UPDATE TO THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION (NJDEP) VAPOR INTRUSION SCREENING LEVELS

(March 2013)

INTRODUCTION

The NJDEP has updated the March 2007 Vapor Intrusion Screening Levels (VISL) that may be accessed at http://www.nj.gov/dep/srp/guidance/vaporintrusion/. The March 2013 NJDEP VISL Tables were developed using the risk-based information included in the United States Environmental Protection Agency (USEPA) Regions 3, 6, and 9 November 2012 Regional Screening Levels Table for Chemical Contaminants at Superfund Sites (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm). The Department's updated screening levels and associated tables incorporate the following additions and modifications:

- The risk-based equations and input parameters are based on the USEPA Regional Screening Levels (RSL) Table and are consistent with USEPA's Risk Assessment Guidance for Superfund, Part F: Supplemental Guidance for Inhalation Risk Assessment (USEPA 2009). The nonresidential indoor air risk-based equations incorporate an exposure time (ET) of 8 hours a day in the calculations to reflect the worker exposure scenario.

- Naphthalene has been added to the tables. The contaminant has been included consistent with the analytical requirements outlined in Section 2.1(c) 3 of the Technical Requirements for Site Remediation (N.J.A.C. 7:26E).

- The analytical reporting limit used in the development of the naphthalene indoor air screening levels has been based on USEPA Method TO-15. The analytical reporting limit used in the development of the elemental mercury indoor air values is based on NIOSH Method 6009. The analytical reporting limits used in the development of the remaining screening levels have continued to be based on USEPA Method TO-15.

- A factor of 10 has been incorporated into the calculation of the health-based ground water screening values for additional petroleum related contaminants (not reflected in the March 2007 tables) to account for degradation of the contaminants in the unsaturated zone. The additional petroleum related contaminants include: 1, 3-butadiene, cyclohexane, n-hexane, naphthalene and styrene.

- Chemical properties have been updated to those listed on the USEPA RSL Table and in the Hazardous Substances Databank.

- Residential and nonresidential indoor air Rapid Action Levels (RAL) have been included for all contaminants listed in Table 1.

- Consistent with USEPA, five contaminants have been eliminated from the tables due to the absence of inhalation toxicity information. These chemicals include: 1, 3-dichlorobenzene, 1, 2- dichloroethene (cis), 1, 2- dichloroethene (total), 2-chlorotoluene, and tertiary butyl alcohol.

- The indoor air and soil gas screening levels are presented in $\mu g/m^3$ units only due to unit conversion errors and misapplication when both ppbv and $\mu g/m^3$ values were included in the tables.

DERIVATION AND APPLICATION OF THE UPDATED VISL

Table 1 is the VISL master table that includes Ground Water Screening Levels (GWSL), Indoor Air Screening Levels (IASL) and Soil Gas Screening Levels (SGSL) for those contaminants previously included in the March 2007 tables where toxicity information is available. Naphthalene has been added to the tables consistent with the analytical requirements outlined in Section 2.1(c) 3 of the Technical Requirements for Site Remediation (N.J.A.C. 7:26E). Table 2 presents residential and nonresidential indoor air RAL for those contaminants listed in Table 1. Table 3 includes a list of GWSL based on the determination of alternate soil textures at a site.

Tables A-1 through A-5 present the information used in the derivation of the above VISL. A discussion on the basis and application of the VISL is outlined below.

Ground Water Screening Levels

The Johnson and Ettinger model was used to calculate GWSL for vapor intrusion (Johnson and Ettinger 1991; USEPA 2002). The USEPA has released a series of spreadsheets that incorporate the model and calculate GWSL (USEPA 2004). New Jersey versions of these spreadsheets have been prepared and released by the NJDEP containing updated toxicity factors, chemical properties, and an appropriate ground water temperature.

In accordance with departmental policy, when calculated health-based screening values were below the current New Jersey Ground Water Quality Standards (GWQS), the screening levels were set at the higher GWQS instead of the calculated values. Table A-1 presents the calculated health-based screening values and the applicable GWQS. Table 1 presents the GWSL after consideration of the calculated values and the GWQS.

Input Parameters for the Johnson and Ettinger (J&E) Model

Soil Texture

Sandy soil is common in much of the southern half of New Jersey (Tedrow 1986). Therefore, this soil texture is appropriate for estimating GWSL for the vapor intrusion (VI) pathway, since heavier soil types (sandy loam, loam, etc.) provide more resistance to contaminant diffusion through the soil column. Additionally, the USEPA generic ground

water screening levels in their Draft Subsurface Vapor Intrusion Guidance (USEPA 2002) use an attenuation factor of 1 x 10^{-3}, which corresponds to the approximate attenuation factor calculated using the J&E model with sand soil. Therefore, this soil texture was selected for development of the GWSL, and was used in all locations in the spreadsheet where a soil texture was required (soil texture just above water table, soil texture in vadose zone for estimation of soil physicochemical properties, and soil texture to estimate soil permeability).

Soil Chemical and Physical Properties

These parameters are pre-set in the spreadsheet according to the soil texture. Since sand was used for the calculations, the following values were incorporated: vadose zone dry soil bulk density, 1.66 gm/cm^3; vadose zone soil total porosity, 0.375, vadose zone soil water-filled porosity, 0.054; vadose zone soil effective permeability, 9.96E-08 cm^2. The soil organic carbon fraction is fixed at 0.002 in the GW-SCREEN spreadsheet, but does not affect results when the source of the contamination is the ground water.

Chemical Properties

Chemical properties in the spreadsheet were updated to those listed in the USEPA RSL Table web pages (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/pdf/params_sl_table_run_NOV2012.pdf). The USEPA data sources have become a de facto national reference source for regulatory chemical properties and toxicity factors. Values were drawn from the November 2011 listing of chemical properties. The chemical properties used in the J&E spreadsheet are the organic carbon partition coefficient, the diffusivity in air, the diffusivity in water, the water solubility, the Henry's law constant, the boiling point, the critical temperature, and the enthalpy of vaporization. Boiling point, critical temperature, and enthalpy of vaporization are not listed in the above tables. Boiling points were determined using USEPA's EPI Suite Program (http://www.epa.gov/oppt/exposure/pubs/episuite.htm), the same program used by the USEPA for determining their above listed chemical properties. Critical temperatures were taken from the Hazardous Substances Databank (HSDB) (http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB), or the USEPA J&E spreadsheets when not available on the HSDB. Enthalpies of vaporization were used as listed in the USEPA J&E spreadsheets.

