

**GUIDELINES FOR
INITIAL RESPONSE AND ABATEMENT,
ASSESSMENT, AND CORRECTIVE ACTION
FOR NON-UST
RELEASES OF PETROLEUM**

Effective July 1, 2012

**UST SECTION
DIVISION OF WASTE MANAGEMENT
DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES
STATE of NORTH CAROLINA**

Table of Contents

Definitions.....	vii
Acronyms.....	xi
1.0 Introduction.....	1
1.1 Regulatory Background.....	1
1.2 Purpose and Application of the Guidelines.....	1
1.3 Guidance Pertaining to Releases from Other Contaminant Sources.....	2
1.4 Certification and Licensing Requirements for Underground Storage Tank Assessment and Corrective Actions.....	2
2.0 Applicability of Regulatory Requirements.....	4
2.1 Statement of Regulatory Requirements.....	4
2.1.A Regulatory Requirements Applicable to Initial Response Actions.....	4
2.1.B Regulatory Requirements Applicable to Initial Abatement Actions.....	4
2.1.C Regulatory Requirements Applicable to Assessment.....	4
2.1.D Regulatory Requirements Applicable to Corrective Action.....	4
3.0 Initial Response.....	5
3.1 Action to Prevent Further Release.....	7
3.2 Identification and Mitigation of Hazards from Fire, Explosion, and Vapor.....	7
3.3 Identification and Mitigation of Hazards from Exposure to Pollutants.....	7
3.4 Submittal of Notification of Discharge Report.....	7
4.0 Initial Abatement.....	8
4.1 Confirmation that the Source of the Release Has Been Identified and Eliminated.....	8
4.2 Investigation and Recovery of Free Product.....	8
4.3 Continued Mitigation and Monitoring of Fire, Explosion, and Vapor Hazards.....	8
4.4 Remediation of Hazards Posed by Exposed Contaminated Soil.....	8
4.5 Initial Assessment of Soil Contamination.....	8
4.6 Removal of Contaminated Soil.....	9
4.7 Sampling During and at Completion of Excavation.....	9
4.8 Submittal of Initial Assessment Report.....	10
5.0 Free Product Recovery and Reporting.....	11
6.0 Risk Classification.....	12

6.1 High Risk.....	12
6.2 Intermediate Risk.....	12
6.3 Low Risk	13
7.0 Comprehensive Site Assessment	14
7.1 Comprehensive Site Assessment Report.....	14
7.1.A Remediation Goals	14
7.1.B CSA Reporting Requirements	14
7.1.C Evaluation of Potential for Contamination to Impact Receptors.....	15
8.0 Corrective Action.....	18
8.1 Corrective Action for All Non-UST Petroleum Release Sites	18
8.1.A Pre-CAP Monitoring	18
8.1.B Corrective Action Plan	18
8.1.B.1 Basis for Requirement	18
8.1.B.2 Purpose and Scope.....	19
8.1.B.3 Basis for Requirement	19
8.1.B.4 Soil Remediation Goals.....	20
8.1.B.5 Development of MSCCs.....	20
8.1.B.6 Evaluation of Soil Remediation.....	20
8.1.B.7 Groundwater Remediation Goals	20
8.1.B.7.a Goals for a .0106(j) CAP.....	21
8.1.B.7.b Goals for a .0106(k) CAP or .0106(m) Termination Plan.	21
8.1.B.7.c Goals for a .0106(l) CAP.....	21
8.1.B.7.d Final Remediation Goals.....	21
8.1.B.8 Evaluation of Groundwater Remediation	22
8.1.B.9 Corrective Action Reporting Requirements	22
8.1.B.10 Approval and Implementation	25
9.0 Site Closure.....	26
10.0 Public Notice.....	27
10.1 Public Notice Requirements for Comprehensive Site Assessment	27
10.2 Public Notice Requirements for Corrective Action.....	27
11.0 Notice of Contaminated Site and Land Use Restrictions.....	28
12.0 Sampling and Analysis Guidance	30

12.1 Use and Limitations of Field-Analytical Technologies.....	30
12.2 Sampling and Analysis for Different Phases of Release Response, Abatement, Assessment, and Corrective Action.....	31
12.3 Sampling.....	31
12.3.A Initial Response and Abatement Sampling	31
12.3.A.1 Notification of Discharge Report	31
12.3.A.2 Initial Assessment Report.....	31
12.3.A.3 Comprehensive Site Assessment Report.....	32
12.3.A.4 Corrective Action Reports.....	32
12.3.A.4.a Corrective Action Plan	32
12.3.A.4.b Monitoring Reports	32
12.3.A.4.c System Enhancement Recommendation Report	32
12.3.A.4.d New Technology Cleanup Plan Report.....	32
12.3.A.4.e Site Closure Report	33
13.0 Water Supply Wells	34
13.1 Sampling of Water Supply Wells	34
13.2 Provision of Alternate Water.....	34
14.0 Disposal of Contaminated Soil and Groundwater	36
14.1 Disposal of Contaminated Soil.....	36
14.1.A Temporary Storage or Limited Land Application of Petroleum Contaminated Soil	36
14.1.B Disposal of Drill Cuttings and Mud	37
14.2 Disposal of Groundwater.....	39
14.2.A Remediation Treatment System Water.....	39
14.2.B Purge Water and Well Water from Construction Activities.....	39
14.2.C Aquifer Test Water and Vapor Extraction System Water	40
14.2.D Tank Pit or Excavation Water	40
15.0 References.....	42

Figures

Figure 1 Regional Office Locations and Map	3
Figure 2 Flowchart of Requirements for Non-UST Releases of Petroleum	6
Figure 3 Disposal of Drill Cuttings and Mud	38
Figure 4 Disposal of Groundwater	41

Tables

Table 1 Maximum Soil Contaminant Concentrations (MSCCs)	44
Table 2 Gross Contamination Levels for Groundwater	47
Table 3 Approved Methods for Soil Analyses for Non-UST Releases of Petroleum	50
Table 4 Approved Methods for Groundwater Analyses for Non-UST Releases of Petroleum	51
Table 5 Sample Containers and Preservatives for Soil Analyses	52
Table 6 Sample Containers and Preservatives for Groundwater Analyses	53
Table 7 Worksheet for Calculating MADEP Soil Sample Results	54
Table 8 Worksheet for Calculating MADEP Groundwater Sample Results	55

Appendices

Appendix A Report Formats	57
1. 24-Hour Notification of Discharge Report	60
2. Free Product Recovery Report	62
3. Free Product Recovery System Specification Report	65
4. Initial Site Assessment Report	71
5. Comprehensive Site Assessment Report	77
6. Corrective Action Plan	85
7. Monitoring Reports	92
8. System Enhancement Recommendation Report	99
9. New Technology Cleanup Plan	102
10. Site Closure Report	108
11. Receptor Survey	115
12. Format of Individual Public Notice for Non-UST Releases of Petroleum	116
13. VPH (Aliphatics/Aromatics) Laboratory Reporting Form	118
14. EPH (Aliphatics/Aromatics) Laboratory Reporting Form	120
Appendix B Reporting Tables	122
Table B-1: Site History – UST/AST System and Other Release Information	123
Table B-2: Site History – UST/AST Owner/Operator and Other Responsible Party Info	124
Table B-3: Summary of Soil Sampling Results	125
Table B-4: Summary of Groundwater and Surface Water Sampling Results	126
Table B-5: Public and Private Water Supply Well and Other Receptor Information	127
Table B-6: Property Owners/ Occupants	128
Table B-7: Monitoring and Remediation Well Construction Information	129
Table B-8A: Free Product Recovery Information	130
Table B-8B: Cumulative Volume of Free Product Recovered from Site	130
Table B-9: Current and Historical Groundwater Elevations and Free Product Thickness	131
Table B-10: Land Use	132
Appendix C Required Permits	133
Appendix D Aquifer Testing	137

1. Slug Tests137

2. Pump Tests138

Appendix E Development of Maximum Soil Contaminant Concentrations139

Appendix F Guidance Pertaining to Releases from Contaminant Sources Other than Non-UST
Petroleum Releases141

Definitions

Action Level: the concentration of a contaminant that if exceeded may require further regulatory action such as cleanup or monitoring.

Aquifer: a permeable body of rock or sediment that stores and transmits groundwater in sufficient quantity to supply wells or springs.

Bedrock: any consolidated rock which is encountered in the place in which it was formed or deposited and which cannot be readily excavated without the use of explosives or heavy rock cutting equipment. Bedrock generally underlies soil or other unconsolidated, superficial material.

Cleanup Level: the concentration of a contaminant at which no further cleanup actions are required based on the risk of harm posed by the contaminant.

Closure: activities conducted during the permanent removal (or abandonment) of underground storage tank systems and not inclusive of corrective actions/remediation.

Confining Layer: a layer having very low hydraulic conductivity, in relationship to adjacent stratigraphic units, that restricts the movement of water into and out of an aquifer (e.g., dense, unfractured clay).

Confirmed Release: a release for which an analytical result for sampled media shows any contaminant level above the Method Detection Limit.

De Minimus Concentration: amount of a regulated substance which does not exceed one percent of the capacity of the tank, excluding piping and vent lines.

Department: the North Carolina Department of Environment and Natural Resources.

Discharge: a release (See also Release).

Division: the Division of Waste Management.

Ex Situ Soil: soil that has been excavated.

Free Product: any accumulation of a substance of greater than or equal to 1/8 inch (0.010417 foot) in contact with groundwater or perched on the water table, with a density less than or greater than water, and existing as a non-aqueous phase liquid (i.e., not dissolved in water).

Gross Contaminant Levels: levels of groundwater contamination for any contaminant (except ethylene dibromide, benzene and the aliphatic and aromatic carbon fraction classes) that exceed 50 percent of the solubility of the contaminant at 25 degrees Celsius or 1,000 times the groundwater quality standard or interim groundwater quality standard established in 15A NCAC 2L .0202, whichever is

lower: and levels of groundwater contamination for ethylene dibromide and benzene that exceed 1,000 times the federal drinking water standard set out in 40 CFR 141.

Groundwater: those waters occurring in the subsurface under saturated conditions.

Hazardous Substance: a hazardous substance defined in Section 101 (14) of the Comprehensive Environmental Response Compensation and Liability (CERCLA) Act of 1980 (but not including any substances regulated as a hazardous waste under Subtitle C or any mixture of such substances and petroleum).

Hazardous Waste: discarded material which, due to its quantity, concentration, or physical or chemical characteristics, may cause or significantly contribute to an increase in mortality, irreversible or incapacitating reversible illness, or pose a substantial threat or potential hazard to human health or the environment when improperly treated, stored, transported, disposed or otherwise managed (Federal regulations define a waste as a hazardous waste if it exhibits a characteristic of a hazardous waste (40 CFR 261.20 through 261.24); has been listed as hazardous (40 CFR 261.31 through 261.33); or is a mixture containing a listed hazardous waste and a non-hazardous solid waste (unless the mixture is specifically excluded or no longer exhibits any of the characteristics of a hazardous waste).)

In Situ Soil: soil or fill material that is in the ground and has not been disturbed.

Land Application: the process of remediating contaminated soil by spreading soil over land. Land application may include remediating soil by natural biological methods, enhanced biological methods, or volatilization.

Maximum Soil Contaminant Concentration: the concentration of a soil contaminant at which no further cleanup actions are required based upon the risk of harm posed by the contaminant.

Method Detection Limit: the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte (40 CFR 136 Appendix B).

Minimum Reporting Limit: the minimum reporting limit that must be achieved by laboratories for target analyte results submitted to the UST Section; it is a reporting limit established by the UST Section for the target analytes required for each approved analytical method as an alternative to the detection limit indicated in the method description and is listed for each analyte in the *Guidelines for Sampling*.

Petroleum or Petroleum Product: crude oil or any fraction thereof which is liquid at standard conditions of temperature (60 degrees Fahrenheit) and pressure (14.7 pounds per square inch absolute), but excluding substances defined as a hazardous substance in Section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980.

Petroleum Contaminated Soil or Soil Containing Petroleum Products: any soil that has been exposed to petroleum products because of any emission, spillage, leakage, pumping, pouring, emptying, or

dumping of petroleum products onto or beneath the land surface and that exhibits characteristics or concentrations of typical petroleum product constituents in sufficient quantities as to be detectable by approved analytical procedures.

Practical Quantitation Limit: the lowest concentration of a given material that can be reliably achieved among laboratories within specified limits of precision and accuracy by a given analytical method during routine laboratory analysis.

Receptor: any human, plant or animal, structure or surface water body that is or has the potential to be adversely effected by the release or migration of contaminants.

Release: any spilling, leaking, emitting, discharging, escaping, leaching or disposing into groundwater, surface water or subsurface soils. (Refer to statutes and regulations relevant to UST releases or to AST and surface releases.)

Responsible Party: a UST owner, UST operator, and/or landowner seeking reimbursement from the State Trust Fund, or any person who is responsible for a discharge or release of petroleum or a hazardous substance. (Refer to statutes and regulations relevant to UST releases or to AST releases and spills.)

Surface Water: all waters of the state as defined in G.S. 143-215.77 Article 21A, except for underground waters, such that "waters" shall mean any stream, river, creek, brook, run, canal, swamp, lake, sound, tidal estuary, bay, reservoir, waterway, wetlands or any other body or accumulation of water, surface or underground, public or private, natural or artificial, which is contained within, flows through, or borders upon this State, or any portion thereof, including those portions of the Atlantic Ocean over which this State has jurisdiction.

Soil or Regolith: a general term for the fragmental and unconsolidated geological material of highly varied character that nearly everywhere forms the surface of the land and overlies or covers bedrock. It includes rock debris of all kinds, volcanic ash, glacial till, alluvium, loess and eolian deposits, and vegetal accumulations.

