06	6.75E-07	6.27E-07	4.94E-07	3.99E-07
		Total	*0.050*	*0.031*	*0.053*	*0.017*	*0.024*	*0.011*

TABLE A.4: QUANTITATIVE HEALTH RISK INDICATORS FOR INDIVIDUAL COMPOUNDS AT ALL RECEPTOR LOCATIONS

			Acute HI					
			Receptor 4		Receptor 5		Receptor 6	
			Baseline Liquor Burner Emissions Scenario		Baseline Liquor Burner Emissions Scenario		Baseline Liquor Burner Emissions Scenario	
No	**CAS # / ID**	**Compound Name**	Max	99.5th Percentile	Max	99.5th Percentile	Max	99.5th Percentile
1	TSP	Total Suspended Particulate	6.66E-02	6.28E-02	1.01E-01	7.60E-02	1.29E-01	7.62E-02
2	630-08-0	Carbon Monoxide	3.21E-02	1.12E-02	7.30E-02	1.30E-02	1.08E-01	1.51E-02
3	7446-09-5	Sulphur Dioxide	3.07E-03	2.89E-03	4.64E-03	3.50E-03	5.92E-03	3.51E-03
4	10102-44-0	Nitrogen Dioxide	1.50E-02	5.23E-03	3.41E-02	6.10E-03	5.06E-02	7.06E-03
15	67-64-1	Acetone	3.66E-05	3.45E-05	5.54E-05	4.18E-05	7.07E-05	4.19E-05
16	75-07-0	Acetaldehyde	3.25E-04	3.06E-04	4.91E-04	3.71E-04	6.27E-04	3.72E-04
18	107-02-8	Acrolein	1.36E-02	4.73E-03	3.09E-02	5.51E-03	4.58E-02	6.39E-03
22	50-00-0	Formaldehyde	1.26E-03	1.19E-03	1.91E-03	1.44E-03	2.44E-03	1.45E-03
24	78-93-3	2-Butanone	7.59E-05	2.64E-05	1.72E-04	3.08E-05	2.55E-04	3.56E-05
25	71-43-2	Benzene	5.26E-03	4.96E-03	7.96E-03	6.00E-03	1.02E-02	6.02E-03
26	74-83-9	Bromomethane	3.93E-06	3.70E-06	5.94E-06	4.48E-06	7.58E-06	4.49E-06
29	74-87-3	Chloromethane	2.51E-06	2.37E-06	3.80E-06	2.87E-06	4.85E-06	2.87E-06
35	75-09-2	Methylene Chloride	1.66E-07	1.57E-07	2.52E-07	1.90E-07	3.21E-07	1.91E-07
38	100-42-5	Styrene	8.24E-05	7.77E-05	1.25E-04	9.41E-05	1.59E-04	9.44E-05
39	108-88-3	Toluene	2.51E-05	2.37E-05	3.80E-05	2.87E-05	4.85E-05	2.87E-05
44	1330-20-7	Xylenes	2.11E-05	1.99E-05	3.19E-05	2.41E-05	4.08E-05	2.42E-05
		Total	*0.138*	*0.093*	*0.254*	*0.112*	*0.353*	*0.116*

			Acute HI					
			Receptor 4		Receptor 5		Receptor 6	
			Upgraded Liquor Burner Emissions Scenario		Upgraded Liquor Burner Emissions Scenario		Upgraded Liquor Burner Emissions Scenario	
No	**CAS # / ID**	**Compound Name**	Max	99.5th Percentile	Max	99.5th Percentile	Max	99.5th Percentile
1	TSP	Total Suspended Particulate	2.60E-03	2.45E-03	3.93E-03	2.97E-03	5.02E-03	2.98E-03
2	630-08-0	Carbon Monoxide	1.00E-03	3.49E-04	2.28E-03	4.07E-04	3.38E-03	4.71E-04
3	7446-09-5	Sulphur Dioxide	3.07E-03	2.89E-03	4.64E-03	3.50E-03	5.92E-03	3.51E-03
4	10102-44-0	Nitrogen Dioxide	1.50E-02	5.23E-03	3.41E-02	6.10E-03	5.06E-02	7.06E-03
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
15	67-64-1	Acetone	9.66E-07	9.10E-07	1.46E-06	1.10E-06	1.86E-06	1.11E-06
16	75-07-0	Acetaldehyde	1.30E-05	1.23E-05	1.97E-05	1.48E-05	2.51E-05	1.49E-05
18	107-02-8	Acrolein	6.80E-05	2.37E-05	1.54E-04	2.76E-05	2.29E-04	3.19E-05
22	50-00-0	Formaldehyde	9.63E-05	9.08E-05	1.46E-04	1.10E-04	1.86E-04	1.10E-04
24	78-93-3	2-Butanone	3.79E-07	1.32E-07	8.62E-07	1.54E-07	1.28E-06	1.78E-07
25	71-43-2	Benzene	1.49E-04	1.41E-04	2.26E-04	1.70E-04	2.88E-04	1.71E-04
26	74-83-9	Bromomethane	7.85E-08	7.40E-08	1.19E-07	8.96E-08	1.52E-07	8.99E-08
29	74-87-3	Chloromethane	5.02E-08	4.74E-08	7.60E-08	5.73E-08	9.70E-08	5.75E-08
35	75-09-2	Methylene Chloride	3.33E-09	3.14E-09	5.04E-09	3.80E-09	6.43E-09	3.81E-09
38	100-42-5	Styrene	1.65E-06	1.55E-06	2.49E-06	1.88E-06	3.18E-06	1.89E-06
39	108-88-3	Toluene	1.58E-06	1.49E-06	2.39E-06	1.80E-06	3.05E-06	1.81E-06
44	1330-20-7	Xylenes	4.22E-07	3.98E-07	6.39E-07	4.82E-07	8.15E-07	4.83E-07
		Total	*0.022*	*0.011*	*0.046*	*0.013*	*0.066*	*0.014*