Exposure Parameters and Toxicity Factors

USEPA RSL Table and Risk Assessment Guidance for Superfund, Part F (USEPA 2009) document residential exposure assumptions were used. The Department, as mandated by the Brownfield Contaminated Site Remediation Act (N.J.S.A. 58:10B-1 et seq.), used an incremental lifetime cancer risk of 1 x 10^{-6} and a Hazard Quotient (HQ) of 1 in the development of the screening levels. Other parameters were: averaging time for carcinogens, 70 years; averaging time for noncarcinogens, 30 years; exposure duration, 30 years; exposure frequency, 350 days/year. Consistent with USEPA, the updated screening levels do not include the use of an age-adjusted factor when evaluating

carcinogenic effects under a residential exposure scenario that was included in the calculation of the GWSL presented in the earlier NJDEP Vapor Intrusion Guidance (VIG), Oct 2005 document (NJDEP 2005).

The toxicity factors used were consistent with those used in the development of the indoor air screening levels discussed below.

Chemical-specific adjustments

In order to make an allowance for known hydrocarbon degradation under VI scenarios, the GWSLs for these chemicals calculated using the J&E model were multiplied by a factor of ten. The chemicals for which this adjustment was made were benzene, 1, 3-butadiene, cyclohexane, ethyl benzene, n-hexane, naphthalene, styrene, toluene and xylene.

GWSL for methylene chloride, trichloroethene and vinyl chloride were also adjusted, because the USEPA considers these chemicals to have a mutagenic mode of action or early lifetime exposure component that justifies the use of modified carcinogenic risk-based equations in the development of residential indoor air screening levels. These equations are on the USEPA website at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/equations.htm but are not contained in the J&E spreadsheet. For this reason, the screening levels from the J&E spreadsheet needed to be multiplied by an adjustment factor for these contaminants. The adjustment factors were as follows: methylene chloride, 0.40; trichloroethene, 0.72; vinyl chloride, 0.29. The factors were determined by comparing screening levels calculated with and without the mutagenic mode of action or early lifetime exposure equations.

Building Parameters

As recommended and discussed in the USEPA Draft Subsurface Vapor Intrusion Guidance (USEPA 2002), the soil gas entry rate (Qsoil) was set at 5 L/min. The building air exchange rate is fixed in GW-SCREEN at 0.25/hr according to USEPA recommendations. The building type used for generation of screening numbers was the generic size recommended for buildings with basements – a floor area of 10 m by 10 m and a height of 3.66 m. Contaminants entering the building are assumed to immediately mix into this volume.

Other Parameters

The depth to ground water was fixed at 352.5 cm below ground surface. This is equivalent to 5 feet below the building foundation (which extends to a depth of 200 cm, or 6.5 feet) and is the minimum separation between the building and the ground water recommended for using the J&E model (USEPA 2002). The ground water temperature for the Department's screening criteria was set at 13°C. This is equivalent to the average temperature of two shallow ground water monitoring wells in the Kirkwood-Cohansey aquifer that had installed temperature monitors at depth (United States Geological Survey

2003). Shallow ground water temperatures in New Jersey generally fluctuate between 10 and 15°C.

Default Screening Numbers for Alternate Soil Textures

Using the J&E model, the Department has developed GWSL for Alternate Soil Textures, which are shown in Table 3. The levels were developed using the same "default" values and assumptions used in the generic GWSL except for those based on soil texture. Table 3 includes screening levels for loamy sand, sandy loam and loam soil textures. Values for vadose zone soil bulk density, total porosity and water filled porosity are built into the J&E spreadsheet and set according to the selected soil texture. Use of these values requires the determination of site-specific soil texture as described in the NJDEP Vapor Intrusion Technical (VIT) Guidance, March 2013, Version 3.1 (NJDEP 2013) document (see Section 2.4.5).

Indoor Air Screening Levels

The following equations used in the development of the residential and nonresidential health-based indoor air screening values were obtained from the USEPA RSL Table. The health-based residential indoor air values for methylene chloride, trichloroethylene and vinyl chloride are from the RSL table and are based on the mutagenic mode of action or early lifetime exposure equations presented on the USEPA website at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/equations.htm. The toxicity factors used in the calculation of the health-based values (see Table A-3) were also obtained from the USEPA RSL Table.

The Department, as required by regulation, used an incremental lifetime cancer risk of 1 x 10^{-6} and a Hazard Quotient (HQ) of 1 in the development of the health-based indoor air screening values. Cancer and noncancer values were calculated with the health-based indoor air screening levels determined as the more stringent of the cancer or noncancer values. The residential and nonresidential IASL, presented in Table 1, represent the higher of the resulting health-based screening values and the analytical reporting limits (see Table A-4). The risk-based equations along with the exposure parameters are presented below.

Carcinogenic Effect Equation:

$$SL_{ca} = \frac{TR \times AT \times LT}{EF \times ED \times ET \times \frac{1}{24}\frac{day}{hours} \times IUR}$$

Noncarcinogenic Effect Equation:

$$SL_{nc} = \frac{THQ \times AT \times ED \times \frac{1000\,\mu g}{mg}}{EF \times ED \times ET \times \frac{1}{24}\frac{day}{hours} \times \frac{1}{RfC}}$$

Parameter/Description	Default
SL_{ca} cancer based screening value	Chemical specific (ug/m^3)
SL_{nc} noncancer based screening value	Chemical specific (ug/m^3)
IUR inhalation unit risk	Chemical specific $(ug/m^3)^{-1}$
RfC inhalation reference concentration	Chemical specific (mg/m^3)
TR target cancer risk	1×10^{-6}
THQ target hazard quotient	1
LT lifetime, cancer effects	70 years
AT averaging time, residential and nonresidential	365 days per year
ED exposure duration, residential	30 years
exposure duration, nonresidential	25 years
EF exposure frequency, residential	350 days per year
exposure frequency, nonresidential	250 days per year
ET exposure time, residential	24 hours per day
exposure time, nonresidential	8 hours per day

Rapid Action Levels (RAL) for Indoor Air

Residential and nonresidential RAL have been developed for the contaminants listed in Table 1. The RAL were calculated by applying a factor of 100 times for carcinogens and a factor of 2 times for noncarcinogens to the Table A-4 rounded health-based indoor air screening values. The RAL presented in Table 2 are the lower of the resulting cancer and noncancer values that default to the analytical reporting limits, when higher.

