APPENDIX R
HAZARDOUS MATERIALS HANDLING SUMMARY OF MODEL RESULTS

Calculation of Model Parameters for OCA for Accidental Release of Aqueous Ammonia
San Gabriel Generating Station - Combined Cycle Plant

Equation Used to Determine the Emission Rate of Ammonia:

$$QR = \frac{0.284 U^{0.78} MW^{2/3} A \times VP}{82.05 T}$$

where:
QR = emission rate of ammonia (pounds per minute)
U = wind speed (meters per second)
MW = molecular weight of ammonia (grams per gram-mole)
A = surface area of spilled liquid pool (square feet)
VP = vapor pressure of ammonia above solution (millimeters of mercury)
T = temperature of liquid (degrees Kelvin)

	Worst-Case Scenario		Alternate Scenario	
U =	1.5	m/s	3	m/s
MW =	17.03	grams/gram-mol	17.03	grams/gram-mol
A =	1625.0	ft^2	1275.0	ft^2
VP =	1961	mm Hg	673	mm Hg
T =	325.37	K	296.98	K

Containment Dimension					height
Length of Storage Tank Containment	65	feet	19.81	m	
Width of Storage Tank Containment	25	feet	7.62	m	
Length of Unloading Pad Contaiment	75	feet	22.86	m	
Width of Unloading Pad Containment	17	feet	5.18	m	

Worst-Case Scenario
QR = 307.871 lbs ammonia / min 2327.465 g ammonia / s

Alternate Scneario
QR = 156.003 lbs ammonia / min 1179.365 g ammonia / s

Equation Used to Determine the Emission Rate Per Area:
(parameter required for dispersion model)

$$E = \frac{QR}{A}$$

where:
E = emission rate of ammonia (g / s*m^2)
QR = emission rate of ammonia (g/s)
A = surface area of spilled liquid pool (m^2)

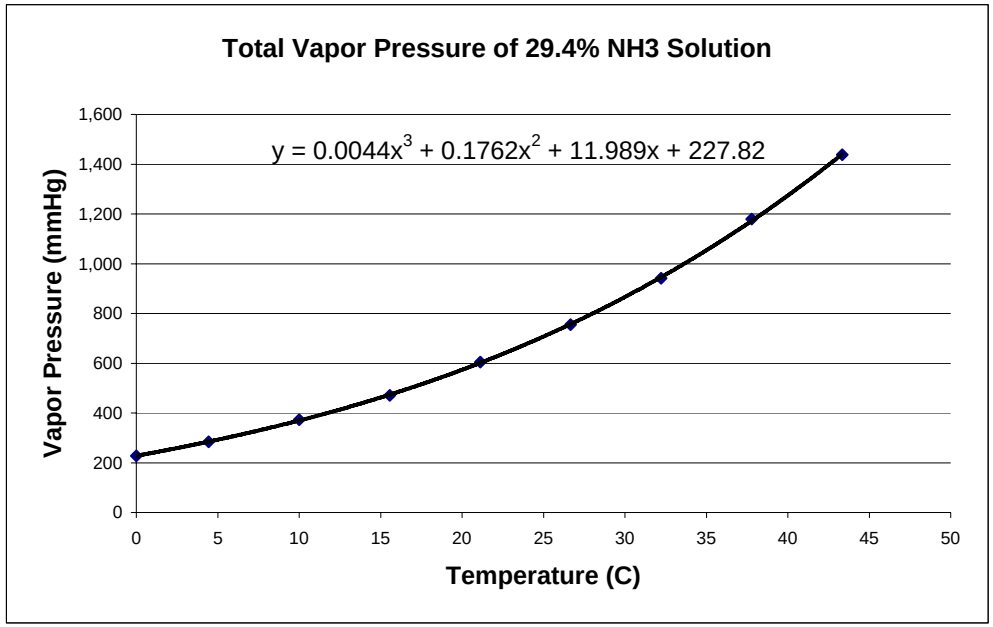
Worst-Case Scenario
E = 1.432 g / s*m^2

Alternate Scneario
E = 0.925 g / s*m^2

Determination of Vapor Pressure above an Aqueous Ammonia Solution

Taken from
http://www.tannerind.com/PDF/green-aqua-amm.pdf
29.4% aqueous solution by wt