TABLE A.4: QUANTITATIVE HEALTH RISK INDICATORS FOR INDIVIDUAL COMPOUNDS AT ALL RECEPTOR LOCATIONS

			Acute HI					
			Receptor 7		Receptor 8		Receptor 9	
			Baseline Liquor Burner Emissions Scenario		Baseline Liquor Burner Emissions Scenario		Baseline Liquor Burner Emissions Scenario	
No	**CAS # / ID**	**Compound Name**	Max	99.5th Percentile	Max	99.5th Percentile	Max	99.5th Percentile
1	TSP	Total Suspended Particulate	6.74E-02	4.02E-02	7.93E-02	6.81E-02	5.19E-02	4.84E-02
2	630-08-0	Carbon Monoxide	8.15E-02	8.34E-03	3.24E-02	1.39E-02	2.41E-02	1.02E-02
3	7446-09-5	Sulphur Dioxide	3.10E-03	1.85E-03	3.65E-03	3.14E-03	2.39E-03	2.23E-03
4	10102-44-0	Nitrogen Dioxide	3.81E-02	3.90E-03	1.51E-02	6.50E-03	1.13E-02	4.78E-03
15	67-64-1	Acetone	3.70E-05	2.21E-05	4.36E-05	3.74E-05	2.85E-05	2.66E-05
16	75-07-0	Acetaldehyde	3.28E-04	1.96E-04	3.87E-04	3.32E-04	2.53E-04	2.36E-04
18	107-02-8	Acrolein	3.45E-02	3.53E-03	1.37E-02	5.88E-03	1.02E-02	4.32E-03
22	50-00-0	Formaldehyde	1.28E-03	7.63E-04	1.51E-03	1.29E-03	9.84E-04	9.19E-04
24	78-93-3	2-Butanone	1.92E-04	1.97E-05	7.64E-05	3.28E-05	5.69E-05	2.41E-05
25	71-43-2	Benzene	5.32E-03	3.17E-03	6.26E-03	5.38E-03	4.10E-03	3.82E-03
26	74-83-9	Bromomethane	3.97E-06	2.37E-06	4.67E-06	4.01E-06	3.06E-06	2.85E-06
29	74-87-3	Chloromethane	2.54E-06	1.52E-06	2.99E-06	2.57E-06	1.96E-06	1.83E-06
35	75-09-2	Methylene Chloride	1.68E-07	1.00E-07	1.98E-07	1.70E-07	1.30E-07	1.21E-07
38	100-42-5	Styrene	8.34E-05	4.98E-05	9.82E-05	8.43E-05	6.42E-05	5.99E-05
39	108-88-3	Toluene	2.54E-05	1.51E-05	2.99E-05	2.57E-05	1.95E-05	1.82E-05
44	1330-20-7	Xylenes	2.13E-05	1.27E-05	2.51E-05	2.16E-05	1.64E-05	1.53E-05
		Total	*0.232*	*0.062*	*0.153*	*0.105*	*0.105*	*0.075*

			Acute HI					
			Receptor 7		Receptor 8		Receptor 9	
			Upgraded Liquor Burner Emissions Scenario		Upgraded Liquor Burner Emissions Scenario		Upgraded Liquor Burner Emissions Scenario	
No	**CAS # / ID**	**Compound Name**	Max	99.5th Percentile	Max	99.5th Percentile	Max	99.5th Percentile
1	TSP	Total Suspended Particulate	2.63E-03	1.57E-03	3.10E-03	2.66E-03	2.02E-03	1.89E-03
2	630-08-0	Carbon Monoxide	2.54E-03	2.60E-04	1.01E-03	4.34E-04	7.53E-04	3.19E-04
3	7446-09-5	Sulphur Dioxide	3.10E-03	1.85E-03	3.65E-03	3.14E-03	2.39E-03	2.23E-03
4	10102-44-0	Nitrogen Dioxide	3.81E-02	3.90E-03	1.51E-02	6.50E-03	1.13E-02	4.78E-03
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
15	67-64-1	Acetone	9.76E-07	5.83E-07	1.15E-06	9.87E-07	7.52E-07	7.02E-07
16	75-07-0	Acetaldehyde	1.31E-05	7.85E-06	1.55E-05	1.33E-05	1.01E-05	9.45E-06
18	107-02-8	Acrolein	1.72E-04	1.76E-05	6.85E-05	2.94E-05	5.10E-05	2.16E-05
22	50-00-0	Formaldehyde	9.74E-05	5.81E-05	1.15E-04	9.84E-05	7.50E-05	7.00E-05
24	78-93-3	2-Butanone	9.62E-07	9.85E-08	3.82E-07	1.64E-07	2.85E-07	1.21E-07
25	71-43-2	Benzene	1.51E-04	9.01E-05	1.78E-04	1.53E-04	1.16E-04	1.09E-04
26	74-83-9	Bromomethane	7.94E-08	4.74E-08	9.35E-08	8.03E-08	6.11E-08	5.71E-08
29	74-87-3	Chloromethane	5.08E-08	3.03E-08	5.98E-08	5.13E-08	3.91E-08	3.65E-08
35	75-09-2	Methylene Chloride	3.37E-09	2.01E-09	3.96E-09	3.40E-09	2.59E-09	2.42E-09
38	100-42-5	Styrene	1.67E-06	9.95E-07	1.96E-06	1.69E-06	1.28E-06	1.20E-06
39	108-88-3	Toluene	1.60E-06	9.54E-07	1.88E-06	1.62E-06	1.23E-06	1.15E-06
44	1330-20-7	Xylenes	4.27E-07	2.55E-07	5.03E-07	4.32E-07	3.29E-07	3.07E-07
		Total	*0.047*	*0.008*	*0.023*	*0.013*	*0.017*	*0.009*