Soil Scientist: an individual who is a Certified Professional in Soils through the NCRCPS (N.C. Registry of Certified Professionals in Soils) or a Certified Professional Soil Scientist or Soil Specialist by ARCPACS (American Registry of Certified Professionals in Agronomy, Crops and Soils) or a Registered Professional Soil Scientist by NSCSS (the National Society of Consulting Soil Scientist) or can provide documentation that he/she meets the minimum education and experience requirements for certification or registration by one or more of the organizations named in this Subparagraph or upon approval by the Director, an individual with a demonstrated knowledge of soil science.

Source Area: point of release or discharge.

Total Petroleum Hydrocarbons (TPH): the concentration of petroleum fuel contamination present.

Transmissivity: the ability of geologic material to transmit water.

Underground Storage Tank (UST): any one or combination of tanks (including underground pipes connected thereto) that is used to contain an accumulation of regulated substances, and the volume of which (including the volume of underground pipes connected thereto) is 10 percent or more beneath the surface of the ground (Refer to full definition in 15A NCAC 2N .0203.).

UST System: an underground storage tank, connected underground piping, underground ancillary equipment, and containment system, if any.

Waste Oil: any used non-hazardous petroleum product (Crankcase oil is considered to contain non-hazardous petroleum product, therefore it is considered a waste oil, unless otherwise demonstrated.)

Water Table: the surface of the saturated zone below which all interconnected voids are filled with water and at which the pressure is atmospheric.

Acronyms

<u>AFVR</u>	Aggressive Fluid - Vapor Recovery
<u>AST</u>	Aboveground Storage Tank
<u>ASTM</u>	American Society for Testing and Materials
<u>CAP</u>	Corrective Action Plan
<u>CAS</u>	Chemical Abstracts Service Number
<u>CERCLA</u>	Comprehensive Environmental Response, Compensation and Liability Act
<u>CFR</u>	Code of Federal Regulations
<u>CSA</u>	Comprehensive Site Assessment
<u>DENR</u>	Department of Environment and Natural Resources
<u>DWQ</u>	Division of Water Quality
<u>DWM</u>	Division of Waste Management
<u>EDB</u>	Ethylene Dibromide (1,2 Dibromoethane)
<u>EPA</u>	The Environmental Protection Agency
<u>FID</u>	Flame Ionization Detector
<u>GCL</u>	Gross Contaminant Limit
<u>HCl</u>	Hydrochloric Acid
<u>HNO₃</u>	Nitric Acid
<u>IAA</u>	Initial Abatement Action
<u>IAR</u>	Initial Site Assessment Report
<u>IATA</u>	International Air Transport Association
<u>L.G.</u>	Licensed Geologist
<u>LSA</u>	Limited Site Assessment
<u>MADEP</u>	Massachusetts Department of Environmental Protection
<u>MDL</u>	Method Detection Limit
<u>MMPE</u>	Mobile Multi-phase Extraction
<u>MRL</u>	Minimum Reporting Limit
<u>MSCC</u>	Maximum Soil Contaminant Concentration
<u>NC</u>	North Carolina
<u>NCAC</u>	North Carolina Administrative Code

<u>NCDA&CS</u>	North Carolina Department of Agriculture& Consumer Services
<u>NCGS</u>	North Carolina General Statutes
<u>NCS</u>	Notice of Contaminated Site
<u>NFA</u>	No Further Action
<u>NORR</u>	Notice of Regulatory Requirements
<u>NOV</u>	Notice of Violation
<u>NPDES</u>	National Pollutant Discharge Elimination System
<u>NRP</u>	Notice of Residual Petroleum
<u>OPHSCA</u>	Oil Pollution and Hazardous Substances Control Act of 1978
<u>PAH</u>	Polycyclic Aromatic Hydrocarbon
<u>PCB</u>	Polychlorinated Biphenyl
<u>P.E.</u>	Professional Engineer
<u>PID</u>	Photoionization Detector
<u>POTW</u>	Publicly Owned Treatment Works
<u>QA/QC</u>	Quality Assurance/Quality Control
<u>SAR</u>	Soil Assessment Report
<u>SCR/SCR</u>	Soil Cleanup Report/Site Closure Request
<u>SM</u>	Standard Method
<u>STF</u>	State Trust Fund
<u>SVE</u>	Soil Vapor Extraction
<u>SVOC</u>	Semi-Volatile Organic Compounds
<u>SW</u>	Solid Waste
<u>TCLP</u>	Toxicity Characteristic Leaching Procedure (EPA Method SW-846 1311)
<u>TOC</u>	Total Organic Carbon
<u>TPH</u>	Total Petroleum Hydrocarbons
<u>TPH-DRO</u>	Total Petroleum Hydrocarbons - Diesel Range Organics
<u>TPH-GRO</u>	Total Petroleum Hydrocarbons - Gasoline Range Organics
<u>UST</u>	Underground Storage Tank
<u>UVF</u>	Ultraviolet Fluorescence
<u>USGS</u>	United States Geological Survey
<u>VOA</u>	Volatile Organic Analysis

VOC Volatile Organic Compounds

1.0 Introduction

1.1 Regulatory Background

Contamination incidents resulting from releases of petroleum products from non-underground storage tank (non-UST) sources are regulated by the Division of Waste Management (DWM), a division of the Department of Environment and Natural Resources (the Department). The DWM responds to non-UST petroleum releases in accordance with the North Carolina General Statute (NCGS) 143-215.75 *et seq.*, the Oil Pollution and Hazardous Substances Control Act of 1978 (OPHSCA), and with Title 15A NCAC Subchapter 2L, Groundwater Classifications and Standards. The OPHSCA and Subchapter 2L establish the requirements for investigating non-UST petroleum releases and for performing initial response and abatement, assessment, and corrective action and set the criteria and standards for cleanup.

1.2 Purpose and Application of the Guidelines

The *Guidelines for the Initial Response and Abatement, Assessment, and Corrective Action for Non-UST Releases of Petroleum* (hereafter referred to “*Guidelines*”) apply to releases of petroleum products from non-UST sources, which include surface spills, aboveground storage tanks (ASTs), and underground and aboveground conduits or piping not associated with underground storage tanks (USTs). The purpose of the *Guidelines* is to describe acceptable methods for investigating suspected or confirmed non-UST petroleum releases, for performing initial response and abatement actions, for assessing the nature and extent of contamination, and for performing corrective action to clean up contamination in accordance with the statutes and rules. A flowchart illustrating the sequence of required actions from release discovery to site closure is presented in Figure 2.

Following this introduction, Section 2.0 of the *Guidelines* discusses the regulatory authority specific to release discovery, initial response and abatement, and assessment and corrective action. Sections 3.0 - 9.0 present initial response; initial abatement; continuing free product recovery; site priority ranking; comprehensive assessment; corrective action and monitoring; and site closure, sequentially. Section 10.0 describes public notice requirements. Section 11 explains the Notice of Contaminated Site and land use restrictions. Section 12.0 provides sampling and analysis guidance specific to the phase of investigation. Section 13.0 provides guidance for water supply well sampling and for provision of alternate water supply. Section 14.0 presents guidance on disposal of contaminated soil and groundwater. Tables, figures, and appendices follow the text. Appendix A presents report formats; Appendix B, reporting tables; Appendix C, required permits; Appendix D, aquifer testing; Appendix E, development of the soil-to-groundwater Maximum Soil Contaminant Concentrations; and Appendix F, guidance pertinent to releases from other sources.

The *Guidelines* can be obtained from any regional office, the UST Section Central Office, or the UST Section web page at <http://portal.ncdenr.org/web/wm/ust>. Questions about the information in this document should be directed to the UST Section, DWM. The address, telephone number, and the jurisdiction of each regional office are presented in Figure 1.

1.3 Guidance Pertaining to Releases from Other Contaminant Sources

A listing of contaminant sources other than non-UST petroleum releases which indicates which state agency to contact for guidance is located in Appendix F.

Cleanup goals for contaminants from a non-UST petroleum source which are co-mingled with contaminants from a petroleum UST are described in NCGS 143-215.94V(h). A non-UST derived petroleum contaminant plume in groundwater which is co-mingled with a UST-derived petroleum contaminant plume can be cleaned up under the risk-based rule established in 15A NCAC 2L .0400 for petroleum UST releases to risk-based standard levels. Likewise, an area of soil contamination derived from a non-UST petroleum source which merges with (or cannot be differentiated from) an area of soil contamination derived from a petroleum UST release can be cleaned up under the risk-based rule to risk-based standard levels. However, if the areas of non-UST and UST soil contamination do not merge, then the non-UST soil contamination must be cleaned up to the soil-to-groundwater MSCCs.

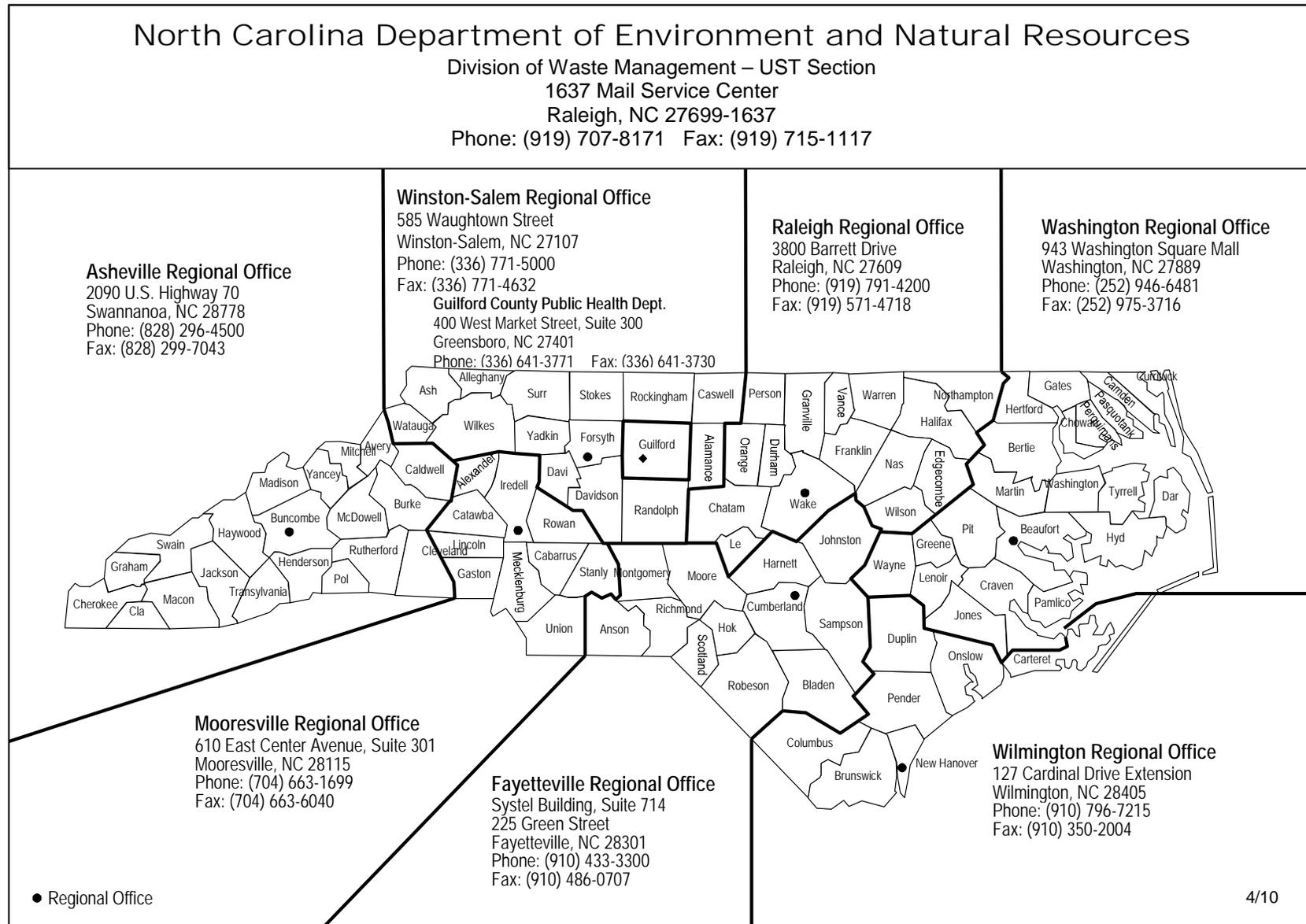
Cleanup goals for contaminants derived from a non-petroleum release (e.g., a chlorinated solvent release from a UST or AST) which are co-mingled with contaminants from a petroleum UST release, are the groundwater quality standards listed in 15A NCAC 2L .0200, for groundwater, and the soil-to-groundwater MSCCs, for soil.

1.4 Certification and Licensing Requirements for Underground Storage Tank Assessment and Corrective Actions

All work performed pursuant to these *Guidelines* which involves site assessment, interpretation of subsurface geologic conditions, or preparation of corrective action plans or which requires detailed technical knowledge of site conditions must be performed by persons, firms, and corporations licensed by the North Carolina State Board of Professional Engineers or the North Carolina State Board of Licensed Geologists, as required under Title 15A NCAC 2L .0103(e). All work following the discovery and notification of a release in the **Notification of Discharge Report** must meet the requirement for performance by licensed persons, firms, and corporations. Furthermore, the title pages of all of the reports required by these *Guidelines* following the initial **Notification of Discharge Report** must display the seal and signature of the certified professional engineer or licensed geologist and the name and corporate certification number of the firm or corporation, as applicable. (The **Initial Assessment Report** is the first report in the sequence for which the seal and signature of a certified individual and the corporate certification number are required.)

