APPENDIX C

JOHNSON AND ETTINGER MODELING RESULTS

LOCATION OF SOIL VAPOR SAMPLES AND 1,1-DICHLOROETHENE RESULTS

VAPOR SAMPLE ID	1,1-DCE (ug/m3)	BUILDING AREA
051-02	740000	South Plant
025-02	520000	Winding/Cafeteria
024-02	450000	Winding/Cafeteria
066-02	300000	South Plant
036-02	210000	Case
035-02	190000	Case
052-02	180000	Winding
067-02	160000	South Plant
068-01	133000	Winding/Cafeteria
023-02	110000	Case
036-01	110000	Case
069-02	61000	Winding/Cafeteria
039-02	43000	Case
022-02	42000	Case
026-02	36000	Winding
041-02	36000	Case
055-02	33000	South Plant
037-02	31000	Case
068-02	28000	Winding/Cafeteria
040-02	26000	Case
069-01	25000	Winding/Cafeteria
072-02	23000	South Plant
037-01	19000	Case
044-02	14000	South Plant
048-02	12000	South Plant
053-02	11000	Winding/Cafeteria
034-02	10000	Winding/Cafeteria
017-02	8100	Case
043-02	6400	Case
052-01	6000	Winding
017-01	5800	Case
019-02	5400	Case
027-02	5000	Winding
019-01	4700	Case
070-02	4000	South Plant
067-01	3700	South Plant
042-02	3400	Case
055-01	3300	South Plant
053-01	2800	Winding/Cafeteria
016-02	2200	Case
051-01	2200	South Plant
023-01	1800	Case
035-01	1800	Case
049-02	1600	South Plant
015-02	1200	Case
038-01	1200	Case
038-02	1100	Case

JOHNSON AND ETTINGER MODEL INPUT VALUES AND SCREENING RESULTS

Building Properties

Department	*Lowest Air Exchange (1/hr)*	*Height (meters)*	*Area (meters)*
Case	1.71	7.88	4967.93
Cafeteria	14.33	2.30	256.55
Winding	5.44	5.56	2174.07
Insulation	7.66	6.25	522.02
South Plant	2.42	9.20	4677.18

Depth to contamination from bottom of foundation: 5ft +/- 2ft

Soil Properties

Soil Type: Sand
Total Porosity: 0.375
Unsaturated Zone Moisture Content: low= 0.053 best estimate= 0.054 high= 0.055
Capillary Zone Moisture Content: 0.253
Height of Capillary Rise: 0.17[m]
Soil-Gas Flow Rate into Building: 5 [L/min]
Average ground water temperature: 19C

Results

Department	*11DCE attenuation factor*
Case	4.6E-06
Cafeteria	2.6E-05
Winding	4.4E-06
Insulation	1.0E-05
South Plant	2.9E-06

TARGET MEDIA CONCENTRATION RESULTS

Screening-Level Johnson and Ettinger Model

Site Name: South Plant
Report Date: Thu Aug 6 16:58:59 CDT 2009
Report Generated From: http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite.htm
Depth to contamination from bottom of foundation: 5ft +/- 2ft
Average ground water temperature: 19C

CHEMICAL PROPERTIES
Chemical of Concern: 1,1-Dichloroethylene CAS Number: 75354
Molecular Weight: 96.94[g/mole] Henrys Constant: 0.8720278[unitless]
Diffusivity in Air: 9.000e-2[cm^2/sec] Diffusivity in Water: 1.040e-5[cm^2/sec]
Unit Risk Factor: 0[$(\mu g/m^3)^{-1}$] Reference Concentration: 0.2[mg/m^3]

SOIL PROPERTIES
Soil Type: Sand Total Porosity: 0.375
Unsaturated Zone Moisture Content:
low= 0.053 best estimate= 0.054 high= 0.055
Capillary Zone Moisture Content: 0.253 Height of Capillary Rise: 0.17[m]
Soil-Gas Flow Rate into Building: 5 [L/min]

BUILDING PROPERTIES
Building Type: Slab-on-Grade Air Exchange Rate: 2.42[hr^{-1}]
Building Mixing Height: 9.2[m] Building Footprint Area: 4677[m^2]
Subsurface Foundation Area: 4680[m^2] Building Crack Ratio: 0.00038[unitless]
Foundation Slab Thickness: 0.1[m]

