

**CHAPTER 26D  
REMEDIATION STANDARDS**

**Authority**

N.J.S.A. 13:1D-1 et seq., 58:10-23.11a et seq.,  
58:10A-1 et seq. and 58:10B-1 et seq.

**Source and Effective Date**

R.2008 d.144, effective June 2, 2008.  
See: 39 N.J.R. 1574(a), 39 N.J.R. 2307(a), 40 N.J.R. 3187(a).

**Chapter Expiration Date**

In accordance with N.J.S.A. 52:14B-5.1b, Chapter 26D, Remediation Standards, expires on June 2, 2015. See: 43 N.J.R. 1203(a).

**Chapter Historical Note**

Chapter 26D, Remediation Standards, was adopted as new rules by R.2008 d.144, effective June 2, 2008. See: Source and Effective Date.

Petition for Rulemaking. See: 41 N.J.R. 2344(b), 2345(a), 2731(a), 2732(a).

Appendix 6, Alternative Soil Remediation Standard Application, was repealed by special adoption R.2009 d.361, effective November 4, 2009 (to expire May 11, 2011). See: 41 N.J.R. 4467(a). Provisions of R.2009 d.361 were readopted without change as R.2011 d.251, effective September 8, 2011. See: 43 N.J.R. 1077(a), 43 N.J.R. 2581(b).

**CHAPTER TABLE OF CONTENTS**

**SUBCHAPTER 1. GENERAL INFORMATION**

- 7:26D-1.1 Purpose
- 7:26D-1.2 Scope
- 7:26D-1.3 Construction and severability
- 7:26D-1.4 Applicability
- 7:26D-1.5 Definitions

**SUBCHAPTER 2. MINIMUM GROUND WATER  
REMEDIATION STANDARDS**

- 7:26D-2.1 Purpose
- 7:26D-2.2 Minimum ground water remediation standards

**SUBCHAPTER 3. MINIMUM SURFACE WATER  
REMEDIATION STANDARDS**

- 7:26D-3.1 Purpose
- 7:26D-3.2 Minimum surface water remediation standards

**SUBCHAPTER 4. MINIMUM SOIL REMEDIATION  
STANDARDS**

- 7:26D-4.1 Purpose
- 7:26D-4.2 Residential direct contact soil remediation standards
- 7:26D-4.3 Non-residential direct contact soil remediation standards

**SUBCHAPTER 5. INTERIM SOIL REMEDIATION  
STANDARDS**

- 7:26D-5.1 Purpose
- 7:26D-5.2 Development of an interim soil remediation standard
- 7:26D-5.3 Publication of interim soil remediation standards; promulgation

**SUBCHAPTER 6. UPDATING SOIL REMEDIATION  
STANDARDS**

- 7:26D-6.1 Purpose

- 7:26D-6.2 Notice of administrative change to update promulgated soil remediation standards

**SUBCHAPTER 7. ALTERNATIVE SOIL REMEDIATION  
STANDARDS**

- 7:26D-7.1 Purpose
- 7:26D-7.2 Applicability
- 7:26D-7.3 Basis for an alternative soil remediation standard
- 7:26D-7.4 Alternative soil remediation standards application and approval process
- 7:26D-7.5 Procedures for the development of alternative soil remediation standards without prior approval from the Department

**APPENDIX 1. SOIL REMEDIATION STANDARDS  
TABLES**

**APPENDIX 2. METHODS FOR THE DEVELOPMENT OF  
INGESTION-DERMAL SOIL REMEDIATION  
STANDARDS FOR RESIDENTIAL AND NON-  
RESIDENTIAL EXPOSURE (EQUATIONS 1  
THROUGH 4)**

**APPENDIX 3. METHODS FOR THE DEVELOPMENT OF  
INHALATION REMEDIATION STANDARDS  
RESIDENTIAL AND NON-RESIDENTIAL USE  
(EQUATIONS 1 THROUGH 25)**

**APPENDIX 4. METHODS FOR THE DEVELOPMENT OF  
ALTERNATIVE INGESTION-DERMAL SOIL  
REMEDIATION STANDARDS**

**APPENDIX 5. METHODS FOR THE DEVELOPMENT OF  
ALTERNATIVE INHALATION SOIL REMEDIATION  
STANDARDS**

**APPENDIX 6. (RESERVED)**

**SUBCHAPTER 1. GENERAL INFORMATION**

**7:26D-1.1 Purpose**

(a) This chapter implements the provisions of the Brown-field and Contaminated Site Remediation Act, N.J.S.A. 58:10B-1.1 et seq., and other statutes, by establishing minimum standards for the remediation of contaminated ground water and surface water, and by establishing the minimum residential direct contact and non-residential direct contact soil remediation standards.