Elemental Mercury

IASL for elemental mercury have been included in the VISL tables, consistent with the March 2007 tables. Residential and nonresidential RAL have been calculated for the contaminant that may be found in Table 2. The Department recommends use of NIOSH Method 6009 for the analysis of elemental mercury in indoor air. NIOSH Method 6009 notes that the Limit of Detection for the method is 0.03 µg. The method further states that 2 to 100 L of air may be sampled. Based on this information, the theoretical

reporting limit could be 0.03 µg/100L or 0.3 µg/m^3. Allowing for differences in sampling variability and recognizing a reporting limit of 0.3 µg/m^3 may be unrealistic at this time, the Department is requiring a reporting limit of 1 µg/m^3. This reporting limit has been considered in the development of the above screening levels.

Elemental mercury SGSL and GWSL have not been included in the VISL tables since (1) the contaminant is typically associated with use within a building rather than related to the VI pathway and (2) sample collection and analytical methods used are an issue when evaluating the levels of elemental mercury (rather than total mercury) present in soil gas and/or ground water. The Department should therefore be contacted concerning the appropriate analytical methods and screening levels to be used if VI is determined to be an issue for elemental mercury at a site.

Soil Gas Screening Levels

The following equation, used for the March 2007 SGSL, was used in the development of the residential and nonresidential health-based soil gas screening values.

The health-based soil gas screening values were calculated by dividing the health-based indoor air values by an attenuation factor (α) of 0.02. The attenuation factor is the ratio of the indoor air concentration measured in a residence to the vapor concentration measured in the subsurface materials underlying or adjacent to the residence (USEPA 2002). Based on the Department's experience, indicating the acceptability of the above attenuation factor, the above value has continued to be used in the development of the updated screening levels. The SGSL equation is presented below.

Health-Based Soil Gas Screening Level:

$$Health-based\ \ Screening\ \ Value\left(\frac{\mu g}{m^3}\right) = Health-based\ \ Indoor\ \ Air\ Value\left(\frac{\mu g}{m^3}\right)\Big/\alpha$$

Consistent with the development of the IASL, the health-based soil gas screening values default to the analytical reporting limit, when higher (see Table A-5). The resulting SGSL are presented in Table 1.

Rounding Procedures Used in the Development of the Screening Levels

The screening level values have been rounded to 2 significant figures for a value greater than or equal to 10, and to 1 significant figure for a value less than 10, including those less than 1. This approach was used in previous versions of the tables and is described in the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, (USEPA 2001). The rounding rules specified below are contained in Hurlbert (1994).

The screening levels and analytical reporting limits were rounded as follows:

- If the first number beyond the last significant digit is less than 5, the last significant number remains the same; and the remaining numbers are dropped. For example, 4.438 is rounded to one significant figure, 4; and 44.38 is rounded to 2 significant figures, 44.

- If the first number beyond the last significant digit is more than 5, the last significant number increases by one and the remaining numbers are dropped. For example, 4.638 is rounded to one significant figure, 5; and 46.68 is rounded to 2 significant figures, 47.

- If the first number beyond the last significant digit is exactly 5, then the last digit is rounded to the closest even number. For example, 4.5 is rounded to one significant figure, 4; and 45.5 is rounded to two significant figures, 46.

Application of the VISL and Use of Site-Specific Options

The VISL are used in the evaluation of the VI pathway as outlined in applicable sections (including Sections 2.2, 4.3, 4.5, and 6.4.1) of the NJDEP VIT guidance that may be accessed at http://www.nj.gov/dep/srp/guidance/vaporintrusion/.

As outlined in Section 2.4.5 of the NJDEP VIT guidance, site-specific screening options, such as the use of modeling and development of alternative screening levels, may be used in the evaluation of a site. Alternative screening levels may be developed based on chemical toxicity factor changes on IRIS or the USEPA RSL table that have not yet been reflected in the most recent NJDEP VISL tables. Alternative screening levels may also be developed based on site-specific factors and changes in the risk assessment methodologies or exposure parameters not yet included in the NJDEP VISL tables. For alternative GWSLs, NJDEP guidance on modifying parameters in the J&E spreadsheet may be consulted (http://www.nj.gov/dep/srp/guidance/vaporintrusion/njje.htm).

It is recommended that the applicable NJDEP representative for VI listed at http://www.nj.gov/dep/srp/guidance/vaporintrusion/ be contacted before implementation of alternative VISL. The Department should also be contacted to develop a VISL for a site VI contaminant of concern that is not currently included on the NJDEP VISL tables. Information on completion of the NJDEP *Alternative Soil Remediation Standard and/or Screening Level Form* to be used in the development of alternative or new VISL may be obtained at http://www.nj.gov/dep/srp/srra/forms/

References

Hurlbert, R. T. 1994. Comprehending Behavioral Statistics. Brooks/Cole Publishers, Pacific Grove, CA.

Johnson, P.C. and R.A. Ettinger. 1991. "Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapors into Buildings," *Environmental Science and Technology* **25:** 1445-1452.

New Jersey Administrative Code (N.J.A.C. 7:26D) Remediation Standards. http://www.state.nj.us/dep/srp/guidance/rs/

New Jersey Administrative Code (N.J.A.C. 7:26E). Technical Requirements for Site Remediation. http://www.nj.gov/dep/rules/rules/njac7_26e.pdf

New Jersey Department of Environmental Protection (NJDEP) 2005. Vapor Intrusion Guidance (VIG), October 2005.

New Jersey Department of Environmental Protection (NJDEP) 2013. Vapor Intrusion Technical Guidance, (Version 3.1). http://www.nj.gov/dep/srp/guidance/vaporintrusion/

New Jersey Statutes Annotated (N.J.S.A. 58:10B-1 et seq.). Brownfields Contaminated Site Remediation Act. http://www.nj.gov/dep/srp/regs/statutes/bcsra.pdf

Tedrow J.F. 1986. Soils of New Jersey. R.E. Krieger: Malabar, FL.

U.S. Environmental Protection Agency (USEPA). 2001. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Draft Final, Office of Solid Waste and Emergency Response, Washington, DC. OSWER 9355-4-24.

U. S. Environmental Protection Agency (USEPA). 2002. Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). Office of Solid Waste and Emergency Response, Washington, DC. USEPA530-F-02-052.

U.S. Environmental Protection Agency (USEPA). 2004. "User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings," Office of Emergency and Remedial Response, Washington, DC. http://www.epa.gov/oswer/riskassessment/airmodel/johnson_ettinger.htm.

U.S. Environmental Protection Agency (USEPA). 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment, Office of Superfund Remediation and Technology Innovation, Washington, D.C. OSWER 9285.7-82.

United States Geological Survey (USGS). 2003. Personal communication.