EXPOSURE PARAMETERS
Exposure Duration: carcinogens 30 [years] non-carcinogens: 30 [years]
Exposure Frequency: carcinogens 350 [days/year] non-carcinogens: 365 [days/year]
Averaging Time: carcinogens 70 [years] non-carcinogens: 30 [years]
Risk Factor for carcinogens: 1E-6 Target Hazard Quotient for non-carcinogens: 1

JOHNSON & ETTINGER SIMULATION RESULTS
Effective Diffusion Coefficients:
Unsaturated Zone(D_{eff}): 0.01455[cm^2/s]
Unsaturated Zone + Capillary Zone (D^T_{eff}): 0.003953[cm^2/s]

Soil Gas Attenuation Factor (α): 0.000002801
Ground Water Attenuation Factor (α_{GW}): 0.000002801
Target Concentrations are based on NON-CANCER risk.
Target Indoor Air Concentration: 200[$\mu g/m^3$] or 50.48[ppbv]

[1]Less Protective Target Concentrations
Soil Gas: 6.857e7[$\mu g/m^3$] or 1.731e7[ppbv]; Ground Water: 8.261e4[$\mu g/L$]

Best Estimate Target Concentrations
Soil Gas: 6.794e7[$\mu g/m^3$] or 1.715e7[ppbv]; Ground Water: 8.189e4[$\mu g/L$]

[2]More Protective Target Concentrations
Soil Gas: 6.732e7[$\mu g/m^3$] or 1.699e7[ppbv]; Ground Water: 8.118e4[$\mu g/L$]

Based on parameter analysis: Advection is the dominant mechanism across foundation. Advection through foundation is the overall rate-limiting process for soil-gas to indoor-air pathway. Advection through foundation is the overall rate-limiting process for groundwater to indoor-air pathway.

[1]"Less Protective" concentrations produced with HIGHEST moisture content and DEEPEST depth to contamination.
[2]"More Protective" concentrations produced with LOWEST moisture content and SHALLOWEST depth to contamination.

Building Air Exchange is outside the recommended range for this parameter.
Building Mixing Height is outside the recommended range for this building type.
Building Footpring Area is outside the recommended range for this building type.
Subsurface Foundation Area is outside the recommended range for this building type.

TARGET MEDIA CONCENTRATION RESULTS

Screening-Level Johnson and Ettinger Model

Site Name: [redacted]
Report Date: Thu Aug 6 16:57:54 CDT 2009
Report Generated From: http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite.htm
Depth to contamination from bottom of foundation: 5ft +/- 2ft
Average ground water temperature: 19C

CHEMICAL PROPERTIES
Chemical of Concern: 1,1-Dichloroethylene CAS Number: 75354
Molecular Weight: 96.94[g/mole] Henrys Constant: 0.8720278[unitless]
Diffusivity in Air: 9.000e-2[cm^2/sec] Diffusivity in Water: 1.040e-5[cm^2/sec]
Unit Risk Factor: 0[$(\mu g/m^3)^{-1}$] Reference Concentration: 0.2[mg/m^3]

SOIL PROPERTIES
Soil Type: Sand Total Porosity: 0.375
Unsaturated Zone Moisture Content:
low= 0.053 best estimate= 0.054 high= 0.055
Capillary Zone Moisture Content: 0.253 Height of Capillary Rise: 0.17[m]
Soil-Gas Flow Rate into Building: 5 [L/min]

BUILDING PROPERTIES
Building Type: Slab-on-Grade Air Exchange Rate: 7.66[hr^{-1}]
Building Mixing Height: 6.25[m] Building Footprint Area: 522[m^2]
Subsurface Foundation Area: 525[m^2] Building Crack Ratio: 0.00038[unitless]
Foundation Slab Thickness: 0.1[m]

EXPOSURE PARAMETERS
Exposure Duration: carcinogens 30 [years] non-carcinogens: 30 [years]
Exposure Frequency: carcinogens 350 [days/year] non-carcinogens: 365 [days/year]
Averaging Time: carcinogens 70 [years] non-carcinogens: 30 [years]
Risk Factor for carcinogens: 1E-6 Target Hazard Quotient for non-carcinogens: 1