TABLE A.4: QUANTITATIVE HEALTH RISK INDICATORS FOR INDIVIDUAL COMPOUNDS AT ALL RECEPTOR LOCATIONS

			Acute HI						Acute HI		
			Receptor 10		Receptor 11		Receptor 12		Receptor 13		Contribution
			Baseline Liquor Burner Emissions Scenario		Baseline Liquor Burner Emissions Scenario		Baseline Liquor Burner Emissions Scenario		Baseline Liquor Burner Emissions Scenario		
No	**CAS # / ID**	**Compound Name**	Max	99.5th Percentile	Max	99.5th Percentile	Max	99.5th Percentile	Max	99.5th Percentile	%
1	TSP	Total Suspended Particulate	6.08E-02	5.73E-02	6.16E-02	5.03E-02	4.76E-02	4.55E-02	1.12E-01	8.77E-02	55.8
2	630-08-0	Carbon Monoxide	2.63E-02	1.06E-02	2.43E-02	9.06E-03	2.39E-02	6.73E-03	4.54E-02	2.24E-02	18.9
3	7446-09-5	Sulphur Dioxide	2.80E-03	2.64E-03	2.84E-03	2.32E-03	2.19E-03	2.09E-03	5.17E-03	4.04E-03	2.6
4	10102-44-0	Nitrogen Dioxide	1.23E-02	4.94E-03	1.14E-02	4.24E-03	1.12E-02	3.15E-03	2.12E-02	1.05E-02	8.8
15	67-64-1	Acetone	3.34E-05	3.15E-05	3.39E-05	2.76E-05	2.62E-05	2.50E-05	6.17E-05	4.82E-05	0.03
16	75-07-0	Acetaldehyde	2.96E-04	2.79E-04	3.00E-04	2.45E-04	2.32E-04	2.22E-04	5.47E-04	4.28E-04	0.3
18	107-02-8	Acrolein	1.11E-02	4.47E-03	1.03E-02	3.83E-03	1.01E-02	2.85E-03	1.92E-02	9.47E-03	8.0
22	50-00-0	Formaldehyde	1.15E-03	1.09E-03	1.17E-03	9.54E-04	9.03E-04	8.63E-04	2.13E-03	1.66E-03	1.1
24	78-93-3	2-Butanone	6.21E-05	2.49E-05	5.74E-05	2.14E-05	5.64E-05	1.59E-05	1.07E-04	5.28E-05	0.04
25	71-43-2	Benzene	4.80E-03	4.52E-03	4.87E-03	3.97E-03	3.76E-03	3.59E-03	8.86E-03	6.93E-03	4.4
26	74-83-9	Bromomethane	3.58E-06	3.37E-06	3.63E-06	2.96E-06	2.81E-06	2.68E-06	6.61E-06	5.17E-06	0.003
29	74-87-3	Chloromethane	2.29E-06	2.16E-06	2.32E-06	1.90E-06	1.79E-06	1.71E-06	4.23E-06	3.31E-06	0.002
35	75-09-2	Methylene Chloride	1.52E-07	1.43E-07	1.54E-07	1.26E-07	1.19E-07	1.14E-07	2.80E-07	2.19E-07	0.0001
38	100-42-5	Styrene	7.53E-05	7.09E-05	7.63E-05	6.22E-05	5.89E-05	5.63E-05	1.39E-04	1.09E-04	0.1
39	108-88-3	Toluene	2.29E-05	2.16E-05	2.32E-05	1.89E-05	1.79E-05	1.71E-05	4.23E-05	3.31E-05	0.02
44	1330-20-7	Xylenes	1.93E-05	1.81E-05	1.95E-05	1.59E-05	1.51E-05	1.44E-05	3.56E-05	2.78E-05	0.02
		Total	*0.120*	*0.086*	*0.117*	*0.075*	*0.100*	*0.065*	*0.215*	*0.143*	*100.000*

			Acute HI						Acute HI		
			Receptor 10		Receptor 11		Receptor 12		Receptor 13		Contribution
			Upgraded Liquor Burner Emissions Scenario		Upgraded Liquor Burner Emissions Scenario		Upgraded Liquor Burner Emissions Scenario		Upgraded Liquor Burner Emissions Scenario		
No	**CAS # / ID**	**Compound Name**	Max	99.5th Percentile	Max	99.5th Percentile	Max	99.5th Percentile	Max	99.5th Percentile	%
1	TSP	Total Suspended Particulate	2.37E-03	2.24E-03	2.41E-03	1.96E-03	1.86E-03	1.78E-03	4.38E-03	3.42E-03	15.1
2	630-08-0	Carbon Monoxide	8.21E-04	3.30E-04	7.60E-04	2.83E-04	7.46E-04	2.10E-04	1.42E-03	6.99E-04	4.1
3	7446-09-5	Sulphur Dioxide	2.80E-03	2.64E-03	2.84E-03	2.32E-03	2.19E-03	2.09E-03	5.17E-03	4.04E-03	17.8
4	10102-44-0	Nitrogen Dioxide	1.23E-02	4.94E-03	1.14E-02	4.24E-03	1.12E-02	3.15E-03	2.12E-02	1.05E-02	61.2
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0
15	67-64-1	Acetone	8.82E-07	8.30E-07	8.93E-07	7.29E-07	6.90E-07	6.59E-07	1.63E-06	1.27E-06	0.01
16	75-07-0	Acetaldehyde	1.19E-05	1.12E-05	1.20E-05	9.82E-06	9.29E-06	8.88E-06	2.19E-05	1.71E-05	0.1
18	107-02-8	Acrolein	5.56E-05	2.23E-05	5.15E-05	1.92E-05	5.05E-05	1.42E-05	9.60E-05	4.73E-05	0.3
22	50-00-0	Formaldehyde	8.79E-05	8.28E-05	8.91E-05	7.27E-05	6.88E-05	6.57E-05	1.62E-04	1.27E-04	0.6
24	78-93-3	2-Butanone	3.10E-07	1.25E-07	2.87E-07	1.07E-07	2.82E-07	7.95E-08	5.36E-07	2.64E-07	0.00
25	71-43-2	Benzene	1.36E-04	1.28E-04	1.38E-04	1.13E-04	1.07E-04	1.02E-04	2.52E-04	1.97E-04	0.9
26	74-83-9	Bromomethane	7.17E-08	6.75E-08	7.26E-08	5.93E-08	5.61E-08	5.36E-08	1.32E-07	1.03E-07	0.0005
29	74-87-3	Chloromethane	4.59E-08	4.32E-08	4.65E-08	3.79E-08	3.59E-08	3.43E-08	8.46E-08	6.61E-08	0.0003
35	75-09-2	Methylene Chloride	3.04E-09	2.86E-09	3.08E-09	2.51E-09	2.38E-09	2.27E-09	5.61E-09	4.39E-09	0.00002
38	100-42-5	Styrene	1.51E-06	1.42E-06	1.53E-06	1.24E-06	1.18E-06	1.13E-06	2.78E-06	2.17E-06	0.01
39	108-88-3	Toluene	1.44E-06	1.36E-06	1.46E-06	1.19E-06	1.13E-06	1.08E-06	2.66E-06	2.08E-06	0.009
44	1330-20-7	Xylenes	3.86E-07	3.63E-07	3.91E-07	3.19E-07	3.02E-07	2.88E-07	7.11E-07	5.56E-07	0.002
		Total	*0.019*	*0.010*	*0.018*	*0.009*	*0.016*	*0.007*	*0.033*	*0.019*	*100.000*