If these reports do not contain plans or designs for active groundwater remediation systems, they may be prepared and sealed by either a North Carolina professional engineer or licensed geologist. Active groundwater remediation is defined to mean any remediation method which employs the use of pumps to move liquids and/or gases at a site. All plans and specifications required under 15A NCAC 2L .0106 and .0400 and intended for use in construction of or for obtaining regulatory authorization to construct an active remediation system, must be prepared under responsible charge of a professional engineer and must bear their seal. However, preliminary or conceptual site restoration plans not intended for use in construction or for obtaining regulatory approval may be prepared by either a professional engineer or a licensed geologist.

Figure 1 Regional Office Locations and Map



2.0 Applicability of Regulatory Requirements

2.1 Statement of Regulatory Requirements

2.1.A Regulatory Requirements Applicable to Initial Response Actions

In the OPHSCA, NCGS 143-215.83(a) and 84(a) indicate that it is unlawful for any person to discharge petroleum oil into or upon any waters or land and that any person having control over such a discharge shall immediately “collect and remove” the discharge and begin to restore the area affected to the condition existing prior to the release. NCGS 143-215.85(b) states that this responsible person shall report the discharge to the Department within 24 hours of the discharge (in a **Notification of Discharge Report**).

Title 15A NCAC 2L .0106(b) states that any person controlling an activity which results in the discharge of oil to groundwater (or in proximity thereof) shall take immediate action to (1) stop the release, (2) mitigate hazards caused by the release, and (3) notify the Department of the release. Title 15A NCAC 2L .0106(c) further stipulates that if this activity results in the increase of the concentration of a substance in excess of the standard, the responsible party shall eliminate the source of the release and notify the Department.

2.1.B Regulatory Requirements Applicable to Initial Abatement Actions

Title 15A NCAC 2L .0106(f) indicates that following discovery of the release, the responsible party shall perform the following initial abatement actions: (1) prevention of fire, explosion, spread of vapors; (2) abatement, containment, or control of contaminant migration; (3) removal, treatment, or control of primary sources such as free product on the surface; (4) removal, treatment, or control of secondary sources which would be continuing sources of pollutants to groundwater such as contaminated soils or free product.

2.1.C Regulatory Requirements Applicable to Assessment

Title 15A NCAC 2L .0106(c) and (g) indicate that if release results in an increase in a petroleum contaminant in excess of the standard, the responsible party shall assess (1) the source and cause of the contamination; (2) imminent hazards to public health and safety; (3) all receptors and significant exposure pathways; (4) the horizontal and vertical extent of soil and groundwater contamination and factors affecting contaminant transport; and (5) geological and hydrogeological factors influencing the movement and character of contaminants, and that the responsible party shall submit the results of the assessment in a report to the Department.

2.1.D Regulatory Requirements Applicable to Corrective Action

Title 15A NCAC 2L .0106(c) and (h) indicate that if release results in an increase in a petroleum contaminant in excess of the standard, the responsible party shall implement an approved corrective action plan which incorporates the elements described in Paragraph (h)(1)-(4).

3.0 Initial Response

When a release is discovered, the responsible party is required to perform initial response actions immediately, in compliance with the OPHSCA, NCGS 143-215.83(a), 84(a), and 85(b), and if a risk of groundwater contamination exists, in compliance with Title 15A NCAC 2L .0106(b) and (c). The required initial response actions are illustrated in the flowchart presented in Figure 2 .

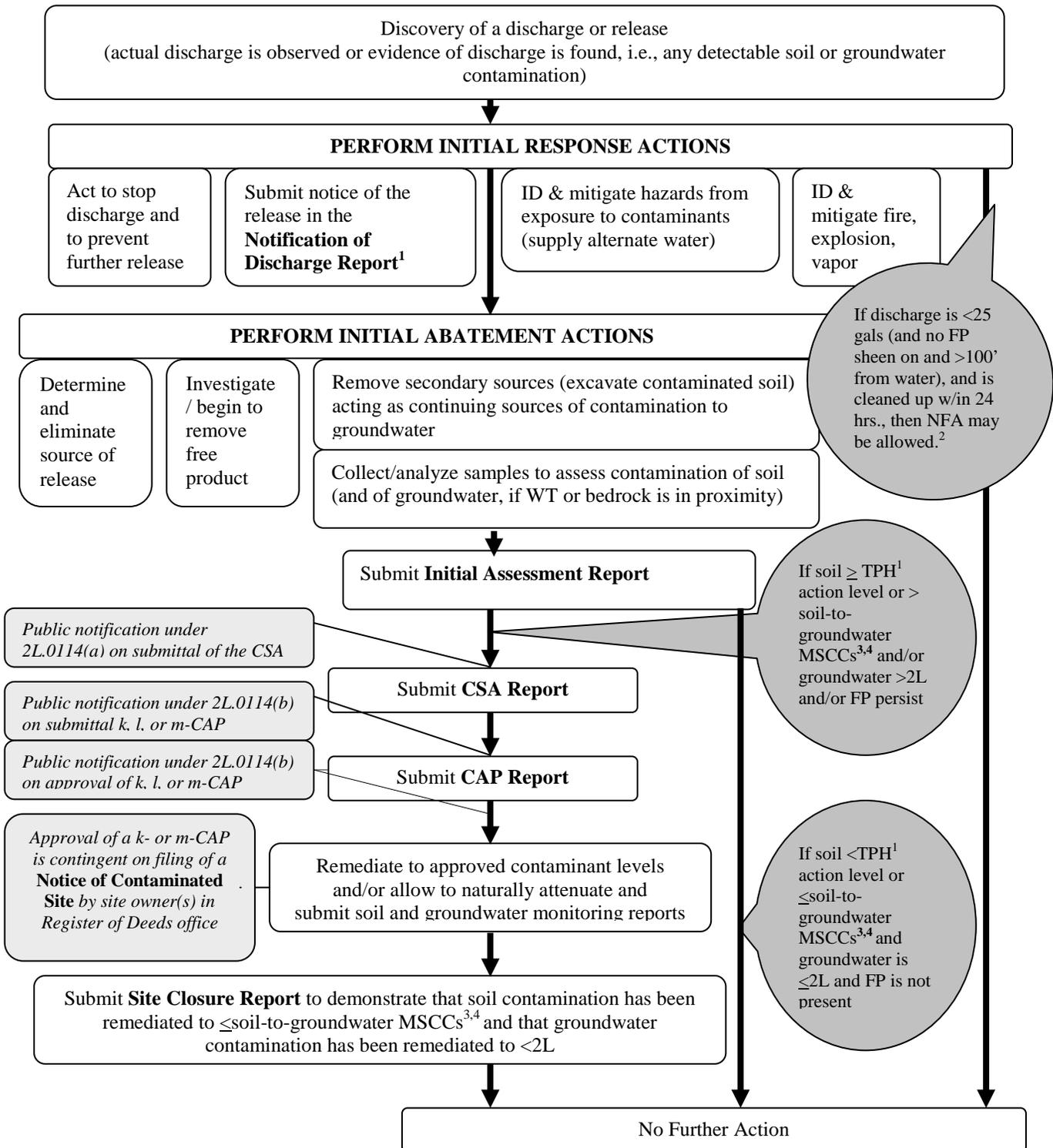
Initial response actions required by the OPHSCA include acting to “collect and remove” the discharge, to restore the area affected to the condition existing prior to the release, and to report the release to the Department within 24 hours of the discharge. Any detectable amount of a contaminant is considered by this statute to constitute a release.

Certain criteria determine if the responsible party is required by the OPHSCA to take all initial response actions for a particular release. In accordance with the OPHSCA, the responsible party must perform all release response actions, including reporting the release to the appropriate UST Section regional office of the Department within 24 hours (in a **Notification of Discharge Report**), if the volume of petroleum that is discharged is greater than or equal to 25 gallons (or if it causes a sheen on surface water or the discharge occurred at a distance of less than or equal to 100 feet from any surface water body).

Conversely, if the volume of petroleum that is discharged is less than 25 gallons (and it does not cause a sheen on surface water or the release occurred at a distance of greater than 100 feet from any surface water body), the responsible party is required only to clean up the release (i.e., “collect and remove” the release and restore the area affected to the condition existing prior to the release) within 24 hours; he/she is not required to report the release. However, if the responsible party fails to clean up this smaller release within 24 hours, then the responsible party must proceed to clean it up immediately and to report the release (in a **Notification of Discharge Report**). For a small, belatedly-reported release, the Department will determine from the information provided in the **Notification of Discharge Report**, if further response/abatement action or reporting is required. (For example, if a release of 10 gallons of petroleum was reported 48 hours after discovery and was responded to quickly and adequately, then the Department may determine that no further action is necessary.)

For releases that meet the criteria specified by the OPHSCA for full response (e.g., if the volume of petroleum that is discharged is greater than or equal to 25 gallons), the responsible party is required further to perform initial response actions in compliance with Title 15A NCAC 2L, since groundwater is potentially at risk. Title 15A NCAC 2L .0106(b) and (c) require that the responsible party take immediate action to terminate and control a release of petroleum to groundwater (or in the proximity of groundwater), to mitigate hazards caused by the release, and to notify the Department of the release. Consequently, in order to satisfy both the requirements of the OPHSCA and of Title 15A NCAC 2L, the Department requires that the responsible party perform all of the initial response actions described below for releases that meet the OPHSCA criteria or that are known or suspected to impact groundwater.

Figure 2 Flowchart of Requirements for Non-UST Releases of Petroleum



1. If the discharge is ≥ 25 gals (etc.), a Notification of Discharge is required, followed by initial abatement actions, etc.
 2. If the discharge is ≤ 25 gals (etc.), but is not cleaned up within 24 hours, a Notification of Discharge is required
 3. Use the approved analytical methods listed in the *UST Section Guidelines for the Investigation and Remediation of Contamination from Non-UST Petroleum Releases*.
 4. If no established soil-to-groundwater MSCC exists for a contaminant in soil, then the default concentration limit is the MDL.

3.1 Action to Prevent Further Release

The responsible party must take immediate steps to prevent further release of the petroleum to the environment. For a leaking AST system, the responsible party must (1) shut down the AST system to stop the release, (2) remove the petroleum product, and (3) repair, replace, or remove part or all of the AST system. For a rupture or leakage of petroleum associated with tanker trucks or rail cars, transformer units, drums, etc., the responsible party must (1) stop the release, (2) remove the petroleum product, and (3) repair, replace, or remove the damaged tanks or containers. The responsible party must take any other actions deemed necessary to stop the further release of petroleum to the environment. The responsible party must undertake an investigation to confirm the presence of any environmental contamination and determine the precise source of the release, if it is not already apparent.

3.2 Identification and Mitigation of Hazards from Fire, Explosion, and Vapor

The responsible party must identify and mitigate fire, explosion, and vapor hazards posed by petroleum vapors, free product, or dissolved product which have accumulated at the site of a release or have migrated into utility lines, vaults, basements, or other subsurface features.

3.3 Identification and Mitigation of Hazards from Exposure to Pollutants

The responsible party must identify and mitigate hazards from exposure to pollutants. The responsible party must identify wells, surface water bodies, utility lines, basements, and other potential receptors and assess them for petroleum contaminants or vapors if they are deemed to be at risk, starting with those located closest to the source. If impact to a receptor is confirmed, then the responsible party must act at once to mitigate the impact (e.g., supply alternate water).

3.4 Submittal of Notification of Discharge Report

The responsible party must report evidence of a release (including odor, vapor, free product, stained soil, analytical results, or observation of the release) to the Department within 24 hours of discovery. The responsible party must submit the information required for the **Notification of Discharge Report** to the appropriate UST Section regional office of the Department by telephone, fax, electronic mail, or other means. This information required for the **Notification of Discharge Report** includes the nature, location, and time of the release and a description of the initial response actions and is specified in Appendix A, Report Formats, on the **24-Hour Notification of Discharge Form, UST Form 62**.

4.0 Initial Abatement

Following initial response, the responsible party is required to perform initial abatement actions. The flowchart presented as Figure 2 illustrates the requirements for initial abatement, including the submittal of the first report, the **Initial Assessment Report**.

4.1 Confirmation that the Source of the Release Has Been Identified and Eliminated

The responsible party must complete the investigation to confirm the presence of and/or determine the precise source of the release, if those determinations have not been accomplished during initial response. The responsible party must measure for the presence of a release wherever contamination of soil or groundwater is likely to be present.

4.2 Investigation and Recovery of Free Product

The responsible party must investigate to determine the possible presence of free product and, if free product is discovered, begin free product removal immediately. Following the initial recovery event and reporting in the subsequent **Free Product Recovery Report** (or the **Initial Assessment Report**, if appropriate), the responsible party must determine the product type, thickness, rate of recovery, and lateral extent of free product; evaluate relevant hydrogeological factors and potential receptors; and submit the results of this investigation and a proposed free product recovery plan to the appropriate regional office of the UST Section in a **FP Recovery System Specification Report**. The responsible party must implement the free product recovery plan immediately upon approval and continue to execute the plan until free product has been removed or until the plan is superseded by the Corrective Action Plan. Free product recovery and reporting is discussed in more detail in Section 5.0; the report formats are specified in Appendix A.

4.3 Continued Mitigation and Monitoring of Fire, Explosion, and Vapor Hazards

The responsible party must continue to mitigate and monitor any fire, explosion, and vapor hazards posed by free product or by vapors which have migrated into subsurface structures.

4.4 Remediation of Hazards Posed by Exposed Contaminated Soil

The responsible party must remedy hazards posed by contaminated soils exposed by assessment or excavation activities. Contaminated soil must be treated and disposed in compliance with state and local requirements. Refer to Section 14.0 for guidance on disposal of contaminated soil from excavations.