TABLE A-1

March 2013

DERIVATION OF THE NJDEP VAPOR INTRUSION GROUND WATER SCREENING LEVELS (GWSL)

Chemical	CAS No.	Cancer/ Noncancer[a]	Health-Based Ground Water to Indoor Air Values (µg/L)	NJDEP Ground Water Quality Standards (µg/L)	NJDEP Ground Water Screening Levels (µg/L)[b]
Acetone (2-Propanone)	67-64-1	N	21,000,000	6,000	**21,000,000**
Benzene	71-43-2	C	20[c]	1	**20[c]**
Bromodichloromethane (Dichlorobromomethane)	75-27-4	C	2	1	**2**
Bromoethene (Vinyl bromide)	593-60-2	C	0.2	-	**0.2**
Bromoform	75-25-2	C	300	4	**300**
Bromomethane (Methyl bromide)	74-83-9	N	20	10	**20**
1,3-Butadiene (Vinyl ethylene)	106-99-0	C	0.3[c]	-	**0.3[c]**
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	N	2,500,000	300	**2,500,000**
Carbon disulfide	75-15-0	N	1,500	700	**1,500**
Carbon tetrachloride	56-23-5	C	0.7	1	**1**
Chlorobenzene	108-90-7	N	770	50	**770**
Chloroethane (Ethyl chloride)	75-00-3	N	26,000	5	**26,000**
Chloroform	67-66-3	C	1	70	**70**
Chloromethane (Methyl chloride)	74-87-3	N	240	-	**240**
3-Chloropropene (Allyl chloride)	107-05-1	C	1	-	**1**
Cyclohexane	110-82-7	N	16,000[c]	-	**16,000[c]**
Dibromochloromethane (Chlorodibromomethane)	124-48-1	C	6	1	**6**
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	C	0.4	0.03	**0.4**
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	N	6,800	600	**6,800**
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	C	6	75	**75**
Dichlorodifluoromethane (Freon 12)	75-71-8	N	12	1,000	**1,000**
1,1-Dichloroethane	75-34-3	C	10	50	**50**
1,2-Dichloroethane	107-06-2	C	3	2	**3**
1,1-Dichloroethene (1,1-Dichloroethylene)	75-35-4	N	260	1	**260**
1,2-Dichloroethene (trans) (t-1,2-Dichloroethylene)	156-60-5	N	520	100	**520**
1,2-Dichloropropane	78-87-5	C	4	1	**4**
1,3-Dichloropropene (total)	542-75-6	C	7	1	**7**
Ethylbenzene	100-41-4	C	61[c]	700	**700**
Hexachloro-1,3-butadiene	87-68-3	C	1	1	**1**

TABLE A-1

DERIVATION OF THE NJDEP VAPOR INTRUSION GROUND WATER SCREENING LEVELS (GWSL)

Chemical	CAS No.	Cancer/ Noncancer[a]	Health-Based Ground Water to Indoor Air Values (µg/L)	NJDEP Ground Water Quality Standards (µg/L)	NJDEP Ground Water Screening Levels (µg/L)[b]
n-Hexane	110-54-3	N	160[c]	30	**160[c]**
Methylene chloride (Dichloromethane)	75-09-2	C	920	3	**920**
4-Methyl-2-pentanone (MIBK)	108-10-1	N	900,000	-	**900,000**
Methyl tert-butyl ether (MTBE)	1634-04-4	C	580	70	**580**
Naphthalene	91-20-3	C	96[c]	300	**300**
Styrene	100-42-5	N	180,000	100	**180,000**
1,1,2,2-Tetrachloroethane	79-34-5	C	6	1	**6**
Tetrachloroethene (PCE) (Tetrachloroethylene)	127-18-4	C	31	1	**31**
Toluene	108-88-3	N	330,000[c]	600	**330,000[c]**
1,2,4-Trichlorobenzene	120-82-1	N	130	9	**130**
1,1,1-Trichloroethane	71-55-6	N	13,000	30	**13,000**
1,1,2-Trichloroethane	79-00-5	C	8	3	**8**
Trichloroethene (TCE) (Trichloroethylene)	79-01-6	C	2	1	**2**
Trichlorofluoromethane (Freon 11)	75-69-4	N	290	2,000	**2,000**
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon TF)	76-13-1	N	3,700	-	**3,700**
Vinyl chloride	75-01-4	C	0.1	1	**1**
Xylenes (total)	1330-20-7	N	8,600[c]	1,000	**8,600[c]**

NOTES

[a] Values based on cancer (C) or noncancer (N) effects.

[b] Levels are the higher of the health-based values and the GWQS/PQL.

[c] Health-based screening value multiplied by a factor of ten to reflect degradation of chemical in the unsaturated soil zone.

"-" = Not available.

TABLE A-2

CHEMICAL PROPERTIES [a, b]