(b) This chapter does not establish the minimum impact to ground water soil remediation standards; these standards shall be developed on a site-by-site basis, pursuant to the Department's authority under N.J.S.A. 58:10B-12a and the Department's Soil Remediation Standards Guidance for Impact to Ground Water available at [www.nj.gov/dep/srp/srra/regs/guidance.htm](http://www.nj.gov/dep/srp/srra/regs/guidance.htm).

(c) This chapter supplements the requirements in the Technical Requirements for Site Remediation rules, N.J.A.C. 7:26E.

Special amendment, R.2009 d.361, effective November 4, 2009 (to expire May 4, 2011).

See: 41 N.J.R. 4467(a).

In (b), deleted "by the Department" following "developed" and inserted "and the Department's Soil Remediation Standards Guidance for Impact to Ground Water available at [www.nj.gov/dep/srp/srra/regs/guidance.htm](http://www.nj.gov/dep/srp/srra/regs/guidance.htm)".

Readoption of special amendment, R.2011 d.251, effective September 8, 2011.

See: 43 N.J.R. 1077(a), 43 N.J.R. 2581(b).

Provisions of R.2009 d.361 readopted without change.

### 7:26D-1.2 Scope

(a) Except as provided in N.J.A.C. 7:26D-1.1(b) and unless otherwise provided by rule or statute, this chapter shall constitute the rules of the Department concerning minimum standards for the remediation of ground water, surface water and soil.

(b) Remediating ground water, surface water, or soil to any applicable standard set forth in this chapter shall not relieve any person from:

1. Complying with more stringent requirements or provisions imposed under any other Federal, State, or local applicable statutes or regulations;

2. Complying with any impact to ground water soil remediation standard established by the Department as provided in N.J.A.C. 7:26D-1.1(b); and

3. Obtaining any and all permits required by Federal, State or local statutes or regulations.

(c) No provision of this chapter shall be construed to limit the Department's authority to require additional remediation based upon site-specific conditions in order to protect human health, safety and the environment.

(d) Nothing in this chapter shall be construed to limit the authority of the Department to establish discharge limits for pollutants, or to prescribe penalties for violations of those limits pursuant to any statutory authority, or to require the complete removal of any illegally discharged hazardous substances, hazardous waste, or pollutants pursuant to law.

(e) The person responsible for conducting the remediation shall not be required to remediate to a level or concentration that is lower than the regional natural background level.

### 7:26D-1.3 Construction and severability

(a) This chapter shall be liberally construed to permit the Department to effectuate the purposes of the statutes listed in N.J.A.C. 7:26D-1.4(a).

(b) If any subchapter, section, subsection, provision, clause, or portion of this chapter, or the application thereof to any person, is adjudged unconstitutional or invalid by a court of competent jurisdiction, such judgment shall be confined in its operation to the subchapter, section, subsection, provision, clause, portion, or application directly involved in the controversy in which such judgment shall have been rendered

and it shall not affect or impair the remainder of this chapter or the application thereof to other persons.

### 7:26D-1.4 Applicability

(a) Except as provided in N.J.A.C. 7:26D-1.1(b), this chapter establishes the minimum remediation standards for ground water, surface water and soil for any contaminated site in New Jersey including, without limitation, those sites subject to:

1. The Industrial Site Recovery Act (ISRA), N.J.S.A. 13:1K-6 et seq.;

2. The New Jersey Underground Storage of Hazardous Substances Act (UST), N.J.S.A. 58:10A-21 et seq.;

3. The Spill Compensation and Control Act, N.J.S.A. 58:10-23.11a et seq.;

4. The Solid Waste Management Act, N.J.S.A. 13:E-1 et seq.;

5. The Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq.;

6. The Brownfield and Contaminated Site Remediation Act, N.J.S.A. 58:10B-1 et seq.;

7. The Comprehensive Regulated Medical Waste Management Act, N.J.S.A. 13:1E-48.1 et seq.;

8. The Major Hazardous Waste Facilities Siting Act, N.J.S.A. 13:1E-49 et seq.;

9. The Sanitary Landfill Facility Closure and Contingency Fund Act, N.J.S.A. 13:1E-100 et seq.; and

10. The Regional Low-Level Radioactive Waste Disposal Facility Siting Act, N.J.S.A. 13:1E-177 et seq.

(b) The requirements of this chapter shall be applied pursuant to N.J.A.C. 7:26E-1.3(c) regardless of whether remediation is conducted with Department oversight pursuant to N.J.A.C. 7:26C.

(c) Notwithstanding any other provision of this chapter, all applicable remediation standards and remedial actions that involve real property located in the Pinelands area shall be consistent with the provisions of the Pinelands Protection Act, N.J.S.A. 13:18A-1 et seq., and any rules promulgated pursuant thereto, and with Section 502 of the National Parks and Recreation Act of 1978, 16 U.S.C. §4711.

