APPENDIX E

RISK ASSESSMENT METHODOLOGIES

METHODOLOGIES FOR RISK ASSESSMENT

The following presents the methodologies the SCAQMD used to estimate the toxic risks associated with the implementation of PAR 1113. The reader referred to the attached spreadsheets for the variables and assumptions used in these methodologies. The reader is also referred to the SCAQMD's Risk Assessment Procedures for Rules 1401 and 212 (November 1998) for a more detailed discussion of risk assessment procedures.

Health risk assessment is used to estimate the likelihood that an individual would contract cancer or experience other adverse health effects as a result of exposure to toxic air contaminants. Risk assessment is a methodology for estimating the probability or likelihood that an adverse health effect will occur. The risk assessment procedures for PAR 1401 are consistent with current recommendations by Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA). OEHHA is the state agency with primary responsibility for developing and recommending risk assessment methods

Carcinogenic Analysis

The equation for calculating MICR is:

$$MICR = Qyr \times U \times \left(\frac{X}{Q}\right) \times MET \times MP \times LEA$$

$$Qyr = \text{Amount of Toxic Emissions}, \frac{\text{tons}}{\text{yr}}$$

$$U = \text{Toxic Unit Risk Factor}, \left(\frac{\mu g}{m^3}\right)^{-1}$$

$$\left(\frac{X}{Q}\right) = \text{Dispersion Factor}, \left(\frac{\frac{\mu g}{m^3}}{\frac{\text{tons}}{\text{yr}}}\right)$$

$$MET = \text{Metrological Correction Factor}$$

$$MP = \text{Multi-Pathway Adjustment Factor}$$

$$LEA = \text{Life Time Exposure Adjustment Factor}$$

Knowing that the SCAQMD significance threshold for toxics is MICR >$10x10^{-6}$, the following equation is used to estimate the yearly toxic emissions that would have to be emitted to exceed this threshold.

$$Qyr = \frac{MICR}{U \times \left(\frac{X}{Q}\right) \times MET \times MP \times LEA}$$

To calculate the amount of daily toxic emissions that would have to be emitted to exceed a MICR >10x10^{-6}, the following equation is used.

$$Qday, \frac{lbs}{day} = \frac{Qyr}{Days} \times \frac{2000\,lbs}{ton}$$

$$Qyr = Amount\ of\ Toxic\ Emissions, \frac{tons}{yr}$$

$$Days = Coating\ Application, \frac{days}{yr}$$

Knowing the daily toxic emissions, the daily coating usage necessary to exceed a MICR >10x10^{-6} can be estimated using the following equation.

$$Usage, \frac{gal}{day} = \frac{Qday}{Density \times \left(\frac{\%Tox}{100}\right)}$$

$$Qday = Amount\ of\ Toxic\ Emissions, \frac{lbs}{day}$$

$$Density = Density\ of\ Coating, \frac{lbs}{gal}$$

$$\%Tox = Percentage\ of\ Toxic\ Compound\ in\ Coating, \%$$

Chronic Analysis

The equation for calculating HIC is:

$$HIC = \frac{Qyr \times \left(\frac{X}{Q}\right) \times MET \times MP}{REL}$$

$$Qyr = Amount\ of\ Toxic\ Emissions, \frac{tons}{yr}$$

$$\left(\frac{X}{Q}\right) = Dispersion\ Factor, \left(\frac{\frac{\mu g}{m^3}}{\frac{tons}{yr}}\right)$$

$$MET = Metrological\ Correction\ Factor$$

$$MP = Multi\text{-}Pathway\ Adjustment\ Factor$$

$$REL = Reference\ Exposure\ Level$$

Knowing that the SCAQMD significance threshold for toxics is HI >1, the following equation is used to estimate the yearly toxic emissions that would have to be emitted to exceed this threshold.

$$Qyr = \frac{HIC \times REL}{\left(\frac{X}{Q}\right) \times MET \times MP}$$

To calculate the amount of daily toxic emissions that would have to be emitted to exceed a HI >1, the following equation is used.

$$Qday, \frac{lbs}{day} = \frac{Qyr}{Days} \times \frac{2000\ lbs}{ton}$$

$$Qyr = Amount\ of\ Toxic\ Emitted, \frac{tons}{yr}$$

$$Days = Coating\ Application, \frac{days}{yr}$$

Knowing the daily toxic emissions, the daily coating usage necessary to exceed a HI >1 can be estimated using the following equation.

$$Usage, \frac{gal}{day} = \frac{Qday}{Density \times \left(\frac{\%Tox}{100}\right)}$$

$$Qday = Amount\ of\ Toxics\ Emitted, \frac{lbs}{day}$$

$$Density = Density\ of\ Coating, \frac{lbs}{gal}$$

$$\%Tox = Percentage\ of\ Toxic\ Compound\ in\ Coating, \%$$

Acute Analysis

The equation for calculating HIA is:

$$HIC = \frac{Qhr \times \left(\frac{X}{Q}\right)_{max}}{REL}$$

$$Qhr = \text{Amount of Toxic Emitted}, \frac{lbs}{hr}$$

$$\left(\frac{X}{Q}\right)_{max} = \text{Dispersion Factor}, \left(\frac{\frac{\mu g}{m^3}}{\frac{tons}{yr}}\right)$$

$$REL = \text{Reference Exposure Level}$$

Knowing that the SCAQMD significance threshold for toxics is HI > 1, the following equation is used to estimate the hourly toxic emissions that would have to be emitted to exceed this threshold.

$$Qhr = \frac{HI \times REL}{\left(\frac{X}{Q}\right)_{max}}$$

Knowing the hourly toxic emissions, the daily coating usage necessary to exceed a HIA > 1 can be estimated using the following equation.

