Inactive Hazardous Sites Branch

Guidelines for Assessment and Cleanup of Contaminated Sites

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Department of Environmental Quality
Division of Waste Management
Superfund Section
Inactive Hazardous Sites Branch

Physical Address:	217 West Jones Street Raleigh, North Carolina 27603
Mailing Address:	1646 Mail Service Center Raleigh, North Carolina 27699-1646
Telephone:	(919) 707-8200

Inactive Hazardous Sites Program website:
https://deq.nc.gov/about/divisions/waste-management/superfund-section/inactive-hazardous-sites-program

Registered Environmental Consultant Program website:
https://deq.nc.gov/about/divisions/waste-management/superfund-section/registered-environment-consultant-program

Updates from January 2020 Version:

1. Section 3.1.2. Added the option of using a twenty-times method for determining leachability of soil.
2. Sections 3.5 and 3.6. Separated into unique sections the use of naturally background levels and practical quantitation limits, respectively, as remedial goals.
3. Updated REC rule references throughout according to the readopted rules effective July 1, 2020.
4. Appendix A. Updated the REC Program document certification requirements according to the readopted rules effective July 1, 2020.
5. Appendix B. Added information pertaining to the analysis of 1,4-Dioxane.
6. Appendix C. Updated the contact information for identifying sensitive environments.

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1.0 General Information

1.1 Statutory Authority and Jurisdiction

Links to Program information:

Inactive Hazardous Sites Program

REC Program

Inactive Hazardous Sites Statutes and Rules

The Inactive Hazardous Sites Response Act of 1987 (N.C.G.S. 130A-310 *et. Seq*) was established by the North Carolina General Assembly to address releases to the environment of hazardous substances, as defined in CERCLA/SARA. Parties responsible under law for the releases must assess and clean up these contaminated sites. The Inactive Hazardous Sites Branch (Branch) is responsible for oversight and approval of the assessment and remediation activities conducted by remediating parties and their environmental consultants. These sites include historical and recent accidental releases of hazardous substances and contamination in, or threatening, groundwater. Excluded are discharges associated with DEQ permits, hazardous waste dumping, normal application of agricultural chemicals, federal remediation sites, petroleum releases and sites undergoing remediation by the State's Drycleaning Solvent Cleanup Act (DSCA) Program. The Branch oversees remedial actions, conducts necessary enforcement at high-risk (highest priority) sites, and conducts the work itself at orphaned sites when state funds are available.

The Inactive Hazardous Sites Response Act provides site owners, operators, or responsible parties an opportunity to voluntarily clean up inactive hazardous substance or waste disposal sites with Branch approval. The Branch must dedicate its staff resources toward overseeing assessment and remedial actions at the sites that pose the highest risk to human health and the environment. At sites not designated as the Branch's highest priorities, a party may still proceed with an approved voluntary cleanup by working through the Branch's privatized oversight program known as the Registered Environmental Consultant (REC) Program. Voluntary remediators will be notified by the Branch whether their site is eligible for the REC Program.

1.2 The Registered Environmental Consultant Program

In this privatized program, the remediating party hires an REC to both perform and certify a voluntary cleanup in place of state oversight. A list of approved RECs may be found on the REC Program website. Rules for implementing the REC Program (15A NCAC 13C .0300) specify the minimum qualification requirements for RECs and their Registered Site Managers (RSMs) and the administrative and technical requirements for conducting voluntary remedial actions in the program. All RSMs must familiarize themselves with the REC rules and this guidance to ensure remedial action regulatory compliance. Administrative requirements include REC certification of required document content and of work phase completion, meeting work-phase completion milestones (see Section 1.8) and submitting documents for the public record.

The REC and its RSMs shall recognize their primary obligation is to protect public health, safety, and welfare and the environment in the performance of professional services as an REC and to comply with the standards of professional responsibility specified in REC Rule 15A NCAC 13C .0305.

The Branch performs audits of the REC's work for compliance with the REC Rules and protection of public health. The audits also help the Branch improve procedures, guidance documents, and training for RECs.

Only Branch-approved RSMs may manage site cleanups and make certifications on behalf of the REC. The RSM is responsible for the day-to-day oversight of the project. This responsibility may not be delegated to anyone else. Inquiries to the Branch from the REC should come from the RSM. When an REC learns that an RSM intends to change employment, the REC must notify the Branch within 30-days.