### 7:26D-1.5 Definitions

The following words and terms, when used in this chapter, shall have the following meanings unless the context clearly indicates otherwise:

"Alternative remediation standard" or "ARS" means a residential use or non-residential use soil remediation standard that is established using site specific factors following the procedures set forth in N.J.A.C. 7:26D-7 Appendices 5 and 6, pursuant to this chapter.

“Carcinogen” means a contaminant capable of inducing a cancer response, including Group A (Human Carcinogen), Group B (Probable Human Carcinogen) and Group C (Possible Human Carcinogen) categorized in accordance with the USEPA Guidelines for Carcinogen Risk Assessment, 51 Fed. Reg. 33932 (1986), as amended and supplemented.

“Contaminated site” means a contaminated site as defined pursuant to the Technical Requirements for Site Remediation rules at N.J.A.C. 7:26E-1.8.

“Contamination” or “contaminant” means contamination or a contaminant as defined pursuant to the Technical Requirements for Site Remediation rules at N.J.A.C. 7:26E-1.8.

“Department” means the New Jersey Department of Environmental Protection.

“Discharge” means a discharge as defined pursuant to the Technical Requirements for Site Remediation rules at N.J.A.C. 7:26E-1.8.

“Exposure pathways” means the methods by which humans can come into contact with contamination including, but not limited to, the ingestion-dermal exposure pathway and the inhalation exposure pathway.

“Ground water” means ground water as defined pursuant to the Ground Water Quality Standards at N.J.A.C. 7:9C-1.6, which includes Class I, Class II and Class III ground water.

“Ground water quality criteria” means any human health-based ground water quality criteria as defined pursuant to the Ground Water Quality Standards at N.J.A.C. 7:9C-1.6.

“Impact to ground water remediation standard” means a vadose zone soil remediation standard established or developed by the Department pursuant to its authority under N.J.S.A. 58:10B-12a that is designed to limit the amount of contaminant that leaches from the vadose zone to ground water such that the resulting ground water concentration will not exceed the applicable ground water remediation standard.

“Ingestion-dermal exposure pathway” means the process by which humans can come into contact with contamination through the direct ingestion of contamination and the absorption of contamination through the skin.

“Inhalation exposure pathway” means the process by which humans can come into contact with contamination through the inhalation of contamination.

“Non-residential use” means an exposure assumption based on exposure of adult outdoor workers to contaminated media during an eight-hour work day, 225 days a year, for 25 years.

“Non-residential direct contact soil remediation standard” means a soil remediation standard for the ingestion-dermal and inhalation exposure pathways established or developed pursuant to this chapter that is designed to protect human health at non-residential use sites.

“Oversight document” means any document defined as an oversight document pursuant to the Department Oversight of the Remediation of Contaminated Sites rules at N.J.A.C. 7:26C-1.3.

“Person responsible for conducting the remediation” means any person defined as such pursuant to the Administrative Requirements for the Remediation of Contaminated Sites rules, at N.J.A.C. 7:26C-1.3.

“Pollutant” means any substance defined as such pursuant to the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq.

“Practical quantitation level” or “PQL” means a practical quantitation level or PQL as defined pursuant to Technical Requirements for Site Remediation rules at N.J.A.C. 7:26E-1.8.

“Regional natural background level” means the concentration of a contaminant consistently present in the environment in the region of the site and which has not been influenced by localized human activities.

“Remediation” or “remediate” means remediation or remediate as defined pursuant to the Technical Requirements for Site Remediation rules at N.J.A.C. 7:26E-1.8.

“Remediation standards” means the combination of numeric standards that establish a level or concentration, and narrative standards, to which contaminants must be treated, removed or otherwise cleaned for soil, ground water or surface water, as established by the Department pursuant to the Brownfield and Contaminated Sites Remediation Act at N.J.S.A. 58:10B-12 and this chapter.

“Residential direct contact soil remediation standard” means a soil remediation standard for the ingestion-dermal and inhalation exposure pathways established or developed pursuant to this chapter that is designed to protect human health at residential use sites, schools (pre-K-12) and child-care centers.

“Residential use” means a land use scenario based on exposure to contaminated media for 24 hours a day, 350 days a year for 30 years by children and adults living on a site.

“Surface water” means “surface water” as defined pursuant to the Surface Water Quality Standards, N.J.A.C. 7:9B.

“USEPA” means the United States Environmental Protection Agency.

Special amendment, R.2009 d.361, effective November 4, 2009 (to expire May 4, 2011).  
See: 41 N.J.R. 4467(a).

Rewrote definition “Person responsible for conducting the remediation”.

Readoption of special amendment, R.2011 d.251, effective September 8, 2011.