$$\text{Usage}, \frac{gal}{day} = \frac{Qhr \times Hours}{Density \times \left(\frac{\%Tox}{100}\right)}$$

$$Qhr = \text{Amount of Toxic}, \frac{lbs}{hrs}$$

$$Hours = \text{Coating Application}, \frac{hrs}{day}$$

$$Density = \text{Density of Coating}, \frac{lbs}{gal}$$

$$\%Tox = \text{Percentage of Toxic Compound in Coating}, \%$$

"Real-Case" Analysis

Compound	% by wt.	Unit Risk Factor	Chronic REL	Acute REL	MICR MP	Chronic MP	Target Organs
		1/(ug/m3)	ug/m3	ug/m3			
Toluene	10		2.00E+02	4.00E+04		1	CNS/PNS, Repr
Xylene	10		3.00E+02	4.40E+03		1	Repr, Resp
Methyl Ethyl Ketone*	10		1.00E+03	3.00E+04		1	Repr
Isopropol Alchol*	10		2.00E+03	3.00E+03		1	CV/BL, CNS/PNS, Immun
Ethylene Glycol*	10		4.00E+02			1	Resp, Skin, Kidn, Repr
Propylene*	10		3.00E+03			1	Resp
Glycol Ethers & Acetates	10		2.00E+01	1.53E+03		1	Resp
EGBE	10		2.00E+01	1.50E+03		1	CV/BL
EGEE	10		2.00E+02	3.70E+02		1	Repr, CV/BL
EGME	10		2.00E+01	3.30E+02		1	Repr
Toulene Diisocyante	*1*	1.10E-05	9.50E-02		1	1	Resp
Hexmethylene Diisocyanate*	*1*		1.00E-02			1	Resp
Isocyanate	*1*		9.50E-02			1	Resp

Assumptions

Coating	Density	10.5	lbs/gal
	hrs/day	8	
	days/yr	260	
	Stack Ht	Ground Level	
	Receptor	Residential	
	Location	West LA	
Signficance Threshold for	MICR	1.00E-05	
Signficance Threshold for	HIC	1	
Signficance Threshold for	HIA	1	

Input Variables

Distance to Receptor	X/Q	X/Qmax	MET	LEA
m	ug/m3 / tons/yr	ug/m3 / lb/hr		
25	51.18	2000	1.00	1
50	16.88	1000.6	1.00	1
100	4.51	373.5	1.00	1

Carcinogenic Analysis (MICR)

Compound	25m QYR	25m QDAY	25m Usage	50m QYR	50m QDAY	50m Usage	100m QYR	100m QDAY	100m Usage
	tons/yr	lbs/day	gals/day	tons/yr	lbs/day	gals/day	tons/yr	lbs/day	gals/day
Toulene Diisocyante	0.02	0.14	1.30	0.05	0.41	3.95	0.20	1.55	14.77

Chonic Exposure Analysis (HIC)

	25m			50m			100m	
Compound	**QYR**	**QDAY**	**Usage**	**QYR**	**QDAY**	**Usage**	**QYR**	**QDAY**	**Usage**
	tons/yr	lbs/day	gals/day	tons/yr	lbs/day	gals/day	tons/yr	lbs/day	gals/day
Toluene	3.9078	30.060	28.628	11.848	91.141	86.801	44.346	341.122	324.878
Xylene	5.8617	45.090	42.943	17.773	136.712	130.202	66.519	511.683	487.318
Methyl Ethyl Ketone	19.5389	150.299	143.142	59.242	455.705	434.005	221.729	1705.611	1624.392
Isopropol Alchol	39.0778	300.598	286.284	118.483	911.411	868.010	443.459	3411.223	3248.784
Ethylene Glycol	7.8156	60.120	57.257	23.697	182.282	173.602	88.692	682.245	649.757
Propylene	58.6166	450.897	429.426	177.725	1367.116	1302.016	665.188	5116.834	4873.176
Glycol Ethers & Acetates	0.3908	3.006	2.863	1.185	9.114	8.680	4.435	34.112	32.488
EGBE	0.3908	3.006	2.863	1.185	9.114	8.680	4.435	34.112	32.488
EGEE	3.9078	30.060	28.628	11.848	91.141	86.801	44.346	341.122	324.878
EGME	0.3908	3.006	2.863	1.185	9.114	8.680	4.435	34.112	32.488
Toulene Diisocyante	0.0019	0.014	0.136	0.006	0.043	0.412	0.021	0.162	1.543
Hexmethylene Diisocyanate	0.0002	0.002	0.014	0.001	0.005	0.043	0.002	0.017	0.162
Isocyanate	0.0019	0.014	0.136	0.006	0.043	0.412	0.021	0.162	1.543

Acute Exposure Analysis (HIA)

	25m		50m		100m	
Compound	**QHR**	**Usage**	**QHR**	**Usage**	**QHR**	**Usage**
	lbs/hr	gals/day	lbs/hr	gals/day	lbs/hr	gals/day
Toluene	20.00	152.38	39.98	304.58	107.10	815.96
Xylene	2.20	16.76	4.40	33.50	11.78	89.76
Methyl Ethyl Ketone	15.00	114.29	29.98	228.43	80.32	611.97
Isopropol Alchol	1.50	11.43	3.00	22.84	8.03	61.20
Glycol Ethers & Acetates	0.77	5.84	1.53	11.67	4.10	31.27
EGBE	0.75	5.71	1.50	11.42	4.02	30.60
EGEE	0.19	1.41	0.37	2.82	0.99	7.55
EGME	0.17	1.26	0.33	2.51	0.88	6.73

*Proposed OEHHA Values