4.5 Initial Assessment of Soil Contamination

In some circumstances, a release of petroleum is not directly observed but is suspected (e.g., a release from underground piping connected to an AST which is located near a petroleum-contaminated well). In order to confirm that a release has occurred, the responsible party must collect and analyze soil samples for petroleum contaminants. Any type of sampling can be used in the field to screen for contamination. However, final sampling and analysis to demonstrate that soil is not contaminated must

be conducted using the approved methods described in Section 12.0 and listed in Table 3. The responsible party may use the TPH methods for this first round of soil sampling.

4.6 Removal of Contaminated Soil

The responsible party must “immediately undertake to collect and remove the discharge” and to restore the area impacted by a release to the condition existing prior to the release, in compliance with NCGS 143-215. 84(a) and must remove, treat, or control “secondary pollution sources which would be continuing sources of contaminants to groundwater such as contaminated soils...”, in compliance with Title 15A NCAC 2L .0106(f). The Department specifically requires that the responsible party immediately excavates all contaminated soil that exceeds the following action level:

Equal to or greater than 10 milligrams per kilogram (mg/kg) TPH, when the soil samples have been analyzed by the approved TPH methods listed in Table 3.

At a specific site, the constituent-specific and/or carbon-fraction methods listed in Table 3 may be determined by the Department to be more appropriate than the TPH methods for soil assessment. The effective action level for analytical results produced by these methods would be the soil-to-groundwater MSCC for each constituent or carbon fraction.

The responsible party should attempt to remove all contaminated soil. Excavation should cease in any direction in which clean soil or bedrock is encountered or in which excavation threatens to harm a substantial structure and generally should cease in the vertical direction when groundwater is encountered.

If during excavation, bedrock or groundwater is encountered, the responsible party must install a monitoring well in the source area and sample and analyze the groundwater using the methods described in Section 12.0 and listed in Table 4.

4.7 Sampling During and at Completion of Excavation

During excavation of contaminated soil any type of sampling can be used to screen for contamination. Intensive assessment and delineation of soil contamination should be accomplished using field-based qualitative or, preferably, semi-quantitative analytical methods, as discussed in Section 12.0. However, final confirmation sampling and analysis must be conducted using the approved TPH or constituent-specific methods described in Section 12.0 and listed in Table 3. The responsible party may use the TPH methods for the first round of sampling and analysis to confirm cleanup in the sidewalls and base of the excavation. Furthermore, if the first round of sample results indicates that more excavation is required *and the pit has remained open*, the responsible party may dig further, take additional “first round” confirmatory samples, and again use TPH methods for analysis, until all contaminated soil has been removed. However, the responsible party may use TPH methods to confirm cleanup only for this extended first round of samples taken at a site. All following rounds of sampling require the use of the constituent-specific and carbon-fraction methods specified in Table 3 to confirm cleanup although the number of samples required to be analyzed by such methods should be minimized and their location optimized by preliminary field-based assessment.

Samples must be collected from sidewall and base locations where contamination is most likely to be present. A minimum of one sample is required from the base of each excavation and from each of the sidewalls. In general, sample(s) collected from the base of the excavation should be collected directly underneath the location(s) of the source(s) of the release. If there were several distinct areas of contaminated soil in an excavation or the excavation is large (greater than 25 feet across in any dimension) or is linearly- or irregularly-shaped, then more samples from each sidewall and the base of the pit, collected at 10-foot intervals, are required. A set of base and sidewall post-excavation confirmation samples must be collected from each excavation at the site. If there are several excavations, then a separate set of samples is required from each excavation.

4.8 Submittal of Initial Assessment Report

The responsible party must submit an **Initial Assessment Report** to the appropriate regional office of the UST Section within 30 days of discovery of a release, following the format specified in Appendix A. The **Initial Assessment Report** reports site history and characterization, free product investigation and removal (if applicable), groundwater and surface water investigation (if applicable), initial response and abatement actions, and the excavation of contaminated soil, with the results of post-excavation confirmatory soil sampling. If the **Initial Assessment Report** shows that (1) the soil has been cleaned up to below the action level for TPH (or to the soil-to groundwater MSCCs, if required); (2) groundwater was not encountered in the excavation or, if encountered, any contamination was determined to be equal to or less than the groundwater quality standards; (3) bedrock was not encountered or, if encountered, any contamination was determined to be equal to or less than the groundwater quality standards; and (4) free product is not present, then the Department may determine that no further action is required.

If, however, any of the above criteria are not met, then the responsible party will be required to perform a comprehensive assessment of the soil and groundwater contamination and submit a **Comprehensive Site Assessment Report** and, subsequently, to implement an approved **Corrective Action Plan** until soil and groundwater have been cleaned up.

5.0 Free Product Recovery and Reporting

As discussed under Initial Abatement in Section 4.2, following an initial free product recovery event and reporting in the subsequent **Free Product Recovery Report** (or the **Initial Assessment Report**, if appropriate), the responsible party must investigate to determine the product type, thickness, rate of recovery, and lateral extent of free product; relevant hydrogeological factors; and potential receptors. The responsible party then must submit the results of this investigation to the appropriate regional office of the UST Section in a **FP Recovery System Specification Report**. This report should summarize and evaluate the results of the investigation, evaluate several possible active free product recovery system options (e.g., excavation, SVE, MMPE, AFVR), and propose a free product recovery plan which incorporates the most appropriate recovery system option. The free product removal plan should be designed to minimize the spread of contamination and treat, discharge, and dispose of free product in compliance with all applicable regulations; the objectives of the plan should be to halt migration and to remove free product to the maximum extent practicable, usually to a thickness of less than 0.01 foot. The report should conclude with a schedule for the free product recovery plan which includes implementation, attainment of free product recovery progress milestones, and submittal of reports.

The responsible party must implement the free product recovery plan immediately upon approval and continue to execute the plan, simultaneously with all other required abatement, assessment, cleanup, and reporting activities, until free product has been removed or until the plan is superseded by the **Corrective Action Plan**.

Free product recovery reporting should be incorporated in the **Initial Assessment Report**, the **Comprehensive Site Assessment Report**, the **Corrective Action Plan**, and all **Monitoring Reports**, whenever the timing is appropriate, and in the **Free Product Recovery Report**, when a more comprehensive report is not due simultaneously. The required formats for these reports are presented in Appendix A.

The responsible party is required to handle flammable product safely and competently in order to prevent fire or explosion.

6.0 Risk Classification

Following submittal of the **Initial Assessment Report** or other documentation, the Department will assign a risk classification to an incident site based on the threat or potential threat that the release poses to human health and the environment. Incident sites are classified as high, intermediate, or low risk. Once determined by the Department, the risk classification should be indicated on the title page of all subsequent reports, along with incident number, geographical location, etc. The risk classification criteria are listed below. If the criteria for more than one risk classification category apply, the incident will be assigned the highest applicable risk.

6.1 High Risk

The criteria for high risk are:

- (1) a water supply well, including one used for non-drinking purposes, has been contaminated by the release;
- (2) a water supply well used for drinking water is located within **1,000 feet** of the source area of a confirmed release;
- (3) a water supply well not used for drinking water is located within **250 feet** of the source area of a confirmed release;
- (4) the groundwater within 500 feet of the source area of a confirmed release has the potential for future use in that there is no source of water supply other than the groundwater;
- (5) the vapors from the release poses a serious threat of explosion due to accumulation of the vapors in a confined space; or
- (6) the release poses an imminent danger to public health, public safety, or the environment.

6.2 Intermediate Risk

The criteria for a intermediate risk are:

- (1) surface water is located within 500 feet of the source area of a confirmed release and the maximum groundwater contaminant concentration exceeds the applicable surface water quality standards and criteria found in 15A NCAC 2B .0200 and US EPA National Criteria by a factor of 10;
- (2) in the Coastal Plain physiographic region as designated on a map entitled “Geology of North Carolina” published by the Department in 1985, the source area of a release is located in an area in which there is recharge to an unconfined or semi-confined deeper aquifer which the Department determines is being used or may be used as a source for drinking water;
- (3) the source area of a confirmed release is located within a designated wellhead protection area, as defined in 42 USC 300h-7(e);
- (4) the levels of groundwater contamination for any contaminant except ethylene dibromide, benzene, and aliphatic and aromatic carbon fraction classes exceed 50 percent of the solubility of the contaminant at 25 degrees Celsius or 1,000 times the groundwater quality standard or interim standard established in 15A NCAC 2L .0202, whichever is lower; or
- (5) the levels of groundwater contamination for ethylene dibromide and benzene exceed 1,000 times the federal drinking water standard set out in 40 CFR 141.

6.3 Low Risk

Low risk classification means that the threat posed by the release does not meet any of the high or intermediate risk criteria, or that based on site-specific information, limited assessment, or interim corrective actions, the Department determines that the release poses no significant threat to human health or the environment.

7.0 Comprehensive Site Assessment

If the **Initial Assessment Report** indicates that, despite initial abatement actions, soil contamination has not been cleaned up to the soil-to-groundwater MSCCs and/or groundwater contamination has not been cleaned up to the groundwater quality standards in 15A NCAC 2L .0202, the responsible party must perform a comprehensive site assessment and submit a **Comprehensive Site Assessment (CSA) Report**.

7.1 Comprehensive Site Assessment Report

The primary objectives of the comprehensive site assessment are to characterize the full extent of contamination resulting from the release, determine the chemical and physical characteristics of the contaminants, investigate the geology and hydrogeology of the site including all factors relating to contaminant transport, and examine risk to potential receptors and exposure pathways. In characterizing the extent of contamination, the responsible party must define and document the vertical and horizontal extent of both soil and groundwater contamination. When assessing the extent of contamination, the responsible party must consider the nature of the contaminant and site-specific conditions. If soil contamination is present at or near bedrock or the water table or if groundwater contamination is known to be present, the responsible party must install groundwater monitoring wells in accordance with 15A NCAC 2C .0100. The responsible party must install a minimum of three monitoring wells in order to determine the direction of groundwater flow and must install one monitoring well within 5 feet and down-gradient of the source of the release. In addition, he/she must install deeper wells to define the shape of the plume and delineate the vertical extent of the plume. The regional office may require additional monitoring wells.

The **CSA Report** must be submitted to the appropriate regional office within 90 days of the date of the notice requesting the comprehensive site assessment. The **CSA Report** must follow the format presented in Appendix A, Report 5. Guidelines for conducting comprehensive site assessment and completing a **CSA Report** are presented below.

7.1.A Remediation Goals

Soil contamination must be delineated and remediated to concentration levels equal to or less than the soil-to-groundwater MSCCs, and groundwater contamination must be remediated to concentration levels equal to or less than the groundwater quality standards in 15A NCAC 2L .0202.

7.1.B CSA Reporting Requirements

Requirements for the comprehensive site assessment and the subsequent **CSA Report** include but may not be limited to the following items:

- (1) update of site history, source determination, and potential receptor information provided in the Initial Assessment Report (The responsible party must provide a history of petroleum releases at the site using the Tables B-1 UST/AST System and Other Release Information and B-2 UST/AST Owner/Operator and Other Responsible Party Information provided in Appendix B. These tables must describe the location, use, and all owners and operators of all current and

previous UST and AST systems at the site. The responsible party must describe all sources of petroleum non-UST releases (spills, AST system releases) and all sources of UST releases on the site.);

- (2) collection of soil and groundwater samples in order to delineate the horizontal and vertical extent of contamination. (Samples must be collected and analyzed in accordance with methods and procedures specified in Section 12.0. Comparison of the sample results must be made to the applicable cleanup standards.);
- (3) determination of the extent and thickness of free product, if present;
- (4) copies of public notice (Refer to Section 10.1. for more information.);
- (5) hydrogeologic investigation which should include:
 - (a) complete characterization of the site geology based on the information obtained during the advancement of soil borings and construction of monitoring wells;
 - (b) collection of groundwater elevation data and calculation of hydraulic gradient and determination of groundwater flow direction;
 - (c) performance of aquifer slug tests (or an aquifer pump test if approved by the regional office), to provide a calculation of hydraulic conductivity, transmissivity, and linear groundwater velocity (See Appendix D.); and
 - (d) determination of rate of contaminant transport and the potential for contaminants to affect receptors.

7.1.C Evaluation of Potential for Contamination to Impact Receptors

The responsible party must evaluate the potential for contaminants in soil and groundwater to affect receptors including but not be limited to:

- (1) water supply wells;
- (2) subsurface features;
- (3) building interiors;
- (4) surface water bodies;
- (5) groundwater in wellhead protection areas; and
- (6) groundwater in areas of recharge to deep unconfined or semi-confined aquifers.

If a receptor is determined to be at risk from soil or groundwater contamination from a release, the responsible party must evaluate all actions which would reduce the risk to the receptor. Such actions might include the abandonment of water supply wells and the extension of public water supply lines.

Groundwater modeling may be required to evaluate potential of groundwater contamination to impact receptors. If the source area of a release is located within 500 feet of a surface water body, within a designated wellhead protection area, or within an area of recharge to a deeper Coastal Plain aquifer, the responsible party must evaluate whether or not groundwater contamination will violate the following criteria:

- (1) surface water standards and criteria;
- (2) groundwater quality standards and interim standards at a location no closer than one year time of travel upgradient of a well within a designated wellhead protection area; and

- (3) groundwater quality standards and interim standards in a deep Coastal Plain aquifer that is or could be used as a source for drinking water.

The responsible party should perform predictive calculations and/or modeling, or use empirical site monitoring data and/or knowledge of the timing of the release to determine contaminant transport rates. Modeling/calculations must be based on site-specific conditions. If modeling/calculation indicates that any of the above standards might be exceeded, the responsible party must propose a cleanup level that will prevent such an exceedance.