JOHNSON & ETTINGER SIMULATION RESULTS
Effective Diffusion Coefficients:
Unsaturated Zone(D_{eff}): 0.01455[cm^2/s]
Unsaturated Zone + Capillary Zone (D^T_{eff}): 0.003953[cm^2/s]

Soil Gas Attenuation Factor (α): [redacted]
Ground Water Attenuation Factor (α_{GW}): 0.000007447
Target Concentrations are based on NON-CANCER risk.
Target Indoor Air Concentration: 200[$\mu g/m^3$] or 50.48[ppbv]

[1]Less Protective Target Concentrations
Soil Gas: 2.058e7[$\mu g/m^3$] or 5.194e6[ppbv]; Ground Water: 3.211e4[$\mu g/L$]

Best Estimate Target Concentrations
Soil Gas: 1.943e7[$\mu g/m^3$] or 4.904e6[ppbv]; Ground Water: 3.080e4[$\mu g/L$]

[2]More Protective Target Concentrations
Soil Gas: 1.831e7[$\mu g/m^3$] or 4.620e6[ppbv]; Ground Water: 2.951e4[$\mu g/L$]

Based on parameter analysis: Advection is the dominant mechanism across foundation.

[1]"Less Protective" concentrations produced with HIGHEST moisture content and DEEPEST depth to contamination.
[2]"More Protective" concentrations produced with LOWEST moisture content and SHALLOWEST depth to contamination.

Building Air Exchange is outside the recommended range for this parameter.
Building Mixing Height is outside the recommended range for this building type.
Building Footpring Area is outside the recommended range for this building type.
Subsurface Foundation Area is outside the recommended range for this building type.

TARGET MEDIA CONCENTRATION RESULTS

Screening-Level Johnson and Ettinger Model

Site Name: Cage
Report Date: Thu Aug 6 16:54:51 CDT 2009
Report Generated From: http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite.htm
Depth to contamination from bottom of foundation: 5ft +/- 2ft
Average ground water temperature: 19C

CHEMICAL PROPERTIES
Chemical of Concern: 1,1-Dichloroethylene CAS Number: 75354
Molecular Weight: 96.94[g/mole] Henrys Constant: 0.8720278[unitless]
Diffusivity in Air: 9.000e-2[cm^2/sec] Diffusivity in Water: 1.040e-5[cm^2/sec]
Unit Risk Factor: 0[$(\mu g/m^3)^{-1}$] Reference Concentration: 0.2[mg/m^3]

SOIL PROPERTIES
Soil Type: Sand Total Porosity: 0.375
Unsaturated Zone Moisture Content:
low= 0.053 best estimate= 0.054 high= 0.055
Capillary Zone Moisture Content: 0.253 Height of Capillary Rise: 0.17[m]
Soil-Gas Flow Rate into Building: 5 [L/min]

BUILDING PROPERTIES
Building Type: Slab-on-Grade Air Exchange Rate: 1.71[hr^{-1}]
Building Mixing Height: 7.88[m] Building Footprint Area: 4968[m^2]
Subsurface Foundation Area: 4970[m^2] Building Crack Ratio: 0.00038[unitless]
Foundation Slab Thickness: 0.1[m]

EXPOSURE PARAMETERS
Exposure Duration: carcinogens 30 [years] non-carcinogens: 30 [years]
Exposure Frequency: carcinogens 350 [days/year] non-carcinogens: 365 [days/year]
Averaging Time: carcinogens 70 [years] non-carcinogens: 30 [years]
Risk Factor for carcinogens: 1E-6 Target Hazard Quotient for non-carcinogens: 1

JOHNSON & ETTINGER SIMULATION RESULTS
Effective Diffusion Coefficients:
Unsaturated Zone(D_{eff}): 0.01455[cm^2/s]
Unsaturated Zone + Capillary Zone (D^T_{eff}): 0.003953[cm^2/s]

Soil Gas Attenuation Factor (α): 0.000004409
Ground Water Attenuation Factor (α_{GW}): 0.000004409
Target Concentrations are based on NON-CANCER risk.
Target Indoor Air Concentration: 200[$\mu g/m^3$] or 50.48[ppbv]