See: 43 N.J.R. 1077(a), 43 N.J.R. 2581(b).

Provisions of R.2009 d.361 readopted without change.

## SUBCHAPTER 2. MINIMUM GROUND WATER REMEDIATION STANDARDS

### 7:26D-2.1 Purpose

This subchapter establishes the minimum remediation standards for ground water.

### 7:26D-2.2 Minimum ground water remediation standards

(a) The minimum remediation standards to which ground water shall be remediated are:

1. For Class II ground water, the Ground Water Quality Standards developed pursuant to N.J.A.C. 7:9C-1.7(c) and (d);
2. For Class I-A and Class I-PL, Ground Water Quality Standards developed pursuant to N.J.A.C. 7:9C-1.7(a) and (b);
3. For Class III-A and Class III-B, Ground Water Quality Standards developed pursuant to N.J.A.C. 7:9C-1.7(e) and (f); and
4. For all ground water, regardless of classification, each of the following narrative ground water remediation standards, as applicable:
  - i. The general ground water quality policies in N.J.A.C. 7:9C-1.2;
  - ii. The narrative ground water quality criteria in N.J.A.C. 7:9C-1.7;
  - iii. The ground water quality antidegradation policy in N.J.A.C. 7:9C-1.8;
  - iv. The remediation requirements in N.J.A.C. 7:26E-1 through 8 in order to both:
    - (1) Address the adverse impact of the contamination on the ground water itself; and
    - (2) Limit additional risks posed by the contamination to the human health and safety and to the environment;
  - v. The free and residual product removal, treatment, or containment requirements of N.J.A.C. 7:26E-6.1(d);
  - vi. The contaminants have not migrated to the ground surface, structures, or air in concentrations that pose a threat to human health; and
  - vii. The following factors, as applicable on a site-specific basis, for selecting an appropriate ground water remedial action:
    - (1) The location of the contaminated site relative to ground water use;
    - (2) The potential human and environmental exposure to the ground water contamination;

(3) The present, projected, and potential ground water use at the site and in the area surrounding the site over the 25 years after the selection of the ground water remedy;

(4) The ambient ground water quality at the site and in the area surrounding the site resulting from both human activities and natural conditions;

(5) The physical and chemical characteristics of the contaminants of concern; and

(6) The criteria in N.J.A.C. 7:26E-6.3(d)1i, used to determine when natural remediation is appropriate as a remedial action for ground water contamination.

(b) The Department shall not approve an alternative ground water remediation standard that is based on a site-specific risk assessment.

## SUBCHAPTER 3. MINIMUM SURFACE WATER REMEDIATION STANDARDS

### 7:26D-3.1 Purpose

This subchapter establishes the minimum remediation standards for surface water.

### 7:26D-3.2 Minimum surface water remediation standards

(a) The minimum remediation standards for surface water are:

1. The numeric New Jersey Surface Water Quality Standards, N.J.A.C. 7:9B-1.14(c) and (d); and
2. The following narrative surface water remediation standards:
  - i. The general surface water quality policies in N.J.A.C. 7:9B-1.5;
  - ii. The narrative surface water quality criteria in N.J.A.C. 7:9B-1.14;
  - iii. The remediation requirements in N.J.A.C. 7:26E-1 through 8 in order to both:
    - (1) Address the adverse impact of the contamination on the surface water itself; and
    - (2) Limit additional risks posed by the contamination to the public health and safety and to the environment;
  - iv. The free and residual product removal, treatment, or containment requirements of N.J.A.C. 7:26E-6.1(d); and

v. The following narrative criteria, as applicable on a site-specific basis, for selecting an appropriate surface water remedial action:

- (1) The location of the contaminated site relative to surface water use;
- (2) The potential human and environmental exposure to the surface water contamination;
- (3) The present and projected surface water use at the site and in the area surrounding the site;
- (4) The ambient ground water quality at the site and in the area surrounding the site resulting from both human activities and natural conditions; and
- (5) The physical and chemical characteristics of the contaminants of concern.

(b) The Department shall not approve an alternative surface water remediation standard that is based on a site-specific risk assessment.

SUBCHAPTER 4. MINIMUM SOIL REMEDIATION STANDARDS

**7:26D-4.1 Purpose**

(a) This subchapter establishes minimum soil remediation standards, including:

1. Residential direct contact soil remediation standards; and
2. Non-residential direct contact soil remediation standards.

**7:26D-4.2 Residential direct contact soil remediation standards**

(a) The Department developed the residential direct contact human health-based criteria in chapter Appendix 1, Table 1A, incorporated herein by reference, as follows:

1. The residential human health-based criteria for the ingestion-dermal exposure pathway, based on the equations, data sources, and conventions provided in chapter Appendix 2, incorporated herein by reference; and
2. The residential human health-based criteria for the inhalation exposure pathway, based on the equations, data sources, and conventions provided in chapter Appendix 3, incorporated herein by reference.