TABLE A.4: QUANTITATIVE HEALTH RISK INDICATORS FOR INDIVIDUAL COMPOUNDS AT ALL RECEPTOR LOCATIONS

			Chronic HI													
			Baseline Liquor Burner Emissions Scenario													
			Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5	Receptor 6	Receptor 7	Receptor 8	Receptor 9	Receptor 10	Receptor 11	Receptor 12	Receptor 13	Contribution
No	**CAS # / ID**	**Compound Name**	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	%
3	7446-09-5	Sulphur Dioxide	2.03E-03	9.23E-04	5.85E-04	6.55E-04	7.17E-04	9.80E-04	4.06E-04	9.87E-04	8.14E-04	7.74E-04	5.17E-04	4.05E-04	1.70E-03	0.266
4	10102-44-0	Nitrogen Dioxide	1.50E-03	6.82E-04	4.32E-04	4.84E-04	5.30E-04	7.24E-04	3.00E-04	7.29E-04	6.01E-04	5.72E-04	3.82E-04	2.99E-04	1.26E-03	0.196
5	7440-38-2	Arsenic	2.75E-05	1.25E-05	7.94E-06	8.88E-06	9.73E-06	1.33E-05	5.51E-06	1.34E-05	1.10E-05	1.05E-05	7.02E-06	5.49E-06	2.31E-05	0.004
8	7439-96-5	Manganese	3.67E-04	1.67E-04	1.06E-04	1.18E-04	1.30E-04	1.77E-04	7.35E-05	1.79E-04	1.47E-04	1.40E-04	9.36E-05	7.32E-05	3.08E-04	0.048
10	7439-98-7	Molybdenum	4.59E-06	2.09E-06	1.32E-06	1.48E-06	1.62E-06	2.22E-06	9.19E-07	2.23E-06	1.84E-06	1.75E-06	1.17E-06	9.15E-07	3.85E-06	0.001
11	7782-49-2	Selenium	1.89E-05	8.59E-06	5.45E-06	6.09E-06	6.67E-06	9.12E-06	3.78E-06	9.18E-06	7.57E-06	7.20E-06	4.81E-06	3.76E-06	1.59E-05	0.002
15	67-64-1	Acetone	1.21E-05	5.51E-06	3.49E-06	3.91E-06	4.28E-06	5.85E-06	2.42E-06	5.89E-06	4.86E-06	4.62E-06	3.09E-06	2.41E-06	1.02E-05	0.002
16	75-07-0	Acetaldehyde	2.15E-03	9.77E-04	6.20E-04	6.93E-04	7.59E-04	1.04E-03	4.30E-04	1.04E-03	8.61E-04	8.20E-04	5.48E-04	4.28E-04	1.80E-03	0.281
17	98-86-2	Acetophenone	4.72E-06	2.15E-06	1.36E-06	1.52E-06	1.67E-06	2.28E-06	9.45E-07	2.30E-06	1.89E-06	1.80E-06	1.20E-06	9.41E-07	3.96E-06	0.001
18	107-02-8	Acrolein	7.43E-01	3.38E-01	2.14E-01	2.40E-01	2.63E-01	3.59E-01	1.49E-01	3.62E-01	2.98E-01	2.84E-01	1.90E-01	1.48E-01	6.24E-01	97.384
21	100-52-7	Benzaldehyde	2.04E-05	9.30E-06	5.90E-06	6.60E-06	7.23E-06	9.88E-06	4.10E-06	9.95E-06	8.20E-06	7.80E-06	5.21E-06	4.08E-06	1.72E-05	0.003
22	50-00-0	Formaldehyde	1.05E-03	4.79E-04	3.04E-04	3.40E-04	3.72E-04	5.09E-04	2.11E-04	5.12E-04	4.23E-04	4.02E-04	2.69E-04	2.10E-04	8.85E-04	0.138
24	78-93-3	2-Butanone	4.95E-06	2.25E-06	1.43E-06	1.60E-06	1.75E-06	2.39E-06	9.93E-07	2.41E-06	1.99E-06	1.89E-06	1.26E-06	9.88E-07	4.16E-06	0.001
25	71-43-2	Benzene	5.05E-03	2.30E-03	1.46E-03	1.63E-03	1.78E-03	2.44E-03	1.01E-03	2.46E-03	2.02E-03	1.93E-03	1.29E-03	1.01E-03	4.24E-03	0.661
26	74-83-9	Bromomethane	2.75E-05	1.25E-05	7.94E-06	8.88E-06	9.73E-06	1.33E-05	5.51E-06	1.34E-05	1.10E-05	1.05E-05	7.02E-06	5.49E-06	2.31E-05	0.004
29	74-87-3	Chloromethane	5.20E-06	2.37E-06	1.50E-06	1.68E-06	1.84E-06	2.51E-06	1.04E-06	2.53E-06	2.09E-06	1.98E-06	1.33E-06	1.04E-06	4.37E-06	0.001
30	100-41-4	Ethylbenzene	8.01E-08	3.64E-08	2.31E-08	2.58E-08	2.83E-08	3.87E-08	1.60E-08	3.90E-08	3.21E-08	3.06E-08	2.04E-08	1.60E-08	6.72E-08	0.000
33	98-82-8	Isopropylbenzene	4.13E-07	1.88E-07	1.19E-07	1.33E-07	1.46E-07	1.99E-07	8.27E-08	2.01E-07	1.66E-07	1.58E-07	1.05E-07	8.24E-08	3.47E-07	0.000
35	75-09-2	Methylene Chloride	7.25E-08	3.30E-08	2.09E-08	2.34E-08	2.56E-08	3.50E-08	1.45E-08	3.53E-08	2.91E-08	2.77E-08	1.85E-08	1.45E-08	6.09E-08	0.000
36	108-10-1	4-Methyl-2-pentanone	5.50E-08	2.50E-08	1.59E-08	1.78E-08	1.95E-08	2.66E-08	1.10E-08	2.68E-08	2.21E-08	2.10E-08	1.40E-08	1.10E-08	4.62E-08	0.000
38	100-42-5	Styrene	5.81E-06	2.64E-06	1.68E-06	1.88E-06	2.05E-06	2.81E-06	1.16E-06	2.83E-06	2.33E-06	2.22E-06	1.48E-06	1.16E-06	4.88E-06	0.001
39	108-88-3	Toluene	5.19E-05	2.36E-05	1.50E-05	1.68E-05	1.84E-05	2.51E-05	1.04E-05	2.53E-05	2.08E-05	1.98E-05	1.32E-05	1.04E-05	4.36E-05	0.007
40	95-63-6	1,2,4-Trimethylbenzene	1.19E-04	5.43E-05	3.44E-05	3.85E-05	4.22E-05	5.76E-05	2.39E-05	5.80E-05	4.79E-05	4.55E-05	3.04E-05	2.38E-05	1.00E-04	0.016
41	108-67-8	1,3,5-Trimethylbenzene	9.17E-05	4.17E-05	2.65E-05	2.96E-05	3.24E-05	4.43E-05	1.84E-05	4.46E-05	3.68E-05	3.50E-05	2.34E-05	1.83E-05	7.70E-05	0.012
44	1330-20-7	Xylenes	4.75E-06	2.16E-06	1.37E-06	1.53E-06	1.68E-06	2.29E-06	9.51E-07	2.31E-06	1.90E-06	1.81E-06	1.21E-06	9.47E-07	3.99E-06	0.001
46	83-32-9	Acenaphthene	1.31E-06	5.96E-07	3.78E-07	4.23E-07	4.63E-07	6.33E-07	2.63E-07	6.38E-07	5.26E-07	5.00E-07	3.34E-07	2.61E-07	1.10E-06	0.000
50	92-52-4	Biphenyl	7.86E-06	3.58E-06	2.27E-06	2.54E-06	2.78E-06	3.80E-06	1.58E-06	3.83E-06	3.16E-06	3.00E-06	2.01E-06	1.57E-06	6.60E-06	0.001
51	132-64-9	Dibenzofuran	1.77E-04	8.05E-05	5.11E-05	5.71E-05	6.26E-05	8.55E-05	3.55E-05	8.61E-05	7.10E-05	6.75E-05	4.51E-05	3.53E-05	1.49E-04	0.023
53	86-73-7	9H-Fluorene	1.97E-06	8.95E-07	5.67E-07	6.34E-07	6.95E-07	9.50E-07	3.94E-07	9.57E-07	7.89E-07	7.50E-07	5.01E-07	3.92E-07	1.65E-06	0.000
55	90-12-0	1-Methylnapthalene	2.25E-06	1.02E-06	6.48E-07	7.25E-07	7.94E-07	1.09E-06	4.50E-07	1.09E-06	9.02E-07	8.58E-07	5.73E-07	4.48E-07	1.89E-06	0.000
56	91-57-6	2-Methylnapthalene	9.83E-05	4.47E-05	2.84E-05	3.17E-05	3.48E-05	4.75E-05	1.97E-05	4.78E-05	3.94E-05	3.75E-05	2.51E-05	1.96E-05	8.26E-05	0.013
57	91-20-3	Napthalene	7.06E-03	3.21E-03	2.04E-03	2.28E-03	2.50E-03	3.41E-03	1.42E-03	3.44E-03	2.83E-03	2.70E-03	1.80E-03	1.41E-03	5.93E-03	0.926
59	129-00-0	Pyrene	7.86E-06	3.58E-06	2.27E-06	2.54E-06	2.78E-06	3.80E-06	1.58E-06	3.83E-06	3.16E-06	3.00E-06	2.01E-06	1.57E-06	6.60E-06	0.001
60	110-86-1	Pyridine	5.96E-05	2.71E-05	1.72E-05	1.92E-05	2.11E-05	2.88E-05	1.19E-05	2.90E-05	2.39E-05	2.28E-05	1.52E-05	1.19E-05	5.01E-05	0.008
		Total	*0.763*	*0.347*	*0.220*	*0.246*	*0.270*	*0.369*	*0.153*	*0.371*	*0.306*	*0.291*	*0.195*	*0.152*	*0.641*	*100.000*