Sites with uniform groundwater flow conditions should use analytical transport models (usually one-dimensional). Sites having complex flow conditions (e.g., multi-aquifer system) where uniform groundwater flow cannot be assumed may require multi-layer numerical models. Before performing a numerical model, the responsible party should discuss site conditions with the regional office personnel to evaluate whether or not the modeling effort is warranted. The modeling results should always be compared and calibrated with empirical (monitoring) data obtained from the site. Site-specific data should be incorporated into the models whenever possible.

When selecting a model, the user should consider the model's performance history and applicability to the site. The model should have been field tested by a number of workers and should be well documented in the literature. Users should select a model with inherent assumptions that are appropriate for the site conditions. All assumptions and estimated values, including biodegradation rates, must be conservative (i.e., predict reasonable worst-case scenarios) and thoroughly documented. At a minimum, a user must provide the following information when submitting modeling results:

- (1) name, version and developer of the model;
- (2) the type of site for which the model is applicable;
- (3) the critical conceptual assumptions and estimates of input values;
- (4) the calibration procedures;
- (5) the range of values used and the results of sensitivity analyses on critical data inputs; and
- (6) a graphical representation and narrative explanation of the modeling results.

Sites characterized by migration of contamination through a surficial unconsolidated aquifer toward surface water should use simple predictive calculations and/or modeling and/or analytical transport models to evaluate potential for a surface water standard exceedance and to establish a groundwater cleanup level. Analytical transport models, simple predictive calculations for estimating retardation factors and contaminant transport rates should be obtained from the literature.

A surface water body may have several different classifications depending on its use and the type of aquatic life present. Each classification has a set of surface water quality standards or criteria. The surface water standards and the criteria for each classification must be reviewed. The most stringent of the standards and the criteria assigned to the surface water should be used in identifying a possible surface water violation. North Carolina surface water classifications and standards (15A NCAC 2B) and US EPA National Criteria are listed by the Division of Water Quality in the NC and EPA Criteria Table at <http://portal.ncdenr.org/web/wq/ps/csu>. If a standard cannot be found for a particular contaminant, the responsible party should call the DWQ's Water Quality Standards Coordinator at (919) 807-6416 for more information.

Sampling a surface water body, instead of performing predictive modeling to demonstrate that surface water standards are not violated, is not acceptable unless the responsible party can also demonstrate that the maximum groundwater contamination concentrations at the site are discharging to surface water at the time of sampling. If this demonstration can be made, surface water samples should be obtained from the discharge area, as well as upstream and downstream of the discharge area.

8.0 Corrective Action

If the **CSA Report** indicates that soil contamination and/or groundwater persists, the responsible party must submit a **Corrective Action Plan (CAP)**. The plan must propose and evaluate actions to clean up soil and groundwater contamination. When the most effective remedial options for soil and groundwater have been selected and the **CAP** has been approved, the responsible party must implement the **CAP** according to an approved schedule. Periodic groundwater monitoring will be required to evaluate changes in groundwater contaminant concentration during the remediation process, to monitor plume migration and to determine the effectiveness of the corrective action.

8.1 Corrective Action for All Non-UST Petroleum Release Sites

8.1.A Pre-CAP Monitoring

If more than six months elapse between approval of the **CSA Report** and implementation of the **CAP**, then the Department may direct the responsible party to perform pre-**CAP** monitoring of groundwater in monitoring and/or water supply wells, of surface waters, of petroleum vapors, and/or of free product. Pre-**CAP** monitoring may be determined necessary for the following purposes:

- (1) to provide an updated evaluation of risk to potential receptors;
- (2) to develop a current picture of contaminant plume geometry and extent in order to facilitate remedial system design;
- (3) to establish the level of contaminant concentration at a site immediately prior to startup of remedial system; and
- (4) to provide empirical data on which to evaluate the progress of natural attenuation.

The Department will determine the frequency and scope of pre-**CAP** monitoring on a site-specific basis. The responsible party should submit a plan for pre-**CAP** monitoring to the Department for approval, perform the monitoring event, and submit a **Pre-CAP Monitoring Report** (which should be prepared using the **Monitoring Report** format presented in Appendix A) to the appropriate regional office by the end of the month following the month of the monitoring event.

8.1.B Corrective Action Plan

8.1.B.1 Basis for Requirement

Pursuant to 15A NCAC 2L.0106 for non-UST petroleum releases, the responsible party must propose actions to cleanup or to mitigate the impact of soil and groundwater contamination. The responsible party is allowed 60-days from the date of the notice approving the **CSA Report** to submit a **CAP** that presents and evaluates the proposed corrective actions.

As the corrective actions for all non-UST petroleum releases are regulated under 15A NCAC 2L. 0106, the responsible party must propose and implement a **CAP** pursuant to Paragraph .0106(j), which requires use of the “best available technology for restoration of groundwater quality to the level of the standards, except as provided in Paragraphs (k), (l), and (m)...”. So the responsible party must

submit a CAP under NCAC 2L .0106(j) (a “j-CAP”) which proposes to use remediation technology continuously until groundwater contamination is reduced to levels equal to or less than the standards established in 15A NCAC 2L .0202, *unless* he/she instead chooses to request the Department to approve an alternative corrective action plan described in Paragraphs .0106(k) or .0106(l).

The responsible party is strongly advised to carefully consider the rigorous requirements and the inflexibility of the alternative CAPs and to propose a CAP under NCAC 2L .0106(j). The requirements for the alternative CAPs are presented in detail later in this section to facilitate full understanding of the difficulties involved firstly in meeting the stringent requirements for approval and then in continuing to meet them throughout implementation (e.g., if a CAP under .0106(k) or (l) is approved but later, during implementation, contaminated soil or FP is discovered or the plume migration model is found to be faulty and a receptor to be at risk, then another CAP, under 2L .0106(j), using active technology to address the soil or FP, will be required.) The formula for a CAP under 2L .0106(j), although strictly described as a plan for implementing active technology from start to finish (with no further action), is interpreted to allow implementation of several different technologies (including excavation) simultaneously or sequentially to the point where each no longer functions to provide further cost-effective or technically-efficient cleanup and also to allow necessary periods of system shutdown to monitor for rebound or attenuation of contaminants.

Pursuant to 15A NCAC 2L .0106(f), all free product and contaminated soil should have been removed, treated or controlled during the initial abatement or assessment. However, if soil contamination persists at levels that could leach into groundwater, then soil remediation must be proposed in the **CAP**.

8.1.B.2 Purpose and Scope

The purpose of the **CAP** is to propose a plan to remediate soil and groundwater contamination, if present. However, if the contamination present at the site is limited to either soil or groundwater, then the **CAP** should address only the contamination that is present. The format for the **CAP** is presented in Appendix A, Report 6. The responsible party must provide the information described in the report format, completing, as appropriate, sections relating to soil contamination, groundwater contamination and/or free product and must organize and present this information in the manner stipulated by the format. The regional office incident manager, on review of the **CAP**, may request information additional to that provided in the **CAP** or supplemental to that specified by the report format. The incident manager may deny approval of the **CAP** if any of the elements specified have not been included or have not been adequately addressed. The incident manager will not approve the **CAP** report until he/she determines that the report is complete. Questions regarding technical aspects of site assessment or corrective action should be directed to the appropriate regional office or the central office.

8.1.B.3 Basis for Requirement

The corrective actions proposed in the **CAP** must be designed to adequately protect human health, insure safety and protect the environment. Specifically, the **CAP** must consider the following elements:

- (1) physical and chemical characteristics of the regulated substance

- (2) toxicity of the regulated substance
- (3) persistence of the regulated substance
- (4) potential for migration of the regulated substance
- (5) hydrogeological characteristics of the site and surrounding area
- (6) proximity, quality, current and future uses of surface water and groundwater
- (7) potential effects of residual contamination on nearby surface water and groundwater
- (8) risk of exposure to organisms

8.1.B.4 Soil Remediation Goals

The responsible party must remediate soil contamination to concentration levels that are equal to or less than the soil-to-groundwater MSCCs. Soil must be remediated to the MSCCs or as closely thereto as economically or technologically feasible. Economic and technological feasibility will only be considered in cases where traditional remediation technologies cannot be used or where treatment or removal of contaminated soil will jeopardize the integrity of a substantial structure. Pavement, decks, patios, or HVAC units are not considered substantial structures. The soil cleanup requirements apply to the entire unsaturated soil column exclusive of the smear zone.

Final determination of soil contamination must be made by the laboratory analytical methods presented in Table 3. MSCCs for petroleum contaminants are listed in Table 1. If a contaminant does not have a published MSCC, the responsible party should contact the UST Central Office Corrective Action Branch at (919) 707-8171 to request establishment of a cleanup level.

8.1.B.5 Development of MSCCs

The soil-to-groundwater MSCCs have been determined to be protective of groundwater impacted by contaminants leaching from soil. The equations used by the Department to calculate the soil-to-groundwater MSCCs are provided in Appendix E.

8.1.B.6 Evaluation of Soil Remediation

The effectiveness and progress of soil remediation should be evaluated by soil sampling as scheduled in the **CAP** or as directed by the Department and should be reported in routine monitoring reports. The requirements for the reporting of soil remediation monitoring are presented in the **Monitoring Report** format presented in Appendix A, Report 7.

8.1.B.7 Groundwater Remediation Goals

For all releases the responsible party is required to restore groundwater quality to concentration levels that are equal to or less than the standards established by 15A NCAC 2L .0202 before being granted no further action. For the majority of releases, the groundwater contamination must be remediated, using one or more technologies, to these standard levels. However, for some releases, if stringent requirements are met (Refer to Section 8.1.B.9), the contamination may be allowed to naturally attenuate to the standard levels or to be remediated actively to alternate concentration levels and then allowed to attenuate to the standard levels.

8.1.B.7.a Goals for a .0106(j) **CAP**.

For the **CAP** required pursuant to 15A NCAC 2L .0106(j), the goals of active remediation of groundwater are concentration levels that are equal to or less than the standards in 15A NCAC 2L .0202. The goals of active remediation under Paragraph .0106(j) are also the final cleanup goals that must be attained for the site to be eligible for no further action (NFA) status.

8.1.B.7.b Goals for a .0106(k) **CAP** or .0106(m) Termination Plan.

For the alternative **CAP** and termination plan allowed pursuant to Paragraph .0106(k) and Paragraph .0106(m), respectively, the goals of active remediation are not equivalent to the final cleanup goals which must be reached for a site to be eligible for NFA status. For the “**k-CAP**”, groundwater contamination must be cleaned up using remediation technology but only to concentration levels determined to be acceptable at the specific site. After the active remediation goals have been attained at the site, the remediation system is shutdown, and the remaining groundwater contamination is allowed to degrade and attenuate naturally to the levels of the standards in 15A NC AC 2L .0202, which are the final goals for NFA status.

The .0106(m) termination plan is a request from the responsible party for approval to terminate operation of remediation technology that is currently in use at the site. The primary justification for termination is that continuation of remedial action will not result in significant reduction of contaminant concentration levels. If termination is approved, the active remediation system is shutdown, and the remaining groundwater contamination is allowed to degrade and attenuate naturally to the levels of the standards in 15A NCAC 2L .0202, which are the final goals for NFA status.

8.1.B.7.c Goals for a .0106(l) **CAP**.

For a **CAP** requested by a responsible party pursuant to Paragraph .0106(l), groundwater contamination is allowed to degrade and attenuate naturally to the standards in 15A NCAC 2L .0202, which are the final goals for NFA status.

8.1.B.7.d Final Remediation Goals.

Following the implementation of all .0106 **CAPs** and of the .0106(m) termination plan, the responsible party must monitor groundwater routinely until he/she can demonstrate that groundwater contamination has been reduced to levels equal to or less than the standards in 15A NCAC 2L .0202 and thus become eligible for NFA status.

The Department requires, at a minimum, four consecutive quarters of data from groundwater monitoring, following discontinuation of remedial action, which document no contamination above the 15A NCAC 2L standards or interim standards to establish that final cleanup goals have been attained. Determination of groundwater contamination must be made by the laboratory analytical methods presented in Table 4.

8.1.B.8 Evaluation of Groundwater Remediation

The effectiveness and progress of groundwater remediation should be evaluated by groundwater monitoring as scheduled in the **CAP** or as directed by the Department and should be reported in routine monitoring reports. The requirements for the reporting of groundwater remediation monitoring are presented in the **Monitoring Report** format presented in Appendix A, Report 7.

8.1.B.9 Corrective Action Reporting Requirements (See *CAP* format in Appendix A, Report 6)

The required elements of all corrective action plans and the corrective action termination plan include, but may not be limited to the following items:

- (1) update of site history, source determination, land use and potential receptor information provided in the **CSA Report**. (The responsible party must provide a history of the UST and AST systems at the site using the Tables B-1 UST/AST System and Other Release Information and B-2 UST/AST Owner/Operator and Other Responsible Party Information provided in Appendix B. The location and use and all owners and operators of all current and previous UST and AST systems at the site must be provided. The responsible party must reconfirm the sources of release, including any on-site petroleum and non-UST sources of contamination.);
- (2) recapitulation and update of assessment information presented in the **CSA** and **pre-CAP Monitoring Reports**;
- (3) comparison of soil and groundwater contaminant concentrations and free product thickness to cleanup goals;
- (4) purpose and objective of this specific **CAP** (e.g., to remove free product, cleanup soil to , the soil-to-groundwater MSCCs and/or remediate groundwater to below 2L standards);
- (5) summary of initial remedial actions taken to date (e.g., excavation at UST closure, free product recovery);
- (6) comprehensive evaluation of remedial options. The responsible party must evaluate excavation plus a minimum of two other viable remedial actions as options for remediating soil; and the responsible party must evaluate a minimum of three viable remedial options (each of which may include one or more technologies or processes, concurrently or sequentially, which may also serve as soil remedial actions) for remediating groundwater at a site, unless fewer viable options can be determined for the site. For example, an evaluation of remedial options for a site with soil and groundwater contamination might compare the following options:
 - (a) excavation of contaminated soil, followed by three years of air sparge to remediate groundwater to 2L standards, (followed by 2 years of monitoring);
 - (b) partial excavation of contaminated soil, followed by five years of SVE/air sparge to remediate soil and groundwater to soil-to-groundwater MSCCs/2L standards (followed by 2 years of monitoring);
 - (c) excavation of contaminated soil, followed by chemical injections to remediate groundwater to 2L standards (followed by 2 years monitoring); or
 - (d) 20 years of monitored natural attenuation of soil and groundwater contamination (For option (d) to be viable, the site must meet the requirements for a .0106(l) **CAP**).