Where there are rule violations, the Branch may conduct informant actions. The Branch may also revoke its approval of REC oversight of a voluntary remedial action and assume direct oversight if the voluntary remedial action is not being properly implemented.

Additional resources to help with REC Program compliance can be found on the REC Program website. The website includes links to the REC Program rules, certification forms, document content checklists, which can be used as a tool to guide the RSM through the REC Program planning and documentation requirements and links to other guidance.

The following deadlines are specified in the REC Program Rules based on the effective date of the administrative agreement:

- Remedial investigation completion – 3 years
- Non-groundwater (soil, sediment and surface water) remedial action completion – 8 years
- Groundwater remedial action initiation – 2 years from completion of the remedial investigation. Initiation is considered to be on the date the REC certifies the remedial action plan (RAP) for monitored natural attenuation remedies and on the date remedial equipment has been installed and initial physical or chemical treatment actions have begun for active remedies.

Remedial action progress reports shall be submitted quarterly until one year after the construction of the remedy is complete. After the first year of progress reporting or if the remedy includes no construction component, remedial action progress reports shall be submitted annually until remedial action is complete.

1.3 New Site Notification

The Inactive Hazardous Sites Response Act (N.C.G.S. 130A-310.1(b)) requires that within 90 days of the date on which any owner, operator or responsible party knows or should know of the existence of an inactive hazardous substance or waste disposal site, the owner, operator or responsible party shall submit to the Branch all site data that is known or readily available to the owner, operator, or responsible party. A Site Notification Form and Instructions are available on the IHSB website.

The Branch must be notified within 24 hours if contamination is detected beyond the site's property boundary or in indoor air, or if a receptor is threatened.

1.4 Procedures for Initiating an Approved Remedial Action

Remediating parties wishing to receive approval for a voluntary cleanup should complete a Site Conditions Questionnaire (Questionnaire) with the aid of their environmental consultant. Branch staff will review the Questionnaire and evaluate the site's risk relative to other sites currently being managed to determine whether the remediation should be directly overseen by Branch staff or by a REC hired by the remediator.

To participate in a voluntary cleanup program (Branch-staff supervised or REC Program), the remediating party must sign an Administrative Agreement and pay a fee as discussed in the following section. The Administrative Agreement will specify the requirements for site cleanups, including, but not limited to, the work to be performed, reporting requirements, and document certification requirements.

The importance of retaining a qualified and experienced environmental consultant cannot be overemphasized. Any work that would constitute the "practice of engineering" as defined by G.S. 89C shall be performed under the responsible charge of a professional engineer registered in the state of North Carolina. Any work that would constitute the "public practice of geology" as defined by G.S. 89E shall be performed under the responsible charge of a geologist licensed in the state of North Carolina. Select documents, or portions thereof may require the seal and signature of a licensed professional (e.g., a registered engineer for engineering design work and/or a licensed geologist for geologic evaluations).

1.5 Voluntary Remedial Action Fees

To participate in a voluntary cleanup program, the remediating party must pay a fee. The one-time fee for remedial action oversight by the Branch is $1,000.

The initial REC Program fee is currently $3,000 to offset the cost of the Branch's administration and auditing of the REC Program. Thereafter, an annual fee is adjusted each year to reflect actual cost of the audit program and availability of remaining funds. The annual fee is usually lower than the initial fee. The fee to participate in either program must be paid to the Branch before an Administrative Agreement will be executed.

1.6 Quick Clean Procedures

An option exists to complete cleanup of mildly contaminated properties where soil is the only medium affected, the contamination is limited in extent and/or concentration, and the remedy consists of land-use restrictions. Refer to the Quick Clean Procedures on the Branch's website.

1.7 Independent Remedial Action

Parties that do not wish to perform an approved voluntary cleanup are not prohibited from performing remedial activities independently. Once the site is remediated to *unrestricted use* cleanup levels for all contaminated media, a remediating party can submit a no-further-action

review request to the Branch. Refer to the No Further Actions web page on the Branch's website for procedures and fees.

Independent cleanups are performed without Branch or REC oversight and approval and are not eligible for the cap on remedial expenses set out in the statute. Risk-based cleanups of soil and/or groundwater that rely on institutional controls as part of the remedy cannot be performed independently so must be performed under a signed Administrative Agreement.