[1]Less Protective Target Concentrations
Soil Gas: 4.365e7[$\mu g/m^3$] or 1.102e7[ppbv]; Ground Water: 5.247e4[$\mu g/L$]

Best Estimate Target Concentrations
Soil Gas: 4.326e7[$\mu g/m^3$] or 1.092e7[ppbv]; Ground Water: 5.202e4[$\mu g/L$]

[2]More Protective Target Concentrations
Soil Gas: 4.288e7[$\mu g/m^3$] or 1.082e7[ppbv]; Ground Water: 5.158e4[$\mu g/L$]

Based on parameter analysis: Advection is the dominant mechanism across foundation. Advection through foundation is the overall rate-limiting process for soil-gas to indoor-air pathway. Advection through foundation is the overall rate-limiting process for groundwater to indoor-air pathway.

[1]"Less Protective" concentrations produced with HIGHEST moisture content and DEEPEST depth to contamination.
[2]"More Protective" concentrations produced with LOWEST moisture content and SHALLOWEST depth to contamination.

Building Air Exchange is outside the recommended range for this parameter.
Building Mixing Height is outside the recommended range for this building type.
Building Footpring Area is outside the recommended range for this building type.
Subsurface Foundation Area is outside the recommended range for this building type.

TARGET MEDIA CONCENTRATION RESULTS

Screening-Level Johnson and Ettinger Model

Site Name: Cafeteria
Report Date: Thu Aug 6 16:53:39 CDT 2009
Report Generated From: http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite.htm
Depth to contamination from bottom of foundation: 5ft +/- 2ft
Average ground water temperature: 19C

CHEMICAL PROPERTIES
Chemical of Concern: 1,1-Dichloroethylene CAS Number: 75354
Molecular Weight: 96.94[g/mole] Henrys Constant: 0.8720278[unitless]
Diffusivity in Air: 9.000e-2[cm^2/sec] Diffusivity in Water: 1.040e-5[cm^2/sec]
Unit Risk Factor: 0[$(\mu g/m^3)^{-1}$] Reference Concentration: 0.2[mg/m^3]

SOIL PROPERTIES
Soil Type: Sand Total Porosity: 0.375
Unsaturated Zone Moisture Content:
low= 0.053 best estimate= 0.054 high= 0.055
Capillary Zone Moisture Content: 0.253 Height of Capillary Rise: 0.17[m]
Soil-Gas Flow Rate into Building: 5 [L/min]

BUILDING PROPERTIES
Building Type: Slab-on-Grade Air Exchange Rate: 14.33[hr^{-1}]
Building Mixing Height: 2.3[m] Building Footprint Area: 257[m^2]
Subsurface Foundation Area: 260[m^2] Building Crack Ratio: 0.00038[unitless]
Foundation Slab Thickness: 0.1[m]

EXPOSURE PARAMETERS
Exposure Duration: carcinogens 30 [years] non-carcinogens: 30 [years]
Exposure Frequency: carcinogens 350 [days/year] non-carcinogens: 365 [days/year]
Averaging Time: carcinogens 70 [years] non-carcinogens: 30 [years]
Risk Factor for carcinogens: 1E-6 Target Hazard Quotient for non-carcinogens: 1

JOHNSON & ETTINGER SIMULATION RESULTS
Effective Diffusion Coefficients:
Unsaturated Zone(D_{eff}): 0.01455[cm^2/s]
Unsaturated Zone + Capillary Zone (D^T_{eff}): 0.003953[cm^2/s]

Soil Gas Attenuation Factor (α): [redacted]
Ground Water Attenuation Factor (α_{GW}): 0.00001584
Target Concentrations are based on NON-CANCER risk.
Target Indoor Air Concentration: 200[$\mu g/m^3$] or 50.48[ppbv]

[1]Less Protective Target Concentrations
Soil Gas: 8.329e6[$\mu g/m^3$] or 2.102e6[ppbv]; Ground Water: 1.538e4[$\mu g/L$]

Best Estimate Target Concentrations
Soil Gas: 7.543e6[$\mu g/m^3$] or 1.904e6[ppbv]; Ground Water: 1.448e4[$\mu g/L$]

[2]More Protective Target Concentrations
Soil Gas: 6.773e6[$\mu g/m^3$] or 1.709e6[ppbv]; Ground Water: 1.360e4[$\mu g/L$]

Based on parameter analysis: Advection is the dominant mechanism across foundation.