TABLE A.4: QUANTITATIVE HEALTH RISK INDICATORS FOR INDIVIDUAL COMPOUNDS AT ALL RECEPTOR LOCATIONS

			Chronic HI													
			Upgraded Liquor Burner Emissions Scenario													
			Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5	Receptor 6	Receptor 7	Receptor 8	Receptor 9	Receptor 10	Receptor 11	Receptor 12	Receptor 13	Contribution
No	**CAS # / ID**	**Compound Name**	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	%
3	7446-09-5	Sulphur Dioxide	2.03E-03	9.23E-04	5.85E-04	6.55E-04	7.17E-04	9.80E-04	4.06E-04	9.87E-04	8.14E-04	7.74E-04	5.17E-04	4.05E-04	1.70E-03	26.253
4	10102-44-0	Nitrogen Dioxide	1.50E-03	6.82E-04	4.32E-04	4.84E-04	5.30E-04	7.24E-04	3.00E-04	7.29E-04	6.01E-04	5.72E-04	3.82E-04	2.99E-04	1.26E-03	19.395
5	7440-38-2	Arsenic	1.07E-06	4.89E-07	3.10E-07	3.47E-07	3.80E-07	5.19E-07	2.15E-07	5.23E-07	4.31E-07	4.10E-07	2.74E-07	2.14E-07	9.02E-07	0.014
8	7439-96-5	Manganese	1.43E-05	6.52E-06	4.13E-06	4.62E-06	5.07E-06	6.92E-06	2.87E-06	6.97E-06	5.75E-06	5.47E-06	3.65E-06	2.86E-06	1.20E-05	0.185
9	7439-97-6	Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.000
10	7439-98-7	Molybdenum	1.79E-07	8.15E-08	5.17E-08	5.78E-08	6.33E-08	8.65E-08	3.59E-08	8.71E-08	7.19E-08	6.84E-08	4.57E-08	3.57E-08	1.50E-07	0.002
11	7782-49-2	Selenium	7.37E-07	3.35E-07	2.13E-07	2.38E-07	2.60E-07	3.56E-07	1.48E-07	3.59E-07	2.96E-07	2.81E-07	1.88E-07	1.47E-07	6.19E-07	0.010
15	67-64-1	Acetone	3.19E-07	1.45E-07	9.21E-08	1.03E-07	1.13E-07	1.54E-07	6.40E-08	1.55E-07	1.28E-07	1.22E-07	8.14E-08	6.37E-08	2.68E-07	0.004
16	75-07-0	Acetaldehyde	8.60E-05	3.91E-05	2.48E-05	2.77E-05	3.04E-05	4.15E-05	1.72E-05	4.18E-05	3.45E-05	3.28E-05	2.19E-05	1.71E-05	7.22E-05	1.113
17	98-86-2	Acetophenone	2.36E-08	1.07E-08	6.81E-09	7.61E-09	8.34E-09	1.14E-08	4.73E-09	1.15E-08	9.47E-09	9.01E-09	6.02E-09	4.71E-09	1.98E-08	0.000
18	107-02-8	Acrolein	3.72E-03	1.69E-03	1.07E-03	1.20E-03	1.31E-03	1.80E-03	7.44E-04	1.81E-03	1.49E-03	1.42E-03	9.48E-04	7.41E-04	3.12E-03	48.099
21	100-52-7	Benzaldehyde	1.02E-07	4.65E-08	2.95E-08	3.30E-08	3.61E-08	4.94E-08	2.05E-08	4.97E-08	4.10E-08	3.90E-08	2.61E-08	2.04E-08	8.59E-08	0.001
22	50-00-0	Formaldehyde	8.02E-05	3.65E-05	2.32E-05	2.59E-05	2.84E-05	3.88E-05	1.61E-05	3.90E-05	3.22E-05	3.06E-05	2.05E-05	1.60E-05	6.74E-05	1.039
24	78-93-3	2-Butanone	2.48E-08	1.13E-08	7.15E-09	7.99E-09	8.76E-09	1.20E-08	4.96E-09	1.21E-08	9.94E-09	9.46E-09	6.32E-09	4.94E-09	2.08E-08	0.000
25	71-43-2	Benzene	1.43E-04	6.52E-05	4.13E-05	4.62E-05	5.07E-05	6.92E-05	2.87E-05	6.97E-05	5.75E-05	5.47E-05	3.65E-05	2.86E-05	1.20E-04	1.855
26	74-83-9	Bromomethane	5.50E-07	2.50E-07	1.59E-07	1.78E-07	1.95E-07	2.66E-07	1.10E-07	2.68E-07	2.21E-07	2.10E-07	1.40E-07	1.10E-07	4.62E-07	0.007
29	74-87-3	Chloromethane	1.04E-07	4.73E-08	3.00E-08	3.36E-08	3.68E-08	5.02E-08	2.08E-08	5.06E-08	4.17E-08	3.97E-08	2.65E-08	2.07E-08	8.73E-08	0.001