CAS No.	Chemical	Org. Car. partition coefficient K_{oc} (cm^3/g)	Diffusivity in air D_a (cm^2/s)	Diffusivity in water D_w (cm^2/s)	Pure component water sol S (mg/L)	Henry's law constant H' (unitless)	Normal boiling point (bp) T_B (^oK)[c]	Critical Temp T_C (^oK)[f]	Enthalpy of vaporization at normal bp $DH_{v,b}$ (cal/mol)[g]
67-64-1	Acetone (2-Propanone)	2.364	1.059228E-01	1.1500E-05	1000000	1.4309E-03	328.65	508	6,955
71-43-2	Benzene	145.8	8.953840E-02	1.0300E-05	1790	2.2690E-01	353.15	562.05	7,342
75-27-4	Bromodichloromethane	31.82	5.626290E-02	1.0700E-05	3030	8.6672E-02	363.15	585.85[g]	7800[f]
593-60-2	Bromoethene (Vinyl bromide)	21.73	8.622380E-02	1.1700E-05	10358	5.0286E-01	288.95	463.51	5401
75-25-2	Bromoform	31.82	3.573200E-02	1.0400E-05	3100	2.1872E-02	422.25	696[g]	9,479
74-83-9	Bromomethane (Methyl bromide)	13.22	1.004967E-01	1.3500E-05	15200	3.0008E-01	276.65	467.15	5,714
106-99-0	1,3-Butadiene (Vinyl ethylene)	39.6	1.003514E-01	1.0300E-05	735	3.0090E+00	268.75	434.95	5,370
78-93-3	2-Butanone (Methyl ethyl ketone)	4.51	9.144430E-02	1.0200E-05	223000	2.3262E-03	352.65	536.7	7,481
75-15-0	Carbon disulfide	21.73	1.064466E-01	1.3000E-05	2160	5.8872E-01	319.15	553.15	6,391
56-23-5	Carbon tetrachloride	43.89	5.714350E-02	9.7849E-06	793	1.1284E+00	349.95	556.35	7,127
108-90-7	Chlorobenzene	233.9	7.213060E-02	9.4765E-06	498	1.2715E-01	404.85	632	8,410
75-00-3	Chloroethane (Ethyl chloride)	21.73	1.037540E-01	1.1600E-05	6710	4.5380E-01	285.45	460.15	5,879
67-66-3	Chloroform	31.82	7.691970E-02	1.0900E-05	7950	1.5004E-01	334.25	536.4	6,988
74-87-3	Chloromethane (Methyl chloride)	13.22	1.239618E-01	1.3600E-05	5320	3.6059E-01	249.15	416.25	5,115
107-05-1	3-Chloropropene (Allyl chloride)	39.6	9.360720E-02	1.0800E-05	3370	4.4971E-01	318.25	514.26	6940[f]
95-49-8	2-Chlorotoluene	382.9	6.290250E-02	8.7194E-06	374	1.4595E-01	432.15	654.25	9958[f]
110-82-7	Cyclohexane	145.8	7.997520E-02	9.1079E-06	55	6.1325E+00	353.85	553.55	7155[f]
124-48-1	Dibromochloromethane	31.82	3.663560E-02	1.0600E-05	2700	3.2011E-02	393.15	678.2[g]	5,900
106-93-4	1,2-Dibromoethane	39.6	4.303480E-02	1.0400E-05	3910	2.6574E-02	404.75	582.95	8,310
95-50-1	1,2-Dichlorobenzene (o)	382.9	5.617030E-02	8.9213E-06	156	7.8496E-02	453.15	690.35	9,700
541-73-1	1,3-Dichlorobenzene (m)	375.3[c]	6.920000E-02[d]	7.8600E-06[d]	125[c]	1.0751E-01[c]	446.15	688.45	9230.18
106-46-7	1,4-Dichlorobenzene (p)	375.3	5.504290E-02	8.6790E-06	81.3	9.8528E-02	447.15	680.65	9,271

TABLE A-2

CHEMICAL PROPERTIES [a, b]

CAS No.	Chemical	Org. Car. partition coefficient K_{oc} (cm^3/g)	Diffusivity in air D_a (cm^2/s)	Diffusivity in water D_w (cm^2/s)	Pure component water sol S (mg/L)	Henry's law constant H' (unitless)	Normal boiling point (bp) T_B (^oK)[c]	Critical Temp T_C (^oK)[f]	Enthalpy of vaporization at normal bp $DH_{v,b}$ (cal/mol)[g]
75-71-8	Dichlorodifluoromethane (Freon 12)	43.89	7.602900E-02	1.0800E-05	280	1.4023E+01	243.35	385	9,421
75-34-3	1,1-Dichloroethane	31.82	8.364460E-02	1.0600E-05	5040	2.2976E-01	330.55	534.65	6,895
107-06-2	1,2-Dichloroethane	39.6	8.572210E-02	1.1000E-05	8600	4.8242E-02	356.65	563.15	7,643
75-35-4	1,1-Dichloroethene	31.82	8.631380E-02	1.1000E-05	2420	1.0670E+00	304.75	493.95	6,247
156-59-2	1,2-Dichloroethene (cis)	39.6	8.840880E-02	1.1300E-05	6410	1.6680E-01	328.15	544.2	7,192
156-60-5	1,2-Dichloroethene (trans)	39.6	8.761260E-02	1.1200E-05	4520	1.6680E-01	328.15	516.7	6,717
540-59-0	1,2-Dichloroethene (total)	39.6	9.003640E-02	1.0500E-05	3500	1.6680E-01	328.15	530.25[g]	6,954
78-87-5	1,2-Dichloropropane	60.7	7.334000E-02	9.7252E-06	2800	1.1529E-01	368.65	572[g]	7,590
542-75-6	1,3-Dichloropropene (total)	72.17	7.627300E-02	1.0100E-05	2800	1.4513E-01	385.15	587.38[g]	7900
100-41-4	Ethylbenzene	446.1	6.846520E-02	8.4558E-06	169	3.2216E-01	409.25	617.15	8,501
87-68-3	Hexachloro-1,3-butadiene	845.2	2.674500E-02	7.0264E-06	3.2	4.2110E-01	488.15	738[g]	10,206
110-54-3	n-Hexane	131.5	7.310640E-02	8.1657E-06	9.5	7.3590E+01	341.85	507.38	6,895
7439-97-6	Mercury (elemental)	26,000	3.070000E-02	6.3000E-06	0.06	4.6700E-01	629.75	1735.15	14127
75-09-2	Methylene chloride (Dichloromethane)	21.73	9.993890E-02	1.2500E-05	13000	1.3287E-01	313.15	510	6,706
91-57-6	2-Methylnaphthalene	2478	5.243190E-02	7.7811E-06	24.6	2.1177E-02	514.25	761	12,600
108-10-1	4-Methyl-2-pentanone (MIBK)	12.6	6.977970E-02	8.3477E-06	19000	5.6419E-03	389.65	574.6	8,243
1634-04-4	Methyl tert-butyl ether (MTBE)	11.56	7.526790E-02	8.5905E-06	51000	2.3998E-02	328.35	497.1[g]	6677.66
91-20-3	Naphthalene	1544	6.049940E-02	8.3770E-06	31	1.7989E-02	491.05	748.4	10373
100-42-5	Styrene	446.1	7.111400E-02	8.7838E-06	310	1.1243E-01	418.15	636.85	8,737
75-65-0	Tertiary butyl alcohol (TBA)	2.111[c]	9.850000E-02[e]	1.1400E-05[e]	1.00E+06[c]	3.6996E-04[c]	355.55	508[h]	9338[f]
79-34-5	1,1,2,2-Tetrachloroethane	94.94	4.892060E-02	9.2902E-06	2830	1.5004E-02	419.65	661.15	8,996
127-18-4	Tetrachloroethene (PCE)	94.94	5.046640E-02	9.4551E-06	206	7.2363E-01	394.45	620.25	8,288

TABLE A-2

CHEMICAL PROPERTIES [a, b]