(b) The residential direct contact soil remediation standard for each contaminant listed in Appendix 1, Table 1A is the more stringent of either the ingestion-dermal human health-based criterion or the inhalation human health-based criterion, or the PQL if the PQL is less stringent than the corresponding human health-based criterion.

**7:26D-4.3 Non-residential direct contact soil remediation standards**

(a) The Department developed the non-residential direct contact human health-based criteria in Appendix 1, Table 1B, incorporated herein by reference, as follows:

1. The non-residential human health-based criteria for the ingestion-dermal exposure pathway, based on the equations, data sources, and conventions provided in Appendix 2; and
2. The non-residential human health-based criteria for the inhalation exposure pathway, based on the equations, data sources, and conventions provided in Appendix 3.

(b) The non-residential direct contact soil remediation standard for each contaminant listed in Table 1B is the more stringent of either the ingestion-dermal human health-based criterion or the inhalation human health-based criterion, or the PQL if the PQL is less stringent than the corresponding human health-based criterion.

SUBCHAPTER 5. INTERIM SOIL REMEDIATION STANDARDS

**7:26D-5.1 Purpose**

Except as provided at N.J.A.C. 7:26D-1.1(b), this subchapter sets forth the procedures that the Department will use to establish interim soil remediation standards.

**7:26D-5.2 Development of an interim soil remediation standard**

(a) The Department may establish an interim remediation standard for soil when a contaminant is not listed in Appendix 1, Tables 1A, or 1B of this chapter.

(b) An interim remediation standard shall be developed for soil as follows:

1. For the ingestion-dermal pathway, using the procedures set forth in Appendix 2; and
2. For the inhalation pathway, using the procedures set forth in Appendix 3.

(c) For the two pathways listed in (b) above, the person responsible for conducting a remediation may request that the Department develop an interim soil remediation standard under this section.

**7:26D-5.3 Publication of interim soil remediation standards; promulgation**

(a) The Department shall publish on its web site a listing of all interim soil remediation standards developed pursuant to this chapter and the technical basis used in their derivation.

(b) Interim soil remediation standards developed pursuant to this chapter shall be replaced with duly promulgated soil remediation standards as soon as reasonably possible.

## SUBCHAPTER 6. UPDATING SOIL REMEDIATION STANDARDS

### 7:26D-6.1 Purpose

This subchapter sets forth the procedures that the Department will use to update remediation standards for soil developed pursuant to this chapter.

### 7:26D-6.2 Notice of administrative change to update promulgated soil remediation standards

(a) The Department shall post on its web site and publish in the New Jersey Register a notice of administrative change to modify a soil remediation standard in Appendix 1, Tables 1A, or 1B when the USEPA revises the carcinogenic slope factor or reference dose data contained in the Integrated Risk Information System (IRIS) database on which a remediation standard in Appendix 1, Table 1A or 1B is based.

(b) The notice of administrative change shall identify the contaminant, the basis for the administrative change, and the revised criterion to be listed in Appendix 1, Tables 1A, and 1B.

## SUBCHAPTER 7. ALTERNATIVE SOIL REMEDIATION STANDARDS

### 7:26D-7.1 Purpose

Except as provided at N.J.A.C. 7:26D-1.1(b), this subchapter sets forth the circumstances in which the Department may require the person responsible for conducting the remediation to develop an alternative soil remediation standard, the procedures that the person responsible for conducting the remediation shall use to apply for permission to use an alternative soil remediation standard, the procedures for the person to develop an alternative remediation standard without the Department's prior approval, and the procedures the Department shall use to evaluate an application for the use of an alternative soil remediation standard that is proposed by the person responsible for conducting the remediation.

Special amendment, R.2009 d.361, effective November 4, 2009 (to expire May 4, 2011).  
See: 41 N.J.R. 4467(a).

Inserted a comma following the N.J.A.C. reference, and inserted "the procedures for the person to develop an alternative remediation standard without the Department's prior approval,".

Readoption of special amendment, R.2011 d.251, effective September 8, 2011.

See: 43 N.J.R. 1077(a), 43 N.J.R. 2581(b).

Provisions of R.2009 d.361 readopted without change.

### 7:26D-7.2 Applicability

An alternative soil remediation standard developed pursuant to this chapter may only be numeric and may only be used at the site for which it is approved and is not applicable at any other site.

### 7:26D-7.3 Basis for an alternative soil remediation standard

(a) Except as provided in N.J.A.C. 7:26D-7.5, the person responsible for conducting the remediation may propose, in accordance with N.J.A.C. 7:26D-7.4, an alternative soil remediation standard based on the following:

1. For the ingestion-dermal exposure pathway, the procedures set forth in chapter Appendix 4, incorporated herein by reference; and
2. For the inhalation pathway, the procedures set forth in chapter Appendix 5, incorporated herein by reference.