The scope of each option must include all technologies or processes to be utilized, concurrently or sequentially, to clean up all types of contamination at the site. The evaluation of each option must consider:

- (a) nature of contamination;
 - (b) a description of the method or process;
 - (c) discussion of feasibility and effectiveness, based on pilot tests or other relevant parameters;
 - (d) projected costs; and
 - (e) a detailed, well-substantiated schedule for all activities from **CAP** approval to attainment of cleanup goals.
- (7) description and basis for selection of the remedial option determined to be the most effective and cost efficient mechanism to treat contamination at a site; and
- 8) copies of public notices (Notice is required if **CAP** proposes remediation by natural attenuation or cleanup of groundwater to alternate standards. Refer to Section 10 for more information.).

Additional requirements specific to alternative **CAPs** and the **CAP** termination plan are described in detail in 15A NCAC 2L, Paragraphs .0106(k), (l), and (m). However, a summary of these requirements is presented below.

For all the alternative **CAPS** and the termination plan, the responsible party must present the technical basis for the request and must demonstrate:

- (1) that the contaminants have not and will not migrate onto adjacent properties (or that alternative water supplies are available or that the owners of the adjacent properties give written consent to the plan);
- (2) that if the groundwater contaminant plumes are expected to intercept surface water, the surface water quality standards in 15A NCAC 2B .0200 and US EPA National Criteria will not be violated; and
- (3) that public notice of the **CAP** or **CAP** termination request is provided in accordance with 15A NCAC 2L .0114(b) and (c), as further described in Section 10.

For **CAPs** requested pursuant to Paragraph .0106(k), the responsible party also must demonstrate:

- (1) that all sources of free product and soil contamination have been removed, treated, or controlled;
- (2) that time and direction of contaminant travel can be predicted with reasonable certainty (Directions related to predictive calculations and/or modeling are presented in Section 7.1.C.);
- (3) that the groundwater standards in 15A NCAC 2L .0202 will be met at a location no closer than one year's predicted travel time upgradient of an existing or foreseeable receptor or at a physical barrier to groundwater migration (Directions related to predictive calculations and/or modeling are presented in Section 7.1.C.);
- (4) that a groundwater monitoring program will be implemented which can monitor further degradation or attenuation to the standards in 15A NCAC 2L .0202; and

(5) that prior to **CAP** submittal, a Notice of Contaminated Site (NCS), with land use restrictions approved by the Department, has been filed by each owner of property contaminated by the release in the appropriate county's register of deeds office to indicate that a plan has been approved which does not require active remediation to the standards in 15A NCAC 2L .0202.

In practice, it is very difficult to demonstrate adequately that the groundwater standards will be met at a satisfactory location upgradient of a receptor, as required in item (3), or to obtain the requisite NCS from all property owners, so that a CAP under Paragraph .0106(k) is rarely utilized. However, in the implementation of the remedial technology(ies) selected for an ordinary CAP under .0106(j), the technology(ies) may be temporarily shutdown to evaluate potential for rebound and natural attenuation for extended periods, without having to comply with all of the requirements of a CAP under .0106(k).

For CAPs requested pursuant to Paragraph .0106(l), the responsible party also must demonstrate:

- (1) that all sources of free product and soil contamination have been removed, treated, or controlled;
- (2) that the contamination has the capacity to degrade or attenuate under the site specific conditions;
- (3) that time and direction of contaminant travel can be predicted with reasonable certainty (Directions related to predictive calculations and/or modeling are presented in Section 7.1.C.);
- (4) that contaminant migration will not result in any violation of the groundwater quality standards at any existing or foreseeable receptor;
- (5) that a groundwater monitoring plan will be implemented which can (a) monitor degradation and attenuation of contaminants within and downgradient of the plume and (b) detect contaminants prior to their reaching an existing or foreseeable receptor at least one year's predicted travel time upgradient of the receptor (and no greater than the distance the groundwater is predicted to travel in 5 years) (Directions related to predictive calculations and/or modeling are presented in Section 7.1.C.); and
- (6) that all necessary access agreements needed to monitor groundwater have been or can be obtained.

For CAP termination plans requested pursuant to Paragraph .0106(m), the responsible party must include:

- (1) a discussion of the current **CAP**;
- (2) an evaluation of alternative technologies which could further reduce contaminant levels;
- (3) effects on groundwater users if the remediation implemented according to the current **CAP** were to be terminated;
- (4) a satisfactory demonstration that continuation of active remediation would not result in a significant reduction in the contaminant levels (including showing that the asymptotic slope of the curve of decontamination is less than 1:40);
- (5) a monitoring program which is sufficient to track degradation and attenuation of contaminants at a location of at least one year's predicted travel time upgradient of any existing or foreseeable receptor; and

(6) evidence that prior to termination plan submittal, a Notice of Contaminated Site (NCS), with land use restrictions approved by the Department, has been filed by each owner of property contaminated by the release in the appropriate county's register of deeds office to indicate that a plan has been approved which does not require active remediation to the standards in 15A NCAC 2L .0202.

In current practice, it is very difficult to demonstrate that implementation of alternate remedial technologies, evaluated as required in item (2), would not further reduce contaminant levels or to obtain the requisite NCS from all property owners, so that termination plans under Paragraph .0106(m) are rarely utilized. However, in the implementation of the remedial technology(ies) selected for an ordinary CAP under .0106(j), the technology(ies) may be temporarily shutdown to evaluate potential for rebound and natural attenuation for extended periods without having to comply with all of the requirements of a CAP termination plan under .0106(m).

8.1.B.10 Approval and Implementation

A responsible party must receive approval of any **CAP** prior to implementation of that **CAP**. Permits and agreements necessary for **CAP** implementation must be obtained; pilot tests must be performed and evaluated; public notices must be sent and receipt documented; and schedule and cost analysis completed or the **CAP** will not be approved.

The responsible party must implement the **CAP** upon approval by the Department in strict accordance with the schedule approved for the selected remedial option.

If results from periodic monitoring of soil and groundwater contamination and remediation system monitoring indicate that a remedial technology implemented in accordance with an approved CAP is not working effectively so that a significant change or major enhancement of or a replacement to this existing remedial technology is required, then a **System Enhancement Recommendation Report** (format presented in Appendix A, Report 8) or a **New Technology Cleanup Plan** (format presented in Appendix A, Report 9) should be submitted.

When groundwater quality has been restored to concentration levels that are equal to or less than the standards established by 15A NCAC 2L .0202, the responsible party must submit a report documenting that soil and groundwater are cleaned up and request No Further Action (NFA).

9.0 Site Closure

Closure of incident sites may be approved by the appropriate regional office when documentation (Follow the **Site Closure Report** format presented in Appendix A, Report 10.) is provided that indicates that no soil and/or groundwater is contaminated in excess of the appropriate cleanup goals.

NOTE: If a DWQ permit was issued for the site in relation to the remedial action, the responsible party should request rescission of the permit within thirty days of receiving the no further action letter. The responsible party should contact the appropriate section of DWQ for rescission of NPDES, Underground Injection Control, and non-discharge permits. DWQ contact information is listed at <http://portal.ncdenr.org/web/wq>.

10.0 Public Notice

10.1 Public Notice Requirements for Comprehensive Site Assessment

In accordance with 15A NCAC 2L .0106(c), a responsible party who conducted or controlled a non-permitted, non-agricultural activity that caused an increase in the concentration of a substance in groundwater in excess of the groundwater quality standards and interim standards must, under 15A NCAC 2L .0114(a), provide a summary of the **CSA Report** to the local Health Director and the chief administrative officer of the political jurisdiction in which the groundwater contamination occurs. This report must include a map of the contaminant plume with the location of all monitoring wells identified, the frequency of monitoring, a table of the constituents exceeding the groundwater quality standards and interim standards, and the analytical results and any actions taken to mitigate threats to human health. This summary report must be submitted by certified mail to the parties above no later than five working days after submittal of the **CSA Report** to the Department.

10.2 Public Notice Requirements for Corrective Action

In accordance with 15A NCAC 2L .0114(b) and (c), a responsible party who submits a **CAP** proposing active remediation combined with natural attenuation or monitoring, or a **CAP** proposing only natural attenuation or monitoring in accordance with 15A NCAC 2L .0106 (k), (l) or (m), must provide notice. Notice should be given to the local Health Director and the chief administrative officer of the political jurisdiction in which the contaminant plume occurs, and all property owners and occupants within or contiguous to the area above the contaminant plume. The notice must describe the nature and purpose of the **CAP** and the reasons supporting it. The format of the notification letter is provided in Appendix A, Report 12.

Notification must be made by certified mail at the same time the **CAP** is submitted to the Department. A list of individuals that were notified, along with copies of the notification letters and certified mail receipts (receipts retained by the sender after mailing), must be included with the **CAP**. Signed return receipts must be submitted to the UST Section, even if they are received at a later date. The signed receipts should be clearly labeled with the site name, incident number and county. Approval of a **CAP** will be postponed until thirty (30) days after these materials are received so that the DWM may consider comments submitted by interested persons. A public meeting may be held if there is a significant degree of public interest in the proposed activities. Within 30 days of receipt of **CAP** approval, the responsible party must notify the parties above of the Department's decision. Re-notification will be required if subsequent **CAPs** or **CAP** supplements are submitted that substantially change the proposed site actions.

11.0 Notice of Contaminated Site and Land Use Restrictions

North Carolina General Statute (NCGS) 143B-279.9 and 143B-279.10 require a Notice of Contaminated Site (NCS) to be filed with the register of deeds in the county where a release from a non-UST petroleum release (or a non-petroleum UST) has occurred when that release is not to be remediated to below “unrestricted use standards”, i.e., when the responsible party proposes a **CAP** under 2L.0106(k) or a plan to terminate active remediation under 2L .0106(m) which will not require cleanup to the level of the groundwater quality standards contained in 15A NCAC 2L .0202. A NCS sets out restrictions on the current and future use of real property contaminated by the release in order to protect public health, the environment, or users of the property. Such land-use restrictions may be placed on the properties contaminated by a non-UST petroleum release (or non-petroleum UST release site) if the following conditions are met:

- (1) the owners of properties contaminated by the release agree with the restrictions.
- (2) the Department approves the restrictions.
- (3) the responsible party implements an approved active remediation plan containing a NCS which lists the land-use restrictions and complies with the other requirements of G.S. 143B-279.10.

The NCS is not equivalent to the Notice of Residual Petroleum (NRP) used at low-risk petroleum UST releases sites to facilitate site closure; it cannot be used to facilitate no further action at a non-UST petroleum release (or non-petroleum UST release) site. The use of the NCS is limited specifically to its required function at the corrective action stage.

When a responsible party proposes a **CAP** under 2L .0106(k) or a **CAP** termination plan under 2L .0106(m), neither of which require that active remediation of groundwater continue until the levels of the standards in 15A NCAC 2L .0202 are reached, he/she must include documentation in the report which shows that a NCS has been filed by the owner(s) of contaminated property(ies) in the appropriate county’s register of deeds office. (Note: Contaminated soil and free product must have been removed or controlled pursuant to NCAC 2L .0106(f) prior to submittal of the **CAP** so that only groundwater contamination is an issue.)

To obtain approval for the **CAP** under 2L .0106(k) or the **CAP** termination plan under 2L .0106 (m), the RP must insure that the following sequence of actions, which requires the voluntary participation of the owner(s) of property(ies) contaminated by the release, is performed prior to the submittal of the k-**CAP** or m-plan to the UST Section:

- (1) The responsible party must submit a list of land-use restrictions to the Department for approval and for modification or addition of restrictions, if necessary.
- (2) The responsible party then must request each site owner having soil and/or groundwater contamination on or under their property to:
 - (a) submit a NCS for their property (inclusive of multiple plots or parcels) which lists the approved land-use restrictions (item#1) to the Department for the UST Section regional supervisor to examine for accuracy and completeness and then to sign with notarization;

- (b) file at the appropriate county's register of deeds office; and
 - (c) provide the RP with proof of filing (book and page number of NCS) and a copy of the filed NCS to include in the **CAP**.
- (3) The responsible party next must incorporate the copy of the filed NCS (with the list of land-use restrictions) in the **CAP** and submit the k-**CAP** (or m-plan) to the Department for review.

If these actions are not performed as described, then the **CAP** under 2L .0106(k) or the termination plan under 2L .0106(m) cannot be approved by the Department, and the responsible party instead will have to prepare and submit a **CAP** under 2L .0106(j) which requires remediation of soil and/or groundwater to unrestricted standards or, if appropriate, a **CAP** under 2L .0106(l), which allows natural attenuation to unrestricted standards.

If the actions are performed satisfactorily and the **CAP** under 2L .0106(k) or **CAP** termination plan under 2L .0106(m) is approved by the Department, then each contaminated property becomes subject to the restrictions in the NCS, and each property owner becomes subject to the following requirements:

- (1) The property owner (or other person responsible for the property) must enforce the approved land-use restrictions.
- (2) When a site subject to land-use restrictions is sold, leased, conveyed, or transferred, the deed must contain in the description section a statement that the site is contaminated and a reference (book and page number) to the recordation of the NCS.