30	100-41-4	Ethylbenzene	1.60E-09	7.29E-10	4.62E-10	5.17E-10	5.66E-10	7.74E-10	3.21E-10	7.79E-10	6.43E-10	6.11E-10	4.08E-10	3.19E-10	1.34E-09	0.000
33	98-82-8	Isopropylbenzene	8.26E-09	3.76E-09	2.38E-09	2.66E-09	2.92E-09	3.99E-09	1.65E-09	4.02E-09	3.31E-09	3.15E-09	2.11E-09	1.65E-09	6.93E-09	0.000
35	75-09-2	Methylene Chloride	1.45E-09	6.60E-10	4.19E-10	4.68E-10	5.13E-10	7.01E-10	2.91E-10	7.06E-10	5.82E-10	5.54E-10	3.70E-10	2.89E-10	1.22E-09	0.000
36	108-10-1	4-Methyl-2-pentanone	1.10E-09	5.01E-10	3.18E-10	3.55E-10	3.89E-10	5.32E-10	2.21E-10	5.36E-10	4.42E-10	4.20E-10	2.81E-10	2.20E-10	9.25E-10	0.000
38	100-42-5	Styrene	1.16E-07	5.29E-08	3.35E-08	3.75E-08	4.11E-08	5.61E-08	2.33E-08	5.65E-08	4.66E-08	4.44E-08	2.96E-08	2.32E-08	9.76E-08	0.002
39	108-88-3	Toluene	3.27E-06	1.49E-06	9.44E-07	1.06E-06	1.16E-06	1.58E-06	6.55E-07	1.59E-06	1.31E-06	1.25E-06	8.34E-07	6.52E-07	2.75E-06	0.042
40	95-63-6	1,2,4-Trimethylbenzene	2.39E-06	1.09E-06	6.88E-07	7.70E-07	8.43E-07	1.15E-06	4.78E-07	1.16E-06	9.57E-07	9.11E-07	6.08E-07	4.76E-07	2.00E-06	0.031
41	108-67-8	1,3,5-Trimethylbenzene	1.83E-06	8.35E-07	5.30E-07	5.92E-07	6.49E-07	8.86E-07	3.68E-07	8.93E-07	7.36E-07	7.00E-07	4.68E-07	3.66E-07	1.54E-06	0.024
44	1330-20-7	Xylenes	9.49E-08	4.32E-08	2.74E-08	3.06E-08	3.36E-08	4.59E-08	1.90E-08	4.62E-08	3.81E-08	3.62E-08	2.42E-08	1.89E-08	7.97E-08	0.001
46	83-32-9	Acenaphthene	2.62E-08	1.19E-08	7.56E-09	8.46E-09	9.27E-09	1.27E-08	5.25E-09	1.28E-08	1.05E-08	1.00E-08	6.69E-09	5.23E-09	2.20E-08	0.000
50	92-52-4	Biphenyl	1.57E-07	7.16E-08	4.54E-08	5.08E-08	5.56E-08	7.60E-08	3.15E-08	7.65E-08	6.31E-08	6.00E-08	4.01E-08	3.14E-08	1.32E-07	0.002
51	132-64-9	Dibenzofuran	3.54E-06	1.61E-06	1.02E-06	1.14E-06	1.25E-06	1.71E-06	7.09E-07	1.72E-06	1.42E-06	1.35E-06	9.03E-07	7.06E-07	2.97E-06	0.046
53	86-73-7	9H-Fluorene	3.93E-08	1.79E-08	1.13E-08	1.27E-08	1.39E-08	1.90E-08	7.88E-09	1.91E-08	1.58E-08	1.50E-08	1.00E-08	7.84E-09	3.30E-08	0.001
55	90-12-0	1-Methylnapthalene	4.49E-08	2.04E-08	1.30E-08	1.45E-08	1.59E-08	2.17E-08	9.00E-09	2.19E-08	1.80E-08	1.72E-08	1.15E-08	8.96E-09	3.77E-08	0.001
56	91-57-6	2-Methylnapthalene	1.97E-06	8.95E-07	5.67E-07	6.34E-07	6.95E-07	9.50E-07	3.94E-07	9.57E-07	7.89E-07	7.50E-07	5.01E-07	3.92E-07	1.65E-06	0.025
57	91-20-3	Napthalene	1.41E-04	6.43E-05	4.08E-05	4.56E-05	4.99E-05	6.83E-05	2.83E-05	6.87E-05	5.67E-05	5.39E-05	3.60E-05	2.82E-05	1.19E-04	1.829
59	129-00-0	Pyrene	1.57E-07	7.16E-08	4.54E-08	5.08E-08	5.56E-08	7.60E-08	3.15E-08	7.65E-08	6.31E-08	6.00E-08	4.01E-08	3.14E-08	1.32E-07	0.002
60	110-86-1	Pyridine	1.19E-06	5.43E-07	3.44E-07	3.85E-07	4.22E-07	5.76E-07	2.39E-07	5.80E-07	4.79E-07	4.55E-07	3.04E-07	2.38E-07	1.00E-06	0.015
		Totals	*0.008*	*0.004*	*0.002*	*0.002*	*0.003*	*0.004*	*0.002*	*0.004*	*0.003*	*0.003*	*0.002*	*0.002*	*0.006*	*100.000*