(b) The basis for the request for an alternative remediation standard may include, but is not limited to, the following:

1. New chemical toxicity data;
2. New risk assessment methodology or models;
3. Alternative land use planned for the site; or
4. Site-specific conditions that support the modification of input parameters for models used to develop alternative soil remediation standards pursuant to Appendices 4 and 5.

(c) The Department may require the person responsible for conducting the remediation to develop an alternative soil remediation standard that is more stringent than the minimum standards established by this chapter where necessary to ensure adequate protection of human health, based upon a review of the following:

1. The number or magnitude of the discharge(s) being investigated;
2. The nature of the contaminants;
3. Distance to and sensitivity of people at risk of exposure; and
4. Any other site-specific conditions the Department identifies that necessitate the need for an alternative soil remediation standard in order to protect human health.

Special amendment, R.2009 d.361, effective November 4, 2009 (to expire May 4, 2011).

See: 41 N.J.R. 4467(a).

In the introductory paragraph of (a), substituted "Except as provided in N.J.A.C. 7:26D-7.5, the" for "The"; and in (b)4, substituted "Appendices 4 and 5" for "Appendices 5 through 7".

Readoption of special amendment, R.2011 d.251, effective September 8, 2011.

See: 43 N.J.R. 1077(a), 43 N.J.R. 2581(b).

Provisions of R.2009 d.361 readopted without change.

Parameter	Definition	Units	Default
z	Anemometer height	m	6.1

Fastest Mile Wind Speed of 55 miles per hour (24.58 m/s) found in “Local Climatological Data Annual Summary for Newark, New Jersey” (NOAA 2002b). Value is fastest mile wind speed among climatological records for stations at Allentown and Philadelphia, Pennsylvania, Wilmington, Delaware, Atlantic City, New Jersey, and Central Park, New York.

**APPENDIX 4**

**Methods for the Development of Alternative Ingestion-Dermal Soil Remediation Standards**

Pursuant to N.J.A.C. 7:26D-7, the person responsible for conducting the remediation may propose, for the Department’s approval, an alternative soil remediation standard (ARS) for the Ingestion-Dermal exposure pathway for a site or an area of concern based on one of the options provided in this Appendix.

**A. General Requirements**

The ingestion-dermal exposure pathway has limited ARS options. Soil remediation standards developed for this exposure pathway are based on established risk assessment methods that do not employ site-specific factors. In addition, the default input parameters for these factors are generally accepted and used by EPA and other state agencies. The Department does not believe it is practicable to develop site-specific ARS through the modifications of these standard default input parameters. Therefore, ARS options for the ingestion-dermal pathway are limited to the two options listed below.

Alternative remediation standards calculated pursuant to this Appendix are applicable to ingestion-dermal remediation standards only. The person responsible for conducting the remediation is required to evaluate an ingestion-dermal ARS to determine if such an ARS impacts 1) human health via the inhalation exposure pathway, 2) ground water quality and 3) ecological receptors.

**B. Alternative Remediation Standard Options**

**Option I – Site Specific Default Values (Lead Site Contamination)**

The ingestion-dermal pathway uses EPA recommended default exposure parameters for residential and non-residential scenarios for all standards, except lead. These default parameters are generic and reflect a reasonable maximum exposure (RME) that may not be adjusted.

For lead, other risk assessment tools have been developed that use models to predict appropriate blood lead levels. The Department may accept an application for an ARS for residential exposure based on input parameters identified by

the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) (USEPA, 1994)<sup>1</sup> using site-specific data for soil and dust lead concentrations. Site data may be used to refine estimates for other exposure-related model parameters such as bioavailability. However, except for lead, the Department will not accept applications for alternative remediation standards based on changes to bioavailability assumptions.

The Department may accept an application for alternative remediation standard for lead for non-residential site use based on input parameters identified in the document Recommendations of the Technical Review Workgroup (TRW) for Lead for an Interim Approach to Assessing Risk Associated with Adult Exposures to Lead in Soil (USEPA, 1996)<sup>2</sup>.

The Department may accept an application for an alternative remediation standard for a recreational land use at a lead site based on the assessment of non-continuous exposure for all ages identified in the EPA guidance, Assessing Intermittent or Variable Exposures at Lead Sites (USEPA, 2003)<sup>3</sup>.

More information on the development of an alternative remediation standard for lead is provided in the ingestion dermal basis and background document which is available on the Department’s web site at [www.state.nj.us/dep/srp](http://www.state.nj.us/dep/srp).