[1]"Less Protective" concentrations produced with HIGHEST moisture content and DEEPEST depth to contamination.
[2]"More Protective" concentrations produced with LOWEST moisture content and SHALLOWEST depth to contamination.

Building Air Exchange is outside the recommended range for this parameter.
Building Footpring Area is outside the recommended range for this building type.
Subsurface Foundation Area is outside the recommended range for this building type.

TARGET MEDIA CONCENTRATION RESULTS

Screening-Level Johnson and Ettinger Model

Site Name: Wirtgen
Report Date: Thu Aug 6 16:56:33 CDT 2009
Report Generated From: http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite.htm
Depth to contamination from bottom of foundation: 5ft +/- 2ft
Average ground water temperature: 19C

CHEMICAL PROPERTIES
Chemical of Concern: 1,1-Dichloroethylene CAS Number: 75354
Molecular Weight: 96.94[g/mole] Henrys Constant: 0.8720278[unitless]
Diffusivity in Air: 9.000e-2[cm^2/sec] Diffusivity in Water: 1.040e-5[cm^2/sec]
Unit Risk Factor: 0[$(\mu g/m^3)^{-1}$] Reference Concentration: 0.2[mg/m^3]

SOIL PROPERTIES
Soil Type: Sand Total Porosity: 0.375
Unsaturated Zone Moisture Content:
low= 0.053 best estimate= 0.054 high= 0.055
Capillary Zone Moisture Content: 0.253 Height of Capillary Rise: 0.17[m]
Soil-Gas Flow Rate into Building: 5 [L/min]

BUILDING PROPERTIES
Building Type: Slab-on-Grade Air Exchange Rate: 5.44[hr^{-1}]
Building Mixing Height: 5.56[m] Building Footprint Area: 2174[m^2]
Subsurface Foundation Area: 2180[m^2] Building Crack Ratio: 0.00038[unitless]
Foundation Slab Thickness: 0.1[m]

EXPOSURE PARAMETERS
Exposure Duration: carcinogens 30 [years] non-carcinogens: 30 [years]
Exposure Frequency: carcinogens 350 [days/year] non-carcinogens: 365 [days/year]
Averaging Time: carcinogens 70 [years] non-carcinogens: 30 [years]
Risk Factor for carcinogens: 1E-6 Target Hazard Quotient for non-carcinogens: 1

JOHNSON & ETTINGER SIMULATION RESULTS
Effective Diffusion Coefficients:
Unsaturated Zone(D_{eff}): 0.01455[cm^2/s]
Unsaturated Zone + Capillary Zone (D^T_{eff}): 0.003953[cm^2/s]

Soil Gas Attenuation Factor (α):
Ground Water Attenuation Factor (α_{GW}): 0.00000398
Target Concentrations are based on NON-CANCER risk.
Target Indoor Air Concentration: 200[$\mu g/m^3$] or 50.48[ppbv]

[1]Less Protective Target Concentrations
Soil Gas: 4.628e7[$\mu g/m^3$] or 1.168e7[ppbv]; Ground Water: 5.846e4[$\mu g/L$]

Best Estimate Target Concentrations
Soil Gas: 4.555e7[$\mu g/m^3$] or 1.150e7[ppbv]; Ground Water: 5.763e4[$\mu g/L$]

[2]More Protective Target Concentrations
Soil Gas: 4.483e7[$\mu g/m^3$] or 1.131e7[ppbv]; Ground Water: 5.681e4[$\mu g/L$]

Based on parameter analysis: Advection is the dominant mechanism across foundation. Advection through foundation is the overall rate-limiting process for soil-gas to indoor-air pathway.

[1]"Less Protective" concentrations produced with HIGHEST moisture content and DEEPEST depth to contamination.
[2]"More Protective" concentrations produced with LOWEST moisture content and SHALLOWEST depth to contamination.

Building Air Exchange is outside the recommended range for this parameter.
Building Mixing Height is outside the recommended range for this building type.
Building Footpring Area is outside the recommended range for this building type.
Subsurface Foundation Area is outside the recommended range for this building type.