The UST Section's Central Office Corrective Action Branch may be contacted at (919) 707-8171 for specific guidance related to preparing and filing a NCS, land-use restrictions, or deed recordation.

12.0 Sampling and Analysis Guidance

This section presents guidance on field screening, sampling and laboratory analysis for the assessment and corrective action stages. Analysis of soil and groundwater samples collected in order to investigate, assess and monitor the concentration of contaminants related to the release must be performed using approved analytical methods to provide reliable results. If proper sampling and QA/QC protocols are not followed, the DWM will not accept the analytical results.

Laboratories used must be NC DWQ certified to run the approved laboratory analytical methods. The NC DWQ Laboratory Certification Program maintains a list of certified commercial laboratories. The list includes laboratory contact information and the analytical methods that each laboratory is certified to perform. The list is available from the NC DWQ Chemistry Laboratory at 4405 Reedy Creek Road, Raleigh, NC 27607 or by calling (919) 733-3908. The Laboratory Certification Program has a list of laboratory contact information on their web page at <http://portal.ncdenr.org/web/wq/lab>. Tables 5 and 6 present the collection requirements for the specified analytical methods, however, the selected laboratory should be consulted for their specific requirements prior to sample collection.

Sample collection and analysis are discussed fully in the *Guidelines for Sampling*.

12.1 Use and Limitations of Field-Analytical Technologies

To establish the extent of contamination, soil and groundwater must be sampled and analyzed. Successful delineation of soil and groundwater contamination usually requires an iterative approach, in which intensive sampling with subsequent qualitative or semi-quantitative analysis using field-based technology to locate and identify contamination is followed up by more rigorous quantitative analysis of a smaller set of samples by approved laboratory methods. Acceptable field-analytical methods include visual and olfactory observations and the use of a portable photoionization detector (PID), a flame ionization detector (FID), or an ultraviolet fluorescence (UVF) instrument. When selected and utilized correctly, the field-based screening method should function to minimize the area and quantity of soil subjected to removal or treatment and/or to facilitate optimal placement of groundwater monitoring wells, thus minimizing and improving the quality and cost-effectiveness of assessment actions. Unfortunately, data obtained by most field-screening methods cannot be relied upon to indicate the presence, nature, and extent of contamination due to lack of specificity, accuracy, reproducibility, quality assurance/quality control, etc. For example, the use of a carefully calibrated PID unit for screening is acceptable only for qualitative assessment of soil for fresh gasoline. The use of a carefully calibrated FID unit for screening is acceptable only for qualitative assessment of soil for fresh gasoline or diesel and not for degraded or heavier fuels. The utilization of a semi-quantitative field technology, such as UVF, which allows on-site confirmation of the presence and lateral and vertical extent of soil and groundwater contamination for a wide range of specific petroleum products (i.e., not only gasoline and diesel, but also degraded fuels and waste oil), is preferable.

Field-screening data should be evaluated to determine where a minimal number of final soil or groundwater samples should be collected (or which previously collected, split samples should be selected) for analysis in the laboratory. Final determination of soil and groundwater contamination must be made by the laboratory analytical methods as specified in Tables 3 and 4.

12.2 Sampling and Analysis for Different Phases of Release Response, Abatement, Assessment, and Corrective Action

This section presents the specifications for collection and analysis of samples during assessment and correction action. The quantities, locations, and methods of collection and analysis are specified for sampling during each phase of action.

The appropriate number and location of samples and the appropriate analytical methods may vary from those specified by this guidance at some sites. At these sites, the licensed geologist or professional engineer should modify sampling or analysis accordingly; however, variations from the strict specifications for sampling and analysis presented in this document must be acceptable to the UST Section. The general directive is to collect the most informative but cost-efficient combination of samples to be analyzed by field-based screening methods and by approved analytical laboratory methods so that the number of samples analyzed by the latter is minimized.

12.3 Sampling

12.3.A Initial Response and Abatement Sampling

12.3.A.1 Notification of Discharge Report

This report informs the Department of the discovery of a release. The discovery of a release can involve actual observation of a release or evidence that a release has occurred. Evidence of a release can consist of various signs of soil or groundwater contamination from petroleum (e.g., staining, odor, product sheen, or sampling results) and is supported by the proximity of the contamination to a source of petroleum, such as an AST system or a spill. Submittal of the report (by telephone, electronic mail, or other means) is required within 24 hours of discovery of release and must not be delayed in order to include analytical results.

However, the responsible party may elect to collect and analyze samples to verify that a release soil or groundwater has occurred and is required to do so, if the volume of petroleum that is discharged is greater than or equal to 25 gallons (etc.), in order to confirm that the release to soil has been cleaned up and has not impacted groundwater. Field-based qualitative or, preferably, semi-quantitative analytical methods should be used intensively to screen for contamination. However, final sampling and analysis to confirm that soil is not contaminated must be conducted using the approved methods in Table 3. The responsible party may use the TPH methods for this first round of soil sampling. Approved methods for analysis of groundwater samples are listed in Table 4.

12.3.A.2 Initial Assessment Report

The function of this report is to present the results of the initial response and abatement actions, including all field and laboratory analytical data produced in the preliminary stages of assessment and following over-excavation of contaminated soil. Approved analytical methods for soil samples from preliminary investigations and over-excavations are listed in Table 3. Approved analytical methods for

groundwater samples are listed in Table 4. Submittal of the report is required within 30 days of discovery of release.

12.3.A.3 Comprehensive Site Assessment Report

The primary function of the assessment required for this report is to delineate soil and groundwater contamination to the applicable standard limits (to the soil-to-groundwater MSCCs for soil and to the Title 15A 2L groundwater quality standards for groundwater). Although intensive assessment and delineation of soil contamination should be accomplished using field-based analytical methods, final confirmation of the vertical and horizontal extent of soil contamination should be determined by the methods stipulated in Table 3 for the comprehensive site assessment. Approved laboratory analytical methods for groundwater monitoring are specified in Table 4. Additional analytical methods may be required, with the approval of the incident manager, to provide information relevant to natural attenuation or modeling. The use of field-based, semi-quantitative methods of groundwater analysis to determine the optimal location for monitoring well installation is strongly recommended. Submittal of the **CSA Report** is required within 90 days of the date of the notice requesting the report.

12.3.A.4 Corrective Action Reports

12.3.A.4.a Corrective Action Plan

This plan describes proposed actions to cleanup soil and groundwater contamination caused by a release. The plan must include a sampling and analysis plan to monitor the progress of remedial action or natural attenuation; must provide a detailed schedule for all remedial activities to be performed until site closure requirements are met; and must set performance milestones. Approved analytical methods for periodic soil monitoring are specified in Table 3. Approved analytical methods for groundwater monitoring are specified in Table 4. Submittal of this plan is required within 90 days of the date of the notice requesting the **CAP**.

12.3.A.4.b Monitoring Reports

These reports present periodic sampling and analysis results for groundwater and soil (when applicable). Plume migration, corrective action effectiveness, water table changes, and contaminant concentration changes are some of the items that should be addressed in monitoring reports. For the initial monitoring event, samples should undergo full analyses. For the periodic monitoring which follows, analysis may be limited, with the approval of the Department, to key constituents which are indicative of the progress of remediation and to the risk to human health and the environment. For a final monitoring event, samples again should undergo full analyses for the contaminants previously detected (equivalent to a final site closure sample set). Approved analytical methods for periodic soil monitoring are specified in Table 3. Approved analytical methods for groundwater monitoring are listed in Table 4. Submittal of this report is required by the end of the month following the month of the monitoring event.

12.3.A.4.c System Enhancement Recommendation Report

This report, which is used to propose a significant change or major enhancement to an existing remedial technology, must be based on results from periodic monitoring of soil and groundwater contamination and on remediation system monitoring. Approved analytical methods for periodic soil monitoring are specified in Table 3. Approved analytical methods for groundwater monitoring are listed in Table 4. Submittal date of this report is set by the Department.

12.3.A.4.d New Technology Cleanup Plan

This plan, which is used to propose replacement of existing remedial technology with a new technology, must be based on results from periodic monitoring of soil and groundwater contamination and on remediation system monitoring. Approved analytical methods for periodic soil monitoring are specified in Table 3. Approved analytical methods for groundwater monitoring are listed in Table 4. Submittal date of this plan is set by the Department.

12.3.A.4.e Site Closure Report

This report documents that the soil and groundwater have been remediated to applicable soil and groundwater cleanup levels (to the soil-to-groundwater MSCCs for soil and to the Title 15A NCAC 2L groundwater quality standards for groundwater) and requests a no further action determination from the Department. Approved analytical methods for final site closure soil sampling are specified in Table 3. Approved analytical methods for groundwater monitoring are listed in Table 4. Submittal date of this report is set by the Department.

13.0 Water Supply Wells

If a release of petroleum from a non-UST source has occurred, water supply wells (residential and public water supply wells) should be sampled by the responsible party to ensure that groundwater used for human consumption is not contaminated. Refer to the *Guidelines for Sampling* for sampling and analysis procedures and methods.

The responsible party must not use a water supply well as a substitute for a monitoring well for contaminant plume monitoring.

13.1 Sampling of Water Supply Wells

If a release of petroleum has occurred, the responsible party must first sample the wells which are closest to the source within a 500 foot radius. If the closest wells are impacted by the release, then the next closest wells should be sampled and so forth until contamination is no longer found.

If the sample results indicate the presence of contaminants (at or above the detection limit), the responsible party must immediately send the results to the UST Section regional supervisor, the well owner, and all well users in order to mitigate the hazard of exposure to contaminants. The responsible party should send the results to the water supply well owner and all users even if analysis shows no contamination. The Department will evaluate the health risk of the water supply by comparing the contaminant concentration levels to acceptable concentration levels and will make a recommendation for safe use of the water supply to the water supply well owner and all users.

If analysis of samples indicates contamination, subsequent samples should be collected at the frequency advised by the Department.

13.2 Provision of Alternate Water

Alternate water must be provided by the responsible party to the users of water supply wells contaminated by a petroleum release.

Pursuant to 15A NCAC 2L .0106(b), any person conducting or controlling an activity which results in the discharge of a waste or hazardous substance or oil to the groundwaters of the State, or in proximity thereto, shall take immediate action to terminate and control the discharge, mitigate any hazards resulting from exposure to the pollutants, and notify the Department of the discharge. This action includes providing alternate water to households with contaminated water supplies. The responsible party must supply alternate water, if the Department, on evaluation of the health risk of the water supply, determines that water from the well is not safe for specific uses. Depending on the level of contamination present, bottled water, a point-of-entry carbon filtration system, connection to municipal water supplies, or other alternatives may be required. The responsible party should coordinate the provision of alternate water with the appropriate regional office.

If a permanent water supply cannot be provided immediately, a temporary source of alternate water must be supplied.

If the responsible party does not immediately provide alternate water to the well owners, the UST Section must be notified so that UST Section staff may initiate the process of supplying alternate water for each affected household. The State must recover costs expended for such activities from the person(s) identified as the responsible party.

14.0 Disposal of Contaminated Soil and Groundwater

14.1 Disposal of Contaminated Soil

Pursuant to 15A NCAC 2T .1502(4), soil is contaminated if analytical results from samples collected during the assessment or from the stockpile show the presence of contaminants at concentrations above the method detection limit (MDL). Once contaminated soil is excavated, it is considered a waste and must be properly disposed of, even if the contaminant concentrations are below applicable cleanup levels. NC General Statute 143-215.1 requires that the storage, disposal, and/or *ex situ* treatment of contaminated soil be permitted by the Department of Environment and Natural Resources. If excavated petroleum contaminated soil is to be treated on site, a soil permit from the DWM is required. If soil is to be hauled off site for treatment/disposal, then disposal manifests are required. Comprehensive guidance on the disposal of contaminated soil is presented in the *Guidelines for Ex Situ Petroleum Contaminated Soil Remediation*, most recent version.

Soil excavations must be filled with clean compacted fill that is similar to the native soil removed from the excavation. If gravel or some other permeable material is to be used, then a low-permeability fill material must be used to cap the excavation. Excavations cannot be back-filled with contaminated soil.

14.1.A Temporary Storage or Limited Land Application of Petroleum Contaminated Soil

On-site temporary storage must be for a period less than 45 days. Authorization for off-site temporary storage requires the approval (through issuance of a "Certificate of Approval for Disposal" (UST-71)) of the appropriate regional office. Approval will not be given by the Department, unless:

- (a) There is a health-based emergency, fire or explosion hazard, or
- (b) The responsible party has an approved soil permit prior to excavating the soil.

Unauthorized storage of soil or storage in excess of 45 days may be considered a violation of GS 143-215.1.

For temporary storage, contaminated soil must be placed on 10 mils-thick plastic sheeting and bermed. The contaminated soil must be covered by 10 mils-thick (at a minimum) plastic sheeting to prevent runoff and the generation of leachate. Any surface water runoff and/or leachate from the contaminated soil storage area must be collected and properly disposed to prevent leachate migration.

Under 15A NCAC 2T, subject to approval (through issuance of a "Certificate of Approval for Disposal" (UST-71)) by the regional office, the land application of less than or equal to 50 cubic yards of petroleum contaminated soils or 50 to 100 cubic yards of petroleum contaminated soils at a minimum rate application is deemed permitted in accordance with NC General Statute 143-215.1(b), and no individual DWM permit is required.

NOTE: Applications for soil permits for petroleum contaminated soil originating from UST releases should be submitted to the UST Section regional office.