1.8 Document Submittal and File Access

Sites with Branch oversight (non-REC) will need to submit both paper and electronic copies of work plans and reports. All REC site work must be submitted electronically unless otherwise requested by Branch staff. All electronic documents should be submitted as one PDF file that includes any cover letters, appendices, and signed and notarized certifications. Documents may be e-mailed, but if they are large in size then a file-sharing system may be used.

Work plans and reports should be submitted to the Branch as follows:

- Non-REC – In accordance with the schedule in the administration agreement for voluntary cleanup
- REC – Within 30 days of completion (RSM certification)

All Branch files are stored electronically in an online document management system which can be accessed remotely. Instructions for accessing the system can be found here: http://deq.nc.gov/about/divisions/waste-management/superfund-section/sf-file-records.

2.0 Remedial Investigation

At any time during remedial activities, the Branch must be notified within 24-hours of discovery, or as soon as feasible, of the following:

1. Contamination that has migrated beyond the source property
2. Imminent Hazards
   a. uncontrolled access by children to the contaminated media
   b. contamination detected in water supply wells, or
   c. site contaminant vapors detected within structures
3. Threat to a sensitive environment

The notification can be by phone, email, or in a report. If notification is written, it should be expressed clearly up-front and not in the body of a document. Any delays should be shown to be unavoidable.

The remedial investigation (RI) involves planning the investigation, gathering information and analytical data, and reporting the findings in a RI report. At least two phases of work are generally necessary to complete the investigation. The purpose of the first phase is to identify all known and suspected releases of hazardous substances to the environment, characterize the nature of such releases, and collect sufficient sampling data to compile a list of contaminants of concern. Additional phases delineate the extent of contamination in all media, and evaluate the potential for structural vapor intrusion when necessary.

For REC sites, a detailed, certified progress update discussing site activities and progress toward meeting the deadlines set out in 15A NCAC 13C.0302(h) must be submitted annually.

2.1 Remedial Investigation Work Plans

The initial RI work plan should present all available information on disposal history, regulatory history and site characteristics, and outline methods for gathering data to identify contaminant source areas and characterize the waste and extent of contaminants in soils, ground water, surface water and other contaminated media. The plan should also provide for collecting data to understand the geology and hydrogeology of the area. This data is then used to develop a site conceptual model that allows design of an effective remedy. A work plan should be prepared for each work phase. The number of phases depends on the size and complexity of the contaminated site. All documents must be properly certified according to the requirements in the Administrative Agreement (for work conducted under state oversight) or according to the REC rules (for work conducted under REC oversight). See Appendix A for the document certification requirements.

2.1.1 Identification of Contaminants and Areas of Concern (First Phase) Work Plan

In this initial phase of work, all areas known or suspected of being contaminated should be investigated. Known or suspected contaminated areas are those where there is some indication of a release based on the following:

If part or all of the remedial investigation was completed prior to the execution of an Administrative Agreement for voluntary cleanup, a summary of the work and the results of the remedial investigation should be prepared. Work does not have to be repeated unless the Branch or the consultant finds QA/QC issues or data gaps in the previous work. The summary should list all pre-existing RI work plans and reports for the site and ensure that they have been provided to the Branch.

1. Existing laboratory data;
2. Observable conditions indicative of contamination, such as staining, odors, or evidence of damage to, or leakage from, a storage facility or vessel;
3. Records of on-site spills or disposal; and
4. Other evidence actually known to the environmental consultant or the remediating party.

The following information should be documented in a RI work plan to guide sample collection and analyses according to the site's setting and environmental history.

1. Site location information including street address, longitude and latitude, and site and surrounding property land use;
2. A summary of the nature of all identified on-site hazardous substance releases, including disposal or spills;
3. Through a discussion with employees and review of records, a summary of all management practices employed at the site for hazardous wastes and wastes that may have contained hazardous substances including: a list of types and amounts of waste generated, treatment and storage methods, and ultimate disposition of wastes; a description of the facility's past and current RCRA status; and the location and condition of

all identified vessels currently or previously used to store any chemical products, hazardous substances or wastes;