CAS No.	Chemical	Org. Car. partition coefficient K_{oc} (cm^3/g)	Diffusivity in air D_a (cm^2/s)	Diffusivity in water D_w (cm^2/s)	Pure component water sol S (mg/L)	Henry's law constant H' (unitless)	Normal boiling point (bp) T_B (^oK)[c]	Critical Temp T_C (^oK)[f]	Enthalpy of vaporization at normal bp $DH_{v,b}$ (cal/mol)[g]
108-88-3	Toluene	233.9	7.780530E-02	9.2045E-06	526	2.7146E-01	383.75	591.75	7,930
120-82-1	1,2,4-Trichlorobenzene	1356	3.959920E-02	8.4033E-06	49	5.8054E-02	486.65	726.45	10,471
71-55-6	1,1,1-Trichloroethane	43.89	6.481740E-02	9.5990E-06	1290	7.0319E-01	347.15	584.65	7,136
79-00-5	1,1,2-Trichloroethane	60.7	6.689040E-02	1.0000E-05	4590	3.3688E-02	386.95	602.00[g]	8,322
79-01-6	Trichloroethene (TCE)	60.7	6.866180E-02	1.0200E-05	1280	4.0270E-01	360.35	573.35	7,505
75-69-4	Trichlorofluoromethane (Freon 11)	43.89	6.535600E-02	1.0000E-05	1100	3.9657E+00	296.85	471.15	5,999
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	196.8	3.756580E-02	8.5920E-06	170	2.1504E+01	320.85	487.45	6,463
95-63-6	1,2,4-Trimethylbenzene	614.3	6.067540E-02	7.9209E-06	57	2.5184E-01	442.45	649.28	9,369
75-01-4	Vinyl chloride	21.73	1.071189E-01	1.2000E-05	8800	1.1365E+00	259.85	424.61	5,250
1330-20-7	Xylenes (total)	382.9	8.473950E-02	9.9011E-06	106	2.1177E-01	411.65	621.18[g]	8570

NOTES

[a] Chemical properties are from USEPA Regional Screening Level Table (November 2011) unless otherwise noted

[b] See Table G-3 for sources of toxicological parameters

[c] Calculated with EPI Suite (USEPA 2010)

[d] From WATER9

[e] Calculated with WATER9

[f] from Hazardous Substances Databank (2012)

[g] From Johnson and Ettinger Spreadsheets (USEPA 2004)

[h] From Chemical Rubber Company (1972)

TABLE A-3
TOXICITY FACTOR INFORMATION

Chemical	CAS No.	Inhalation Unit Risk (IUR) $(\mu g/m^3)^{-1}$	Source	Reference Concentration (RfC) (mg/m^3)	Source
Acetone (2-Propanone)	67-64-1	-		3.1E+01	ATSDR
Benzene	71-43-2	7.8E-06	IRIS	3.0E-02	IRIS
Bromodichloromethane (Dichlorobromomethane)	75-27-4	3.7E-05	CAL	-	
Bromoethene (Vinyl bromide)	593-60-2	3.2E-05	HEAST	3.0E-03	IRIS
Bromoform	75-25-2	1.1E-06	IRIS	-	
Bromomethane (Methyl bromide)	74-83-9	-		5.0E-03	IRIS
1,3-Butadiene (Vinyl ethylene)	106-99-0	3.0E-05	IRIS	2.0E-03	IRIS
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	-		5.0E+00	IRIS
Carbon disulfide	75-15-0	-		7.0E-01	IRIS
Carbon tetrachloride	56-23-5	6.0E-06	IRIS	1.0E-01	IRIS
Chlorobenzene	108-90-7	-		5.0E-02	PPRT
Chloroethane (Ethyl chloride)	75-00-3	-		1.0E+01	IRIS
Chloroform	67-66-3	2.3E-05	IRIS	9.8E-02	ATSDR
Chloromethane (Methyl chloride)	74-87-3	-		9.0E-02	IRIS
3-Chloropropene (Allyl chloride)	107-05-1	6.0E-06	CAL	1.0E-03	IRIS
Cyclohexane	110-82-7	-		6.0E+00	IRIS
Dibromochloromethane (Chlorodibromomethane)	124-48-1	2.7E-05	CAL	-	
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	6.0E-04	IRIS	9.0E-03	IRIS
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	-		2.0E-01	HEAST
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	1.1E-05	CAL	8.0E-01	IRIS
Dichlorodifluoromethane (Freon 12)	75-71-8	-		1.0E-01	PPRT X
1,1-Dichloroethane	75-34-3	1.6E-06	CAL	-	
1,2-Dichloroethane	107-06-2	2.6E-05	IRIS	7.0E-03	PPRT
1,1-Dichloroethene (1,1-Dichloroethylene)	75-35-4	-		2.0E-01	IRIS
1,2-Dichloroethene (trans) (t-1,2-Dichloroethylene)	156-60-5	-		6.0E-02	PPRT
1,2-Dichloropropane	78-87-5	1.0E-05	CAL	4.0E-03	IRIS
1,3-Dichloropropene (total)	542-75-6	4.0E-06	IRIS	2.0E-02	IRIS
Ethylbenzene	100-41-4	2.5E-06	CAL	1.0E+00	IRIS
Hexachloro-1,3-butadiene	87-68-3	2.2E-05	IRIS	-	
n-Hexane	110-54-3	-		7.0E-01	IRIS
Mercury (elemental)	7439-97-6	-		3.0E-04	IRIS

TABLE A-3
TOXICITY FACTOR INFORMATION

Chemical	CAS No.	Inhalation Unit Risk (IUR) $(\mu g/m^3)^{-1}$	Source	Reference Concentration (RfC) (mg/m^3)	Source
Methylene chloride (Dichloromethane) [a]	75-09-2	1.0E-08	IRIS	6.0E-01	IRIS
4-Methyl-2-pentanone (MIBK)	108-10-1	-		3.0E+00	IRIS
Methyl tert-butyl ether (MTBE)	1634-04-4	2.6E-07	CAL	3.0E+00	IRIS
Naphthalene	91-20-3	3.4E-05	CAL	3.0E-03	IRIS
Styrene	100-42-5	-		1.0E+00	IRIS
1,1,2,2-Tetrachloroethane	79-34-5	5.8E-05	CAL	-	
Tetrachloroethene (PCE) (Tetrachloroethylene)	127-18-4	2.6E-07	IRIS	4.0E-02	IRIS
Toluene	108-88-3	-		5.0E+00	IRIS
1,2,4-Trichlorobenzene	120-82-1	-		2.00E-03	PPRT
1,1,1-Trichloroethane	71-55-6	-		5.0E+00	IRIS
1,1,2-Trichloroethane	79-00-5	1.6E-05	IRIS	2.0E-04	PPRT X
Trichloroethene (TCE) (Trichloroethylene) [a]	79-01-6	4.1E-06	IRIS	2.0E-03	IRIS
Trichlorofluoromethane (Freon 11)	75-69-4	-		7.0E-01	HEAST
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon TF)	76-13-1	-		3.0E+01	HEAST
Vinyl chloride [a]	75-01-4	4.4E-06	IRIS	1.0E-01	IRIS
Xylenes (total)	1330-20-7	-		1.0E-01	IRIS

NOTES

Toxicity factors are based on the November 2012 USEPA Regional Screening Level (RSL) Table.