The Department does not require the remediation of a discharge to levels that are lower than natural background levels. See N.J.S.A. 58:10B-12(g)(4). The person responsible for conducting the remediation may conduct a site investigation to determine background levels in soil, pursuant to N.J.A.C. 7:26E-3.10 on a site specific basis.

**Option II - Recreational Land Use Scenario**

An alternative remediation standard may be based on use of the site for recreational purposes. Recreational purposes are site-specific uses that do not reflect either a residential or non-residential land use scenario. Alternative standards may be based on site-specific land use scenarios that effect the amount time that people are likely to spend at a site that is designated for recreational use. There are two basic types of recreational land use, active and passive, that may be considered. Examples of active recreational land use are sports playing fields and playgrounds. Examples of passive recreational land use are walking or bike trails. The approval of an alternative remediation standard for recreational land use will be contingent on the use of proper institutional controls to ensure the continued use of the site for the proposed recreational purpose.

<sup>1</sup>U.S. Environmental Protection Agency (USEPA). 1994. Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children. Office of Solid Waste and Emergency response, Washington, DC. OSWER 9285.7-15-1.

<sup>2</sup>U.S. Environmental Protection Agency (USEPA). 1996b. Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, USEPA Technical Workgroup for Lead. December, 1996.

<sup>3</sup>U.S. Environmental Protection Agency (USEPA). 2003b. Assessing Intermittent or Variable Exposures at Lead Sites, Office of Solid Waste and Emergency Response, OSWER 9285.7-76.

## APPENDIX 5

**Methods for the Development of Alternative Inhalation Soil Remediation Standards**

Pursuant to N.J.A.C. 7:26D-7.2, the person responsible for conducting the remediation may propose, for the Department's approval, an alternative soil remediation standard (ARS) for the inhalation exposure pathway for a site or an area of concern based on one of the options provided in this Appendix.

**A. General Requirements**

The inhalation exposure pathway has several ARS options. The soil remediation standards developed for this exposure pathway are based on established risk assessment methods that employ some factors that are not site-specific. In addition, the default input parameters for these factors are generally accepted and used by EPA and other state agencies. The Department does not believe it is practicable to develop a site-specific ARS through the modification of these standard default input parameters. Therefore, ARS options for the inhalation pathway are limited to the options listed below.

If the concentration of any alternative remediation standard derived pursuant to this Appendix exceeds the contaminant's  $C_{sat}$  value (Table 1), the contaminant is not regulated as a volatile phase contaminant by the inhalation exposure pathway. However, the contaminant may be regulated as a particulate if appropriate.

Alternative remediation standards calculated pursuant to this Appendix are applicable to inhalation remediation standards only. The person responsible for conducting the remediation is required to evaluate an inhalation ARS to determine if such an ARS impacts 1) human health via the ingestion-dermal exposure pathway, 2) ground water quality and/or 3) ecological receptors.

Multiple site-specific conditions may be used to calculate an ARS for a given contaminant. If an ARS is developed using a given site-specific physical and/or operational condition(s), that (those) condition(s) must be applied consistently.

**B. Alternative Remediation Standard Options****Option I. Volatile Phase Contaminants**

1. For volatile phase contaminants, three parameters can be varied to develop an ARS. These parameters are depth range of contamination, organic carbon content of the soil, and site size. These parameters are applicable to residential and non-residential scenarios as well as carcinogenic and noncarcinogenic health endpoints.

**i. Depth Range of Contamination**

(1) Determine the actual depth range of contamination by conducting sampling pursuant to the Technical Requirements for Site Remediation, N.J.A.C. 7:26E-4.

(2) Use the actual depth range of contamination in the Jury Model that is included in the EMSOFT software package to derive a site-specific volatilization factor (VF) following the methodology in Appendix I of the Inhalation Pathway Basis and Background.

(3) Substitute the derived site-specific volatilization factor into Equations 1 and 2 N.J.A.C. 7:26D, Appendix 2, to calculate an alternative inhalation remediation standard. Using a finite depth range reduces the mass of contaminant in the soil, which will reduce the average volatilization flux.

(4) The Department will not require the use of an institutional control pursuant to N.J.A.C. 7:26E-8 for an ARS based on depth range of contamination when the depth range of contamination begins at the ground surface. The Department will require the use of an institutional control pursuant to N.J.A.C. 7:26E-8 when an ARS is based on depth range of contamination that begins below the ground surface.

**ii. Soil organic carbon content ( $f_{oc}$ ):**

(1) Collect a minimum of 3 samples from different locations at the site that are representative of each area of concern including soil type(s) and sample depth equivalent to the location of contamination. Samples may not be collected from areas with high levels of organic contamination (greater than 1,000 ppm).

(2) Analyze samples for soil organic carbon content using the Lloyd Kahn Method<sup>1</sup>.