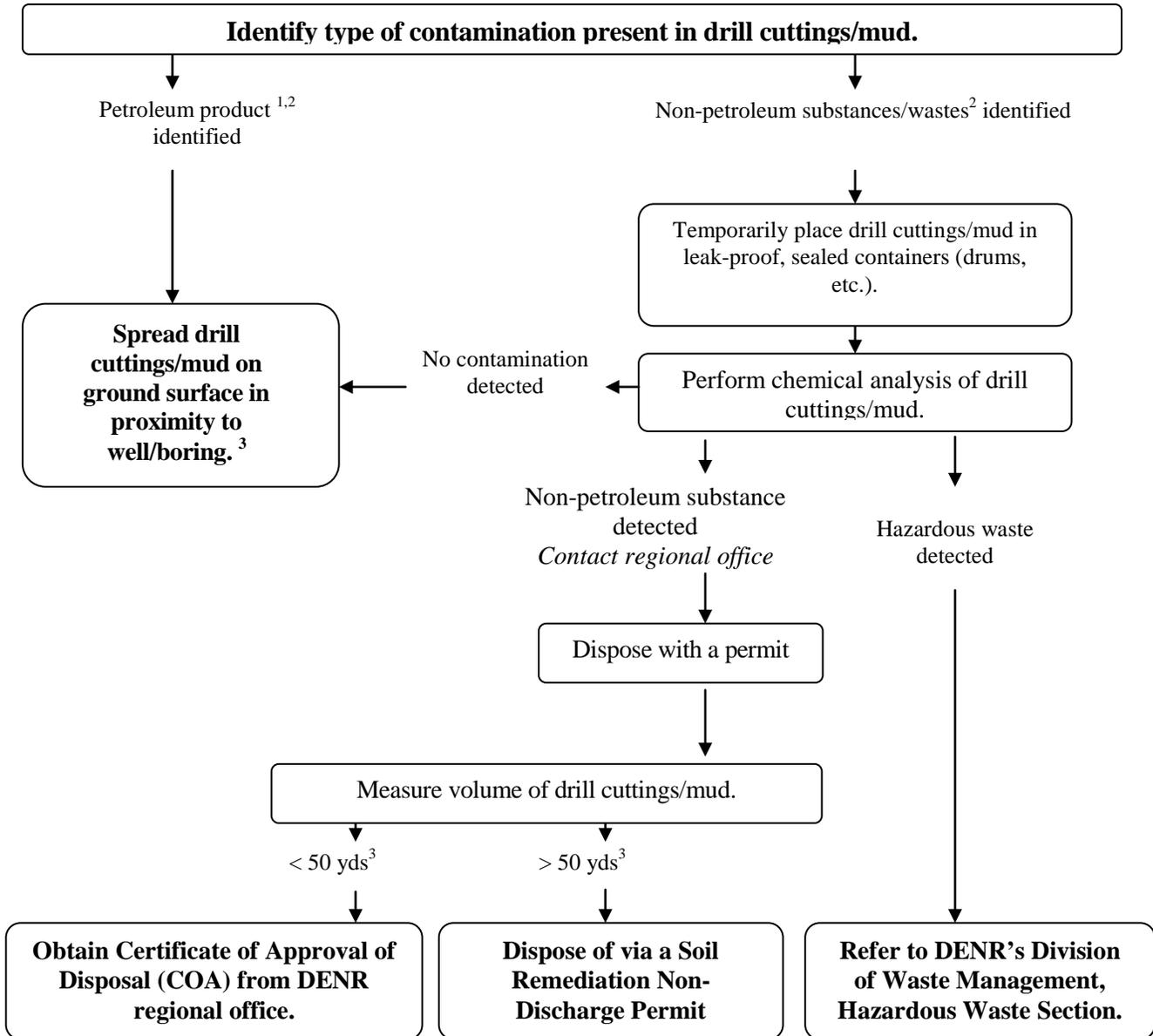
14.1.B Disposal of Drill Cuttings and Mud

Drill cuttings and mud produced during field environmental investigation activities such as borehole and well construction are deemed permitted under 15A NCAC 2T .0113 [Waste Not Discharged to Surface Waters - Permitting by Regulation], in accordance with NC General Statute 143-215.1(b). Thus, no individual or general permit must be issued by DWM for the construction or operation of disposal systems for drill cuttings or mud, provided that the system does not result in violations of groundwater or surface water standards, there is no direct discharge to surface waters, and all criteria required for the specific system are met.

However, if the drill cuttings/mud have been contaminated by hazardous waste constituents, the DWM, Hazardous Waste Section, tel. (919) 707-8200, must be contacted to determine the regulatory status of the contaminated material.

The flow diagram in Figure 3 presents detailed guidance for the proper disposal of drill cuttings and mud.

Figure 3 Disposal of Drill Cuttings and Mud
Resulting from Environmental Investigations



¹ “Petroleum product” means all petroleum products as defined by G.S. 143-215.94A(7) and includes motor gasoline, aviation gasoline, gasohol, jet fuels, kerosene, diesel fuel, fuel oils (#1-#6), and motor oils (new and used).

² If the soil contaminants include both petroleum products and non-petroleum products/hazardous substances, then the disposal guidance for non-petroleum products/hazardous substances should be followed.

³ If the well/boring is located in a paved area (asphalt, concrete, etc.); spread drill cuttings/mud on the nearest open ground surface within site property boundaries.

14.2 Disposal of Groundwater

If groundwater is withdrawn from the ground, it must be disposed of according to 15A NCAC 2T and NCGS 143-215.1. Contaminated or treated groundwater is considered wastewater and must be disposed of with the appropriate permits, which are issued by NCDENR, DWQ. However, some types of waste groundwater (purge water, well water from development/construction, condensate/water withdrawn by vapor extraction systems, or water withdrawn during aquifer tests) are deemed permitted.

14.2.A Remediation Treatment System Water

Remediation treatment system water (including any waters produced that have contact with any contaminated materials) is considered a wastewater and must be disposed of or treated under a permit. The permit may be an on-site or off-site permit.

The permits and/or authorizations required for commonly-used groundwater treatment methods are discussed in Appendix C, Required Permits. In addition, permit or prior approval requirements are tabulated by groundwater remediation method in Appendix C, Table C-1.

The disposal by pumping and hauling of condensate and groundwater drawn from the ground by the operation of vapor extraction systems is deemed permitted under 15A NCAC 2T .0203, Disposal of Industrial Wastewater, as discussed below in Section 14.2.C.

14.2.B Purge Water and Well Water from Construction Activities

Disposal of purge water from groundwater monitoring wells and of wastewater from the development of wells or from other construction activities including directional boring (but not including dewatering activities) is deemed permitted under 15A NCAC 2T .0113 [Waste Not Discharged to Surface Waters –General Requirements - Permitting by Regulation], in accordance with NC General Statute 143-215.1(b). Thus, no individual or general permit must be issued by NC DENR, DWQ, for the construction or operation of disposal systems for purge water or well construction water, provided that the system does not result in violations of groundwater or surface water standards, there is no direct discharge to surface waters, and all criteria required for the specific system are met. The water may be discharged onto the ground in proximity to the well in a manner that will preclude runoff if the aquifer is contaminated with equal or higher concentrations than the wastewater; if the aquifer is less contaminated than the wastewater, then the wastewater must be containerized and transported to a permissible disposal facility.

However, if the purged well water may be contaminated by hazardous waste constituents, the contaminated water should be stored on the site in sealed containers, analyzed to confirm that hazardous waste constituents exceed the groundwater quality standards in 15A NCAC 2L .0202, and, if exceedances are confirmed, the DWM, Hazardous Waste Section, contacted at (919) 707-8200 to determine the regulatory status of the contaminated material and the protocol for disposal.

The flow diagram in Figure 4, Disposal of Groundwater, presents detailed guidance for the proper disposal of groundwater from well purging or well construction.

14.2.C Aquifer Test Water and Vapor Extraction System Water

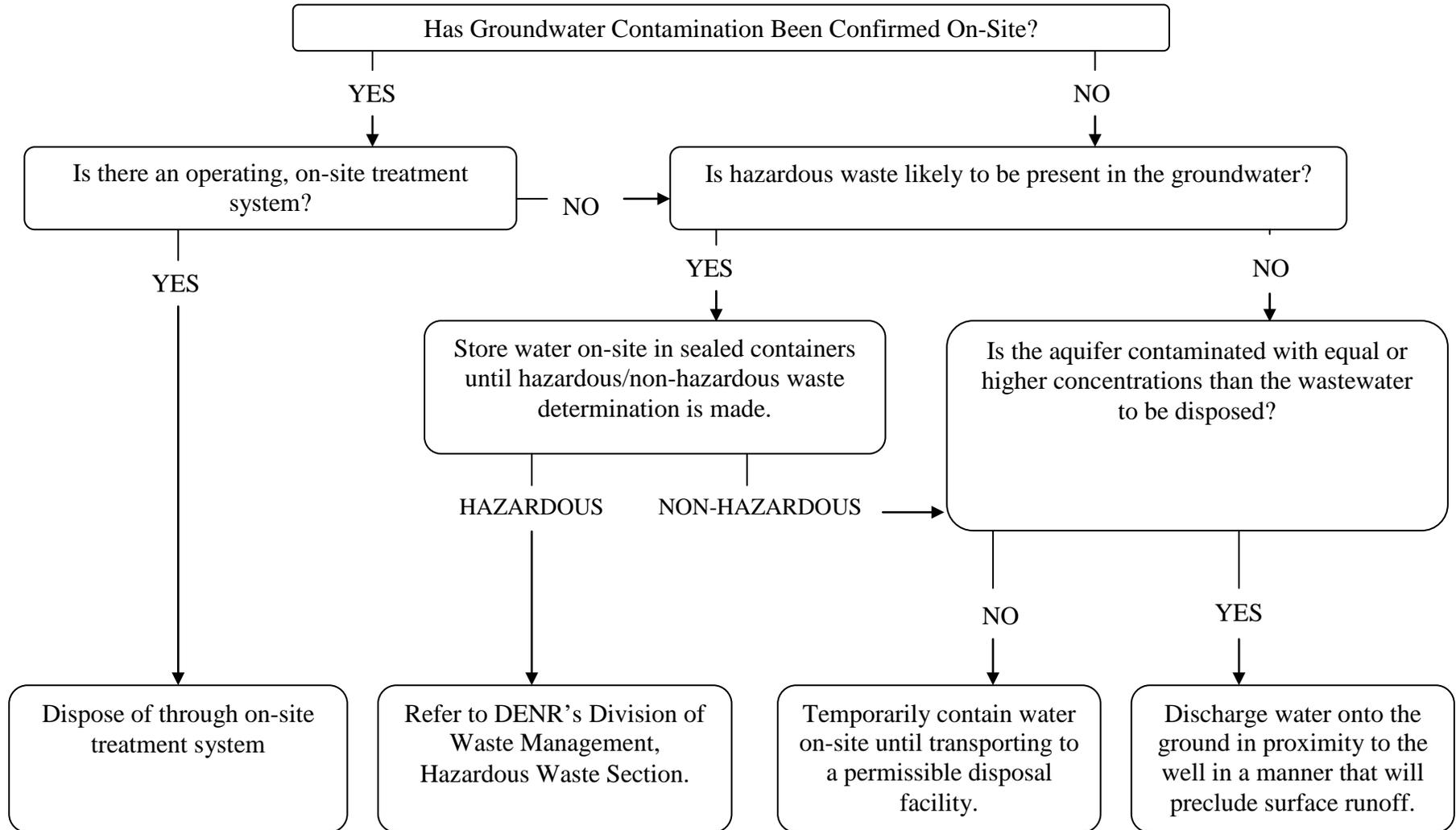
Disposal by pumping and hauling of groundwater withdrawn from the ground during aquifer pump tests and condensate/water withdrawn by vapor extraction systems, which may be considered industrial wastewater, is deemed permitted under 15A NCAC 2T .0203 [Waste Not Discharged to Surface Waters - Wastewater Pump and Haul Systems - Permitting by Regulation], in accordance with NC General Statute 143-215.1(b). Thus, no individual permit must be issued by NC DENR, DWQ, for the operation of “pump and haul” disposal systems for aquifer test water and vapor extraction water, provided that the system does not result in violations of groundwater or surface water standards, that there is no direct discharge to surface waters, that all criteria required for the specific system are met, that the appropriate regional office of the DWQ is notified, and that the other criteria of Paragraph .0203 are met. The wastewater must be containerized and transported to a permissible disposal facility.

However, if this wastewater may be contaminated by hazardous waste constituents, the contaminated water should be stored on the site in sealed containers, analyzed to confirm that it is hazardous waste and that hazardous waste constituents exceed the groundwater quality standards in 15A NCAC 2L .0202, and, if exceedances are confirmed, the DWM, Hazardous Waste Section, contacted at (919) 707-8200 to determine the regulatory status of the contaminated material and the protocol for disposal.

14.2.D Tank Pit or Excavation Water

If a tank pit or an excavation at a contaminated site requires de-watering, the contaminated water must be properly treated to meet discharge levels allowed in a POTW or NPDES permit or must be properly disposed of at a permitted facility.

Figure 4 Disposal of Groundwater
 Permitted and Deemed-Permitted Wastewater Disposal Activities
 (Exclusive of Aquifer Test Water and Vapor Extraction System Water)



15.0 References

NC DENR. *Guidelines for Assessment and Corrective Action for UST Releases(current version)*. Available on the Internet at <http://portal.ncdenr.org/web/wm/ust>.

NC DENR. *Guidelines for Ex Situ Petroleum Contaminated Soil Remediation (current version)*. Available on the Internet at <http://portal.ncdenr.org/web/wm/ust>.

NC DENR. *Guidelines for Sampling (current version)*. Available on the Internet at <http://portal.ncdenr.org/web/wm/ust>.

NC DENR. *Guidelines for Site Checks, Tank Closure, and Initial Response and Abatement for UST Releases(current version)*. Available on the Internet at <http://portal.ncdenr.org/web/wm/ust>.