[a] Residential values calculated for a mutagenic mode of action or early lifetime exposure as specified in the USEPA RSL Table equations.

IRIS = USEPA Integrated Risk Information System.

CAL = CalEPA toxicity value.

HEAST = Health Effects Assessment Summary Tables.

PPRT = EPA Provisonal Peer Reviewed Toxicity Value (Superfund).

PPRT X = EPA Provisional Peer Reviewed Toxicty Appendix value.

ATSDR = Agency for Toxic Substances Disease Registry toxicity value.

"-" = Not available.

TABLE A-4

DERIVATION OF THE NJDEP VAPOR INTRUSION INDOOR AIR SCREENING LEVELS (IASL)

Chemical	CAS No.	Method TO-15 Reporting Limits ($\mu g/m^3$)	Residential[a]			Nonresidential[a]		
			Cancer Health-Based Indoor Air Screening Values	Noncancer Health-Based Indoor Air Screening Values	**Residential Indoor Air Screening Levels**	Cancer Health-Based Indoor Air Screening Values	Noncancer Health-Based Indoor Air Screening Values	**Nonresidential Indoor Air Screening Levels**
		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
Acetone (2-Propanone)	67-64-1	21	-	32,000	**32,000**	-	140,000	**140,000**
Benzene	71-43-2	2	0.3	31	**2**	2	130	**2**
Bromodichloromethane (Dichlorobromomethane)	75-27-4	3	0.07	-	**3**	0.3	-	**3**
Bromoethene (Vinyl bromide)	593-60-2	2	0.08	3	**2**	0.4	13	**2**
Bromoform	75-25-2	5	2	-	**5**	11	-	**11**
Bromomethane (Methyl bromide)	74-83-9	2	-	5	**5**	-	22	**22**
1,3-Butadiene (Vinyl ethylene)	106-99-0	1	0.08	2	**1**	0.4	9	**1**
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	1	-	5,200	**5,200**	-	22,000	**22,000**
Carbon disulfide	75-15-0	2	-	730	**730**	-	3,100	**3,100**
Carbon tetrachloride	56-23-5	3	0.4	100	**3**	2	440	**3**
Chlorobenzene	108-90-7	2	-	52	**52**	-	220	**220**
Chloroethane (Ethyl chloride)	75-00-3	1	-	10,000	**10,000**	-	44,000	**44,000**
Chloroform	67-66-3	2	0.1	100	**2**	0.5	430	**2**
Chloromethane (Methyl chloride)	74-87-3	1	-	94	**94**	-	390	**390**
3-Chloropropene (Allyl chloride)	107-05-1	2	0.4	1	**2**	2	4	**2**
Cyclohexane	110-82-7	2	-	6,300	**6,300**	-	26,000	**26,000**
Dibromochloromethane (Chlorodibromomethane)	124-48-1	4	0.09	-	**4**	0.5	-	**4**
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	4	0.004	9	**4**	0.02	39	**4**
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	3	-	210	**210**	-	880	**880**
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	3	0.2	830	**3**	1	3,500	**3**
Dichlorodifluoromethane (Freon 12)	75-71-8	2	-	100	**100**	-	440	**440**
1,1-Dichloroethane	75-34-3	2	2	-	**2**	8	-	**8**
1,2-Dichloroethane	107-06-2	2	0.09	7	**2**	0.5	31	**2**
1,1-Dichloroethene (1,1-Dichloroethylene)	75-35-4	2	-	210	**210**	-	880	**880**
1,2-Dichloroethene (trans) (t-1,2-Dichloroethylene)	156-60-5	2	-	63	**63**	-	260	**260**
1,2-Dichloropropane	78-87-5	2	0.2	4	**2**	1	18	**2**
1,3-Dichloropropene (total)	542-75-6	2	0.6	21	**2**	3	88	**3**
Ethylbenzene	100-41-4	2	1	1,000	**2**	5	4,400	**5**
Hexachloro-1,3-butadiene	87-68-3	5	0.1	-	**5**	0.6	-	**5**
n-Hexane	110-54-3	2	-	730	**730**	-	3,100	**3,100**
Mercury (elemental) [b]	7439-97-6	1	-	0.3	**1**	-	1	**1**
Methylene chloride (Dichloromethane) [c]	75-09-2	2	96	630	**96**	1,200	2,600	**1,200**

TABLE A-4

DERIVATION OF THE NJDEP VAPOR INTRUSION INDOOR AIR SCREENING LEVELS (IASL)

Chemical	CAS No.	Method TO-15 Reporting Limits ($\mu g/m^3$)	Residential[a]			Nonresidential[a]		
			Cancer Health-Based Indoor Air Screening Values	Noncancer Health-Based Indoor Air Screening Values	**Residential Indoor Air Screening Levels**	Cancer Health-Based Indoor Air Screening Values	Noncancer Health-Based Indoor Air Screening Values	**Nonresidential Indoor Air Screening Levels**
		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
4-Methyl-2-pentanone (MIBK)	108-10-1	2	-	3,100	**3,100**	-	13,000	**13,000**
Methyl tert-butyl ether (MTBE)	1634-04-4	2	9	3,100	**9**	47	13,000	**47**
Naphthalene	91-20-3	3	0.07	3	**3**	0.4	13	**3**
Styrene	100-42-5	2	-	1,000	**1,000**	-	4,400	**4,400**
1,1,2,2-Tetrachloroethane	79-34-5	3	0.04	-	**3**	0.2	-	**3**
Tetrachloroethene (PCE) (Tetrachloroethylene)	127-18-4	3	9	42	**9**	47	180	**47**
Toluene	108-88-3	2	-	5,200	**5,200**	-	22,000	**22,000**
1,2,4-Trichlorobenzene	120-82-1	4	-	2	**4**	-	9	**9**
1,1,1-Trichloroethane	71-55-6	3	-	5,200	**5,200**	-	22,000	**22,000**
1,1,2-Trichloroethane	79-00-5	3	0.2	0.2	**3**	0.8	0.9	**3**
Trichloroethene (TCE) (Trichloroethylene) [c]	79-01-6	3	0.4	2	**3**	3	9	**3**
Trichlorofluoromethane (Freon 11)	75-69-4	3	-	730	**730**	-	3,100	**3,100**
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon TF)	76-13-1	4	-	31,000	**31,000**	-	130,000	**130,000**
Vinyl chloride [c]	75-01-4	1	0.2	100	**1**	3	440	**3**
Xylenes (total)	1330-20-7	2	-	100	**100**	-	440	**440**

NOTES

[a] The Indoor Air Screening Level is the higher of the health-based screening value (determined as the lower of the cancer or noncancer value) and the analytical reporting limit.