4. United States Geological Survey topographic maps sufficient to display topography within a one-mile radius of the site;
5. An accurate and detailed site map including: scale, north arrow, locations of property boundaries, buildings, structures, perennial and non-perennial surface water features, drainage ditches, dense vegetation, known and suspected spill or disposal areas, sumps chemical or waste, storage vessels, existing on-site wells, septic systems, and storm water conduit and ponds;
6. A description of local geologic and hydrogeologic conditions;
7. A chronological listing of all previous owners and each period of ownership since the property was originally developed from pristine land;
8. Operational history with aerial photographs and Sanborn Fire Insurance maps to support land-use history as needed;
9. A list of all hazardous substances which have been used or stored at the site, and approximate amounts and dates of use or storage as revealed by available written documentation and interviews with a representative number of former and current employees or occupants possessing relevant information;
10. Site environmental permit history, including copies of all federal, state, and local environmental permits, past and present, issued to the remediating party or within its custody or control;
11. A summary of all previous and ongoing environmental investigations and environmental regulatory involvement with the site, and copies of all associated reports and laboratory data in public records, or within the custody or control of the remediating party so the work does not have to be repeated;
12. Proposed procedures to evaluate the risk of contaminant migration into structures via the vapor pathway and to wells, springs, surface water supply intakes and to sensitive environments identified;
13. Intended procedures for characterizing site geologic and hydrogeologic conditions and identifying each contamination source as to each affected environmental medium, including any plan for special assessment such as a geophysical survey;
14. Intended field methods, locations, depths of, and justification for, all sample collection points for all media sampled, including monitoring well locations and anticipated screened intervals;
15. Proposed field and laboratory procedures for quality assurance/quality control;
16. Proposed analytical parameters and analytical methods for all samples (see Appendix B);
17. Equipment and personnel decontamination procedures;
18. A description of measures that assure the health and safety of nearby residential and business communities by demonstrating that they will not be adversely affected by activities related to the remedial investigation;

19. Signatures and seals from the appropriate professionals, if necessary (e.g., licensed geologist, registered professional engineer, etc.). A single document may require the signature and seal of more than one professional;
20. Additional appropriate document certification statements or forms (See Appendix A); and
21. A schedule for completing site activities and submission of reports.

> The REC Program rules do not authorize an RSM to practice outside his/her area of professional expertise in any phase of work. If an RSM has relied on the advice of other professionals with relevant expertise, the document must be signed and sealed by the appropriate professionals.

2.1.2 Delineation of Extent of Contamination (Subsequent RI Work Phase)

> Even if the site property is, and/or will be, designated as industrial-use only, the extent of contamination must be delineated to the unrestricted-use goals to identify where land use controls must be placed.

Upon completion of the initial phase of the remedial investigation, the contaminants of concern for the site should be known. Subsequent phases of, and work plans for, the remedial investigation are generally designed to (i) delineate the lateral and vertical extent of contamination in each area of concern for all contaminated media (soil, groundwater, sediment, surface water, and vapor), (ii) identify potential exposure pathways and receptors that may currently be, or may become, exposed to the contamination, (iii) collect sufficient sampling data to support a cleanup-level determination, and (iv) characterize site conditions sufficiently to conduct a feasibility study of remedial alternatives and to support a proposed remedy. Appropriate document certification statements or forms (see Appendix A) should be included in all RI work plans.

The sampling and analysis procedures for delineating the extent of contamination should follow the specifications in Appendix B. The unrestricted-use remediation goals referenced in this document (See Chapter 3.0) *must* be used as delineation endpoints for soil, groundwater, and surface water during the remedial investigation. However, at some sites, local natural background concentrations (metals only) and anthropogenic background concentrations (PAHs, PCB and/or Dioxins) or sample reporting limits (using the analytical methods specified in Section B.6.12) may serve as delineation endpoints, provided that the laboratory's reporting limits are not elevated more than 10 times the laboratory's MDLs, and/or published average MDLs for the particular method/analyte.

Information contained in prior reports submitted to DEQ may be summarized or referenced. Any data or reports not already provided to DEQ should be attached. The following information should be included in subsequent RI work phase work plans:

1. Items 14-21 from Section 2.1.1.
2. An inventory and map of all identifiable wells, springs, and surface-water intakes used as sources of potable water (this excludes all wells used solely for the purposes of monitoring groundwater quality) within 1,500 feet of the contaminant perimeter as

defined by 15A NCAC 02L standards for ground water, or, if the extent of contamination is not defined, within 1,500 feet of the property boundary. As the remedial investigation and remedial action proceeds, conditions may change. The potable water survey for a site should be updated approximately every three years or more frequently, depending on the site-specific situation, to determine whether any threats exist.