TABLE A.4: QUANTITATIVE HEALTH RISK INDICATORS FOR INDIVIDUAL COMPOUNDS AT ALL RECEPTOR LOCATIONS

			Incremental Carcinogenic Risk								
			Baseline Liquor Burner Emissions Scenario[1]								
			Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5	Receptor 6	Receptor 7	Receptor 8	Receptor 9
No	**CAS # / ID**	**Compound Name**	Life-time	Life-time	Life-time	Life-time	Life-time	Life-time	Life-time	Life-time	Life-time
5	7440-38-2	Arsenic	4.13E-08	1.88E-08	1.19E-08	1.33E-08	1.46E-08	1.99E-08	8.27E-09	2.01E-08	1.66E-08
25	71-43-2	Benzene	1.14E-06	5.17E-07	3.28E-07	3.66E-07	4.01E-07	5.49E-07	2.27E-07	5.52E-07	4.56E-07
52	206-44-0	Fluoranthene	1.20E-06	5.45E-07	3.46E-07	3.86E-07	4.23E-07	5.78E-07	2.40E-07	5.83E-07	4.80E-07
		Total	*2.37E-06*	*1.08E-06*	*6.85E-07*	*7.66E-07*	*8.39E-07*	*1.15E-06*	*4.76E-07*	*1.16E-06*	*9.53E-07*

			Incremental Carcinogenic Risk								
			Upgraded Liquor Burner Emissions Scenario[1]								
			Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5	Receptor 6	Receptor 7	Receptor 8	Receptor 9
No	**CAS # / ID**	**Compound Name**	Life-time	Life-time	Life-time	Life-time	Life-time	Life-time	Life-time	Life-time	Life-time
5	7440-38-2	Arsenic	1.61E-09	7.33E-10	4.65E-10	5.20E-10	5.70E-10	7.79E-10	3.23E-10	7.84E-10	6.47E-10
25	71-43-2	Benzene	3.22E-08	1.47E-08	9.30E-09	1.04E-08	1.14E-08	1.56E-08	6.46E-09	1.57E-08	1.29E-08
52	206-44-0	Fluoranthene	2.39E-08	1.09E-08	6.91E-09	7.73E-09	8.47E-09	1.16E-08	4.80E-09	1.17E-08	9.61E-09
		Total	*5.78E-08*	*2.63E-08*	*1.67E-08*	*1.87E-08*	*2.04E-08*	*2.79E-08*	*1.16E-08*	*2.81E-08*	*2.32E-08*

Note:
1 Calculated upper bound Incremental Carcinogenic Risk (i.e. based on upper range of UR factors published by the WHO for benzene and fluoranthene).