[b] The analytical reporting limit for elemental mercury is based on NIOSH Method 6009.

[c] Residential values are based on the mutagenic mode of action or early lifetime exposure equation as specified in the USEPA RSL Table.

"-" = Not available

TABLE A-5

DERIVATION OF THE NJDEP VAPOR INTRUSION SOIL GAS SCREENING LEVELS (SGSL)

Chemical	CAS No.	Cancer/ Noncancer[a]	Method TO-15 Reporting Limits	Residential [b]		Nonresidential [b]	
				Health-Based Soil Gas Screening Values	**Residential Soil Gas Screening Levels**	Health-Based Soil Gas Screening Values	**Nonresidential Soil Gas Screening Levels**
			$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
Acetone (2-Propanone)	67-64-1	N	210	1,600,000	**1,600,000**	6,800,000	**6,800,000**
Benzene	71-43-2	C	16	16	**16**	79	**79**
Bromodichloromethane (Dichlorobromomethane)	75-27-4	C	34	3	**34**	17	**34**
Bromoethene (Vinyl bromide)	593-60-2	C	22	4	**22**	19	**22**
Bromoform	75-25-2	C	52	110	**110**	560	**560**
Bromomethane (Methyl bromide)	74-83-9	N	19	260	**260**	1,100	**1,100**
1,3-Butadiene (Vinyl ethylene)	106-99-0	C	11	4	**11**	20	**20**
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	N	15	260,000	**260,000**	1,100,000	**1,100,000**
Carbon disulfide	75-15-0	N	16	36,000	**36,000**	150,000	**150,000**
Carbon tetrachloride	56-23-5	C	31	20	**31**	100	**100**
Chlorobenzene	108-90-7	N	23	2,600	**2,600**	11,000	**11,000**
Chloroethane (Ethyl chloride)	75-00-3	N	13	520,000	**520,000**	2,200,000	**2,200,000**
Chloroform	67-66-3	C	24	5	**24**	27	**27**
Chloromethane (Methyl chloride)	74-87-3	N	10	4,700	**4,700**	20,000	**20,000**
3-Chloropropene (Allyl chloride)	107-05-1	C	16	20	**20**	100	**100**
Cyclohexane	110-82-7	N	17	310,000	**310,000**	1,300,000	**1,300,000**
Dibromochloromethane (Chlorodibromomethane)	124-48-1	C	43	5	**43**	23	**43**
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	C	38	0.2	**38**	1	**38**
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	N	30	10,000	**10,000**	44,000	**44,000**
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	C	30	11	**30**	56	**56**
Dichlorodifluoromethane (Freon 12)	75-71-8	N	25	5,200	**5,200**	22,000	**22,000**
1,1-Dichloroethane	75-34-3	C	20	76	**76**	380	**380**
1,2-Dichloroethane	107-06-2	C	20	5	**20**	24	**24**
1,1-Dichloroethene (1,1-Dichloroethylene)	75-35-4	N	20	10,000	**10,000**	44,000	**44,000**
1,2-Dichloroethene (trans) (t-1,2-Dichloroethylene)	156-60-5	N	20	3,100	**3,100**	13,000	**13,000**
1,2-Dichloropropane	78-87-5	C	23	12	**23**	61	**61**
1,3-Dichloropropene (total)	542-75-6	C	23	30	**30**	150	**150**
Ethylbenzene	100-41-4	C	22	49	**49**	250	**250**
Hexachloro-1,3-butadiene	87-68-3	C	53	6	**53**	28	**53**
n-Hexane	110-54-3	N	18	36,000	**36,000**	150,000	**150,000**
Methylene chloride (Dichloromethane)	75-09-2	C	17	4,800	**4,800**	61,000	**61,000**

TABLE A-5

DERIVATION OF THE NJDEP VAPOR INTRUSION SOIL GAS SCREENING LEVELS (SGSL)

Chemical	CAS No.	Cancer/ Noncancer[a]	Method TO-15 Reporting Limits	Residential [b]		Nonresidential [b]	
				Health-Based Soil Gas Screening Values	**Residential Soil Gas Screening Levels**	Health-Based Soil Gas Screening Values	**Nonresidential Soil Gas Screening Levels**
			$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
4-Methyl-2-pentanone (MIBK)	108-10-1	N	20	160,000	**160,000**	660,000	**660,000**
Methyl tert-butyl ether (MTBE)	1634-04-4	C	18	470	**470**	2,400	**2,400**
Naphthalene	91-20-3	C	26	4	**26**	18	**26**
Styrene	100-42-5	N	21	52,000	**52,000**	220,000	**220,000**
1,1,2,2-Tetrachloroethane	79-34-5	C	34	2	**34**	11	**34**
Tetrachloroethene (PCE) (Tetrachloroethylene)	127-18-4	C	34	470	**470**	2,400	**2,400**
Toluene	108-88-3	N	19	260,000	**260,000**	1,100,000	**1,100,000**
1,2,4-Trichlorobenzene	120-82-1	N	37	100	**100**	440	**440**
1,1,1-Trichloroethane	71-55-6	N	27	260,000	**260,000**	1,100,000	**1,100,000**
1,1,2-Trichloroethane	79-00-5	N	27	8	**27**	38	**38**
Trichloroethene (TCE) (Trichloroethylene)	79-01-6	C	27	22	**27**	150	**150**
Trichlorofluoromethane (Freon 11)	75-69-4	N	28	36,000	**36,000**	150,000	**150,000**
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon TF)	76-13-1	N	38	1,600,000	**1,600,000**	6,600,000	**6,600,000**
Vinyl chloride	75-01-4	C	13	8	**13**	140	**140**
Xylenes (total)	1330-20-7	N	22	5,200	**5,200**	22,000	**22,000**

NOTES

[a] Value based on cancer (C) or noncancer (N) effects**.**

[b] The Soil Gas Screening Level is the higher of the health-based soil gas value (determined as the lower of the cancer or noncancer value) and the analytical reporting limit.

"-" = Not available