Temp deg F	VP (lb/in2)	Temp deg C	VP (mmHg)
32	4.4	0.00	227.55
40	5.5	4.44	284.43
50	7.2	10.00	372.35
60	9.1	15.56	470.61
70	11.7	21.11	605.06
80	14.6	26.67	755.04
90	18.2	32.22	941.21
100	22.8	37.78	1179.10
110	27.8	43.33	1437.68



For a 29.4% solution of aquesous ammonia, the Vapor pressure, for a given temperature is . . .

	Temp deg K	Temp deg F	Temp deg C	**mmHg**
Alternate	296.9833333	74.9	23.8	673
Worst Case	325.37	126	52.2	1961

28.81 33.71

SCREEN3 Model Results

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S) (	USTK M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)	**CONC PPM**
10	1.44E+07	6	1.5	1.5	10000	0.38	0	20500.00
20	9.27E+06	6	1.5	1.5	10000	0.38	0	13237.14
30	5.09E+06	6	1.5	1.5	10000	0.38	0	7277.14
40	3.11E+06	6	1.5	1.5	10000	0.38	0	4438.57
50	2.07E+06	6	1.5	1.5	10000	0.38	0	2958.57
60	1.48E+06	6	1.5	1.5	10000	0.38	0	2107.14
70	1.10E+06	6	1.5	1.5	10000	0.38	0	1577.14
80	8.58E+05	6	1.5	1.5	10000	0.38	0	1225.43
90	6.87E+05	6	1.5	1.5	10000	0.38	0	980.71
100	5.62E+05	6	1.5	1.5	10000	0.38	0	803.29
200	1.54E+05	6	1.5	1.5	10000	0.38	1	219.71
300	7.36E+04	6	1.5	1.5	10000	0.38	3	105.13
400	4.43E+04	6	1.5	1.5	10000	0.38	1	63.29
500	3.02E+04	6	1.5	1.5	10000	0.38	2	43.07
600	2.22E+04	6	1.5	1.5	10000	0.38	2	31.69
700	1.72E+04	6	1.5	1.5	10000	0.38	1	24.56
800	1.39E+04	6	1.5	1.5	10000	0.38	2	19.79
900	1.15E+04	6	1.5	1.5	10000	0.38	2	16.40
1000	9729	6	1.5	1.5	10000	0.38	2	13.90
1100	8396	6	1.5	1.5	10000	0.38	1	11.99
1200	7352	6	1.5	1.5	10000	0.38	2	10.50
1300	6516	6	1.5	1.5	10000	0.38	2	9.31
1400	5835	6	1.5	1.5	10000	0.38	2	8.34
1500	5271	6	1.5	1.5	10000	0.38	2	7.53
2000	3489	6	1.5	1.5	10000	0.38	2	4.98
2500	2565	6	1.5	1.5	10000	0.38	2	3.66
3000	2010	6	1.5	1.5	10000	0.38	2	2.87
3500	1644	6	1.5	1.5	10000	0.38	1	2.35
4000	1387	6	1.5	1.5	10000	0.38	1	1.98
4500	1196	6	1.5	1.5	10000	0.38	1	1.71
5000	1050	6	1.5	1.5	10000	0.38	1	1.50

INTERPOLATION OF END POINTS

		Lethal	IDLH	CalARP	CEC
Concentration	x	2000	300	200	75
	x1	2107.14	803.29	219.71	105.13
	x2	1577.14	219.71	105.13	63.29
Distance	y1	60	100	200	300
	y2	70	200	300	400
	y =	**62.02**	**186.24**	**217.20**	**372.00**

