# APPENDIX Q
# HAZARDOUS MATERIALS HANDLING
# SUMMARY OF MODEL RESULTS

**Calculation of Model Parameters** fill in with project relevant info

19.1% aqueous ammonia

**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:**

| | | |
|---|---|---|
| stability = | F | |
| U = | 1.5 | m/s |
| T = | 97 | F |
| MW = | 17.03 | grams/gram-mol |
| A = | 10.85 | $ft^2$ |
| VP = | 359 | mm Hg |
| T = | 309.3 | K |

avg max temperature Antioch 1E Pump Station 1971 - 2000 (WRCC)

| | | |
|---|---|---|
| Drain diameter | 42 | inches |
| Unloading drain diameter | 24 | inches |

Note:
20,000 gallon tank with 1 drain holes below each tank
and a drain hole in the unloading area
* area assumes 15% covered by grating

Effective spill dimensions

| | | |
|---|---|---|
| Area | 1.008 | m2 |
| Effective Length | 1.420 | m |
| Effective Width | 0.710 | m |

**Emission Rate**

QR = 0.396 lbs ammonia / min
2.995 g ammonia / s

**Alternative Scenario**

| | | |
|---|---|---|
| stability = | D | |
| U = | 3 | m/s |
| T = | 69 | F |
| MW = | 17.03 | grams/gram-mol |
| A = | 10.85 | $ft^2$ |
| VP = | 359 | mm Hg |
| T = | 293.7 | K |

avg temperature Antioch 1E Pump Station 1971 - 2000 (WRCC)

| | | |
|---|---|---|
| Drain diameter | 42 | inches |
| Unloading drain diameter | 24 | inches |

Note:
20,000 gallon tank with 1 drain holes below each tank
and a drain hole in the unloading area
* area assumes 15% covered by grating

Effective spill dimensions

| | | | |
|---|---|---|---|
| Area | 1.008 | m2 | (= 1 cm) |
| Effective Length | 1.420 | m | |
| Effective Width | 0.710 | m | |

QR = 0.716 lbs ammonia / min
5.416 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 ($m^2$)

E = 2.972 g / s*$m^2$

E = 5.373 g / s*$m^2$

05/09/08

16:02:14
*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

MIRANT MARSH LANDING AMMONIA ALTERNATE RELEASE CASE

SIMPLE TERRAIN INPUTS:

| | | |
|---|---|---|
| SOURCE TYPE | = | AREA |
| EMISSION RATE (G/(S-M**2)) | = | 5.37300 |
| SOURCE HEIGHT (M) | = | .0000 |
| LENGTH OF LARGER SIDE (M) | = | 1.4200 |
| LENGTH OF SMALLER SIDE (M) | = | .7100 |
| RECEPTOR HEIGHT (M) | = | .0000 |
| URBAN/RURAL OPTION | = | RURAL |

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = .000 M**4/S**3; MOM. FLUX = .000 M**4/S**2.

*** STABILITY CLASS 5 ONLY ***
*** ANEMOMETER HEIGHT WIND SPEED OF 3.00 M/S ONLY ***

**********
*** SCREEN AUTOMATED DISTANCES ***
**********

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

| DIST (M) | CONC (UG/M**3) | STAB | U10M (M/S) | USTK (M/S) | MIX HT (M) | PLUME HT (M) | MAX DIR (DEG) |
|---|---|---|---|---|---|---|---|
| 10. | .1503E+07 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 100. | .2650E+05 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 200. | 7906. | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 300. | 3902. | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 400. | 2409. | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 500. | 1658. | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 600. | 1222. | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 700. | 944.4 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 800. | 755.5 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 900. | 620.6 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 1000. | 520.5 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 1100. | 449.3 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 1200. | 392.9 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 1300. | 347.3 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 1400. | 309.8 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 1500. | 278.6 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 1600. | 252.2 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 1700. | 229.8 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 1800. | 210.4 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 1900. | 193.6 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 2000. | 178.9 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 2100. | 166.5 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2200. | 155.4 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 2300. | 145.5 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 2400. | 136.7 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 2500. | 128.7 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 2600. | 121.4 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 2700. | 114.9 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 2800. | 108.9 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 2900. | 103.4 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 3000. | 98.32 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 3500. | 78.34 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 4000. | 64.35 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 4500. | 54.53 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 5000. | 47.03 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 10. M:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10. | .1503E+07 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |

**********
*** SCREEN DISCRETE DISTANCES ***
**********

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

| DIST (M) | CONC (UG/M**3) | STAB | U10M (M/S) | USTK (M/S) | MIX HT (M) | PLUME HT (M) | MAX DIR (DEG) |
|---|---|---|---|---|---|---|---|
| 10. | .1453E+07 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 10. | .1429E+07 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 10. | .1405E+07 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 10. | .1417E+07 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 10. | .1415E+07 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 20. | .4514E+06 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 30. | .2216E+06 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 32. | .1977E+06 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 31. | .2091E+06 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 31. | .2115E+06 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 31. | .2127E+06 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 31. | .2121E+06 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 35. | .1688E+06 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 40. | .1334E+06 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 38. | .1460E+06 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 39. | .1395E+06 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 39. | .1427E+06 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 39. | .1420E+06 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 39. | .1414E+06 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 60. | .6527E+05 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 70. | .4972E+05 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 68. | .5233E+05 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 67. | .5372E+05 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 68. | .5301E+05 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 67. | .5306E+05 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |
| 67. | .5304E+05 | 5 | 3.0 | 3.0 | 10000.0 | .00 | 0. |

**********
*** SUMMARY OF SCREEN MODEL RESULTS ***
**********

| CALCULATION PROCEDURE | MAX CONC (UG/M**3) | DIST TO MAX (M) | TERRAIN HT (M) |
|---|---|---|---|

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--------------    -----------   -------   -------
SIMPLE TERRAIN      .1503E+07       10.        0.

**************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
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05/09/08

15:55:55
*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

MIRANT MARSH LANDING AMMONIA WORST CASE RELEASE CASE

SIMPLE TERRAIN INPUTS:

| | | |
|---|---|---|
| SOURCE TYPE | = | AREA |
| EMISSION RATE (G/(S-M**2)) | = | 2.97200 |
| SOURCE HEIGHT (M) | = | .0000 |
| LENGTH OF LARGER SIDE (M) | = | 1.4200 |
| LENGTH OF SMALLER SIDE (M) | = | .7100 |
| RECEPTOR HEIGHT (M) | = | .0000 |
| URBAN/RURAL OPTION | = | RURAL |

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = .000 M**4/S**3; MOM. FLUX = .000 M**4/S**2.

*** STABILITY CLASS 6 ONLY ***
*** ANEMOMETER HEIGHT WIND SPEED OF 1.50 M/S ONLY ***

**********
*** SCREEN AUTOMATED DISTANCES ***
**********

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

| DIST (M) | CONC (UG/M**3) | STAB | U10M (M/S) | USTK (M/S) | MIX HT (M) | PLUME HT (M) | MAX DIR (DEG) |
|---|---|---|---|---|---|---|---|
| 10. | .3449E+07 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 100. | .6704E+05 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 200. | .2005E+05 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 300. | .1004E+05 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 400. | 6149. | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 500. | 4206. | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 600. | 3084. | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 700. | 2373. | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 800. | 1917. | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 900. | 1588. | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 1000. | 1342. | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 1100. | 1158. | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 1200. | 1012. | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 1300. | 894.8 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 1400. | 798.1 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 1500. | 717.6 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 1600. | 649.6 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 1700. | 591.7 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 1800. | 541.8 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 1900. | 498.5 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 2000. | 460.6 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 2100. | 429.1 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2200. | 401.1 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 2300. | 376.0 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 2400. | 353.5 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 2500. | 333.2 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 2600. | 314.8 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 2700. | 298.0 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 2800. | 282.7 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 2900. | 268.7 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 3000. | 255.8 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 3500. | 207.2 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 4000. | 172.6 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 4500. | 147.0 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 5000. | 127.3 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 10. M:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10. | .3449E+07 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |

**********
*** SCREEN DISCRETE DISTANCES ***
**********

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

| DIST (M) | CONC (UG/M**3) | STAB | U10M (M/S) | USTK (M/S) | MIX HT (M) | PLUME HT (M) | MAX DIR (DEG) |
|---|---|---|---|---|---|---|---|
| 13. | .2251E+07 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 15. | .1774E+07 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 16. | .1592E+07 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 17. | .1436E+07 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 17. | .1422E+07 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 17. | .1408E+07 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 17. | .1401E+07 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 17. | .1415E+07 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 30. | .5430E+06 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 40. | .3303E+06 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 45. | .2691E+06 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 50. | .2240E+06 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 51. | .2164E+06 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 51. | .2149E+06 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 52. | .2127E+06 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 52. | .2120E+06 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 60. | .1631E+06 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 61. | .1584E+06 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 62. | .1540E+06 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 63. | .1498E+06 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 65. | .1419E+06 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 65. | .1415E+06 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 85. | .8898E+05 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 100. | .6704E+05 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 105. | .6157E+05 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 110. | .5678E+05 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 115. | .5255E+05 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 114. | .5335E+05 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 114. | .5319E+05 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 115. | .5295E+05 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |
| 114. | .5303E+05 | 6 | 1.5 | 1.5 | 10000.0 | .00 | 0. |

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     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION        MAX CONC    DIST TO   TERRAIN
  PROCEDURE        (UG/M**3)    MAX (M)    HT (M)
--------------    -----------   -------   -------
SIMPLE TERRAIN      .3449E+07       10.        0.


**************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
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