TABLE A.4: QUANTITATIVE HEALTH RISK INDICATORS FOR INDIVIDUAL COMPOUNDS AT ALL RECEPTOR LOCATIONS

			Incremental Carcinogenic Risk				
			Baseline Liquor Burner Emissions Scenario[1]				
			Receptor 10	Receptor 11	Receptor 12	Receptor 13	Contribution
No	**CAS # / ID**	**Compound Name**	Life-time	Life-time	Life-time	Life-time	%
5	7440-38-2	Arsenic	1.58E-08	1.05E-08	8.24E-09	3.47E-08	1.7
25	71-43-2	Benzene	4.33E-07	2.90E-07	2.26E-07	9.53E-07	47.8
52	206-44-0	Fluoranthene	4.57E-07	3.05E-07	2.39E-07	1.01E-06	50.4
		Total	*9.06E-07*	*6.05E-07*	*4.74E-07*	*1.99E-06*	*100*

			Incremental Carcinogenic Risk				
			Upgraded Liquor Burner Emissions Scenario[1]				
			Receptor 10	Receptor 11	Receptor 12	Receptor 13	Contribution
No	**CAS # / ID**	**Compound Name**	Life-time	Life-time	Life-time	Life-time	%
5	7440-38-2	Arsenic	6.15E-10	4.11E-10	3.22E-10	1.35E-09	2.8
25	71-43-2	Benzene	1.23E-08	8.22E-09	6.43E-09	2.71E-08	55.8
52	206-44-0	Fluoranthene	9.14E-09	6.11E-09	4.78E-09	2.01E-08	41.4
		Total	*2.21E-08*	*1.47E-08*	*1.15E-08*	*4.85E-08*	*100*

APPENDIX A

Carcinogenesis of Formaldehyde and Acetaldehyde

Classified 2A by IARC, formaldehyde is a highly reactive, water-soluble gas that is rapidly absorbed and metabolised at the site of contact. It is also a common product of intermediary metabolism. At high concentrations, it is a genotoxic irritant, producing tissue damage, regenerative hyperplasia, and DNA–protein cross-links at the site of entry (nose). Formaldehyde causes nasal tumours in rats at high exposure concentrations (≥ 6 ppm), with a clearly non-linear dose-response. The dose-response relationships for cell turnover, hyperproliferation, DNA-protein cross-linking, and neoplastic changes are very similar, suggesting that cytotoxicity followed by regenerative proliferation of respiratory epithelium is an obligatory intermediate step (necessary but not sufficient) in carcinogenesis (WHO 2000b, 2002). WHO (2000b) concluded that, "the inhalation of formaldehyde *under conditions that induce cytotoxicity and sustained regenerative proliferation* is considered to present a carcinogenic hazard to humans" (emphasis added). "Thus, if the respiratory tract tissue is not repeatedly damaged, exposure of humans to low, noncytotoxic concentrations of formaldehyde can be assumed to be associated with a negligible cancer risk. This is consistent with epidemiological findings of excess risks of nasopharyngeal and sinonasal cancers associated with concentrations above about 1 mg/m^3" (WHO 2000b).

The U.S. Chemical Industry Institute for Toxicology, USEPA, and Health Canada have developed a biologically motivated case-specific model that integrates dosimetry calculations from computational fluid dynamics modelling of formaldehyde flux in various regions of the nose and single-path modelling for the lower respiratory tracts of animals and humans with a biologically based two-stage clonal growth model of carcinogenesis. This model is summarised in a Concise International Chemical Assessment Document (CICAD) published by WHO (WHO 2002; available online at http://www.who.int/pcs/cicad/full_text/cicad40.pdf). As noted in 66 FR 11165 (http://www.epa.gov/iris/frn02-22-01.htm), the USEPA has a revised and updated assessment underway for formaldehyde that will also apply the biologically motivated model. As indicated in Table A.1, estimated human cancer risks calculated using this model are extremely low.

Table A.1: Potential Human Cancer Risk at Formaldehyde Concentration, Assuming Lifetime (80-Year) Continuous Exposure

Formaldehyde Exposure Concentration (µg/m^3)	Non-smoking	Mixed	Smoking
1	2.3×10^{-10}	3.9×10^{-9}	4.9×10^{-9}
20	4.8×10^{-9}	1.0×10^{-7}	1.2×10^{-7}
50	1.0×10^{-8}	2.1×10^{-7}	2.5×10^{-7}
70	1.5×10^{-8}	3.3×10^{-7}	3.8×10^{-7}
100	2.1×10^{-8}	4.5×10^{-7}	5.3×10^{-7}

Formaldehyde Exposure Concentration (µg/m^3)	Non-smoking	Mixed	Smoking
120	2.7×10^{-8}	5.8×10^{-7}	6.7×10^{-7}

Because irritation occurs at formaldehyde levels associated with very low cancer risk, irritation is considered the more sensitive and hence more appropriate endpoint for guideline development. WHO (2000b) determined that 100 µg/m^3, "over one order of magnitude lower than a presumed threshold for cytotoxic damage to the nasal mucosa…, represents an exposure level at which there is a negligible risk of upper respiratory tract cancer in humans." However, because this value is higher than the draft 24-hour NEPM of 16.9 µg/m^3, ENVIRON has used the ATSDR chronic MRL of 10.7 µg/m^3 for assessment of chronic health risks associated with Liquor Burner emissions.

Like formaldehyde, acetaldehyde (IARC Group 2B) seems to be carcinogenic by means of cytotoxicity. As discussed in the WHO monograph on acetaldehyde (WHO 1995), "The irritancy of acetaldehyde may … play an important role in the development of tumours in the nose and larynx of rats and hamsters, respectively, exposed by inhalation…." By analogy with related compounds formaldehyde and glutaraldehyde, a tolerable concentration (TC) of 300 g/m^3 was derived on the basis of division of an effect level for irritancy in the respiratory tract of rodents (275,000 µg/m^3) by an uncertainty factor of 1,000, based on the assumption that there is a threshold for acetaldehyde-induced cancer of the respiratory tract in rodents exposed via inhalation (WHO 1995). In the absence of detailed information regarding mode of action, a unit risk of 9×10^{-7} per µg/m^3 was also estimated on the basis of the default linearized multistage model (WHO 1995). This value is cited in the WHO summary document *Guidelines for Air Quality* (WHO 2000a). However, as concluded in the acetaldehyde monograph, "…it is very likely that, since estimated risk is based on tumour incidence at concentrations that induce irritancy in the respiratory tract and no-observed-effect levels for irritancy are well below these concentrations, the true cancer risk is most likely much lower at concentrations generally present in the environment and may, indeed, be zero." Therefore, ENVIRON considers the TC to be the most appropriate health protective guideline for chronic exposure to acetaldehyde.