INTERPOLATION OF RECEPTOR CONCENTRATIONS

		fenceline	pub rec	resident
Distance	x	185	530	640
	x1	100.00	500.00	600.00
	x2	200.00	600.00	700.00
Concentration	y1	803.29	43.07	31.69
	y2	219.71	31.69	24.56
	y =	**307.25**	**39.66**	**28.83**

SCREEN3 Model Results

DIST (M)	CONC (UG/M**3)	STAB (	U10M M/S) (	USTK M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)	**CONC PPM**
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10	4.97E+06	4	3	3	960	0	0	7100.00
20	1.55E+06	4	3	3	960	0	0	2208.57
30	6.36E+05	4	3	3	960	0	0	908.43
40	3.46E+05	4	3	3	960	0	0	494.14
50	2.18E+05	4	3	3	960	0	0	311.71
60	1.51E+05	4	3	3	960	0	0	215.00
70	1.10E+05	4	3	3	960	0	0	157.43
80	8.44E+04	4	3	3	960	0	0	120.57
90	6.67E+04	4	3	3	960	0	0	95.33
100	5.41E+04	4	3	3	960	0	0	77.29
200	1.39E+04	4	3	3	960	0	2	19.84
300	6363	4	3	3	960	0	2	9.09
400	3690	4	3	3	960	0	2	5.27
500	2433	4	3	3	960	0	2	3.48
600	1740	4	3	3	960	0	2	2.49
700	1315	4	3	3	960	0	2	1.88
800	1035	4	3	3	960	0	2	1.48
900	839.9	4	3	3	960	0	2	1.20
1000	698.4	4	3	3	960	0	2	1.00
1100	592.1	4	3	3	960	0	2	0.85
1200	510	4	3	3	960	0	2	0.73
1300	445.2	4	3	3	960	0	2	0.64
1400	393.1	4	3	3	960	0	2	0.56
1500	350.4	4	3	3	960	0	2	0.50
2000	219.6	4	3	3	960	0	2	0.31
2500	154.9	4	3	3	960	0	2	0.22
3000	117.6	4	3	3	960	0	2	0.17
3500	93.72	4	3	3	960	0	2	0.13
4000	77.37	4	3	3	960	0	2	0.11
4500	65.57	4	3	3	960	0	2	0.09
5000	56.71	4	3	3	960	0	2	0.08

INTERPOLATION OF END POINTS					
		Lethal	IDLH	CalARP	CEC
Concentration	x	2000	300	200	75
	x1	2208.57	311.71	215.00	77.29
	x2	908.43	215.00	157.43	19.84
Distance	y1	20	50	60	100
	y2	30	60	70	200
	y =	**21.60**	**51.21**	**62.61**	**103.98**

INTERPOLATION OF RECEPTOR CONCENTRATIONS				
		fenceline	pub rec	resident
Distance	x	185	530	640
	x1	100.00	500.00	600.00
	x2	200.00	600.00	700.00
Concentration	y1	77.29	3.48	2.49
	y2	19.84	2.49	1.88
	y =	**28.46**	**3.18**	**2.24**

Summary of Results - Hazardous Materials Handling
San Gabriel Generating Station

Levels of Concern	Threshold Limit (ppm)	Worst-Case Scenario Distance to Threshold		Alternative Scenario Distance to Threshold	
		(meters)	(feet)	(meters)	(feet)
Lethal	2000	62.0	203.5	21.6	70.9
IDLH	300	186.2	611.0	51.2	168.0
CalARP	200	217.2	712.6	62.6	205.4
CEC	75	372.0	1220.5	104.0	341.1

	Concentration (ppm)		
Scenario	**Nearest Public Receptor (Big Lots Distribution Center)**	**Facility Fenceline**	**Nearest Residence**
Worst-Case Scenario (ppm)	39.7	307.3	28.8
Alternate Scenario (ppm)	3.2	28.5	2.2
Distance from Ammonia storage facility (meters)	530	185	640