(3) Use the average soil organic carbon content as  $f_{oc}$  in the Soil-Water Partition Coefficient Equation (Appendix 2, Equation 5) to develop a site-specific  $K_d$  value. If  $f_{oc}$  values at a given area of concern vary by more than an order of magnitude, they may not be averaged to calculate a site-specific  $K_d$  value. In this case, the lowest  $f_{oc}$  value must be used to determine the  $K_d$  value for the soil in the area of concern.

(4) Use the site-specific  $K_d$  value in Equation 4, Appendix 2 to calculate a site-specific value for apparent diffusivity,  $DA$ .

(5) Use the site-specific value for apparent diffusivity,  $DA$ , in Equation 3, Appendix 2, to calculate a site-specific volatilization factor,  $VF$ .

(6) Substitute the site-specific volatilization factor into Equations 1 and 2, Appendix 2, to calculate an alternative inhalation remediation standard.

(7) The Department will not require the use of an institutional control pursuant to N.J.A.C. 7:26E-8 for an ARS based on soil organic carbon content.

<sup>1</sup>Determination of Total Organic Carbon in Sediment (Lloyd Khan Method). U.S. Environmental Protection Agency, Region II, Edison, New Jersey, 1988. (<http://www.epa.gov/region02/qa/documents.htm>)

**Option II. Particulate Phase Contaminants**

**1. For Residential Exposure**

i. Vegetative Cover:

(1) Measure the actual amount of vegetative cover to determine the fraction of vegetative cover (V) on the site. An example of an acceptable vegetative cover would be areas of continuous grass where there is no bare ground.

(2) Use the measured fraction of vegetative cover (V) in Equation 11, Appendix 2 to calculate the particulate emission factor (PEF).

(3) Use the calculated particulate emission factor (PEF) in Equation 9 or 10 of Appendix 2 to calculate the volatile contaminant carcinogenic ( $Inh_vSRS_c$ ) or noncarcinogenic ( $Inh_vSRS_n$ ) soil remediation standard for the inhalation pathway, respectively.

(4) The Department will require the use of an institutional control pursuant to N.J.A.C. 7:26E-8 for an ARS based on an actual amount of vegetative cover to ensure that the basis for the ARS is maintained.

**2. For Non-residential Scenario**

i. Vehicle Trips Per Day ARS for nonresidential sites of two or more acres

(1) Determine the daily traffic count for an unpaved area (TC) (For future use, the entire site is assumed to be unpaved). The number of vehicle trips per day will be calculated by dividing the weekly total by the number of days of site operation for that week.

(2) Use the measured daily traffic count for an unpaved area (TC) in Equation 20, Appendix 2 to calculate the particulate emission rate for site traffic ( $ER_{traffic}$ ).

(3) Use the calculated particulate soil remediation standards ( $ER_{traffic}$ ) in Equation 19 to calculate the particulate emission factor from site activity ( $PEF_s$ ).

(4) Use the calculated particulate emission factor from site activity ( $PEF_s$ ) in Equation 18, Appendix 2 to calculate the exposure dose calculation (DOSE).

(5) Use the calculated exposure dose calculation (DOSE) in Equation 14 or 15 of Appendix 2 to calculate the particulate contaminant carcinogenic ( $Inh_{hp}SRS_c$ ) or the particulate contaminant noncarcinogenic ( $Inh_{hp}SRS_n$ ) soil remediation standard for the inhalation pathway, respectively.

(6) The Department will require the use of an institutional control pursuant to N.J.A.C. 7:26E-8 for an ARS based on actual vehicle activity to ensure that the basis for the ARS is maintained.

**Option III. Recreational Land Use Scenario**

An alternative remediation standard may be based on use of the site for recreational purposes. Recreational purposes are site-specific uses that do not reflect either a residential or non-residential land use scenario. Alternative standards may be based on site-specific land use scenarios that effect the amount time that people are likely to spend at a site that is designated for recreational use. There are two basic types of recreational land use, active and passive, that may be considered. Examples of active recreational land use are sports playing fields and playgrounds. Examples of passive recreational land use are walking or bike trails. The approval of an alternative remediation standard for recreational land use will be contingent on the use of proper institutional controls to ensure the continued use of the site for the proposed recreational purpose.

Special amendment, R.2009 d.361, effective November 4, 2009 (to expire May 4, 2011).  
See: 41 N.J.R. 4467(a).

In 1i(4) of Part B, Option I, inserted "when the depth range of contamination begins at the ground surface", and inserted the last sentence. Readoption of special amendment, R.2011 d.251, effective September 8, 2011.

See: 43 N.J.R. 1077(a), 43 N.J.R. 2581(b).

Provisions of R.2009 d.361 readopted without change.

**APPENDIX 6**

**(RESERVED)**