Note: This information is required unless documentation is available to demonstrate that groundwater is not and will not become contaminated from site sources.

3. A structural vapor intrusion evaluation if volatile organic compound contamination is located within 100 feet of an occupied or potentially occupied building. Refer to the DWM Vapor Intrusion Guidance document for procedures. The DEQ Risk Calculator should be used to evaluate structural vapor intrusion risk as groundwater, soil gas, and indoor air data are gathered.

4. An evaluation of the source property and adjacent properties for the existence of environmentally sensitive areas. For very large sites, identification of such areas should extend to a 1,500-foot radius of the contamination. A visual evaluation of the source property and all adjacent properties should be conducted to identify and document the existence of any of the areas listed below. In addition to a visual site reconnaissance, the state and federal agencies noted below should be contacted to identify sensitive, protected, or recreational areas. Associated contact information is listed in Appendix C.

   - Wetlands
   - Natural areas that could be attractive to terrestrial ecological receptors
   - Areas of stressed vegetation or stressed wildlife
   - Sensitive Areas Identified Under the National Estuary Program
   - Rare Species (state and federal Threatened and Endangered)
   - Sensitive Aquatic Habitat
   - Federal Land designated for the protection of Natural Ecosystems
   - State-Designated Areas for Protection or Maintenance of Aquatic Life
   - Terrestrial Areas Utilized for Breeding by Large or Dense Aggregations of Animals
   - Spawning Areas Critical for the Maintenance of Fish/Shellfish Species within River, Lake or Coastal Tidal Waters
   - Migratory Pathways and Feeding Areas Critical for Maintenance of Anadromous Fish Species within River Reaches or Areas in Lakes or Coastal Tidal Waters in which such Fish Spend Extended Periods of Time
   - Areas Important to Maintenance of Unique Natural Communities
   - National and State Historical Sites
   - Areas Identified Under Coastal Protection Legislation
   - Coastal Barriers or Units of a Coastal Barrier Resources System
   - Designated State Natural Areas
   - Federal or State Designated Wild and Scenic Rivers
   - Designated and Proposed Federal Wilderness and Natural Areas
   - National and State Preserves and Forests
   - National or State Wildlife Refuges
   - Marine Sanctuaries

- State Lands Designated for Wildlife or Game Management
- National and State Seashore, Lakeshore and River Recreational Areas
- National and State Parks or Monuments

Knowledge of the presence of any sensitive environments is necessary to determine if any special sampling (such as aquatic toxicity testing) is necessary for an ecological risk assessment and to plan remedial actions so as to avoid damage to these areas where possible. Whether active site remediation may do more harm to an ecosystem than leaving residual contamination in place should be considered. The Branch should be contacted for further instructions regarding conducting ecological screening evaluations and risk assessments. Procedures for conducting additional assessment can be described in a work plan.

Distance to known or potential threatened receptors should be reviewed as the remedial investigation proceeds. The primary receptors of concern include potable water supplies, structures within 100 feet of volatile contamination, surface waters, and sensitive ecological environments. However, contamination advancing toward neighboring properties should also be noted.

2.2 Remedial Investigation Reports

Following each phase of the remedial investigation, reports should be submitted to the Branch pursuant to the terms of the Administrative Agreement, the Remedial Investigation Request Letter, or the Remedial Investigation Order. The investigation reports should document the findings of the site investigation in sufficient detail to delineate the contamination in all media to unrestricted use levels or regional background levels, identify potential sensitive receptors, support the final cleanup-level determination, and assist with conducting a feasibility study of remedial alternatives. If a single investigative phase can complete contaminant delineation for a site, the report should state that it serves as a final RI report. Reports prepared by RECs should be clearly written and well-organized for the public to understand. Any special studies that may be conducted including an ecological evaluation, a vapor intrusion study, or a geophysical survey for buried material would be part of a remedial investigation and the findings should be included in the remedial investigation report.

If the remedial investigation is complete and no remedial goals have been exceeded for any of the media (i.e., soil, groundwater, sediment, surface water, vapor, etc.) such that remedial action is not necessary, a combined Remedial Investigation and Remedial Action Completion Report should be prepared.

RI reports should be organized in sections and at minimum, they should include the following information:

1. A narrative description of how the investigation was conducted, including a discussion of any variances from the approved work plan(s);
2. A description of groundwater monitoring well design and installation procedures, including drilling methods used, completed drilling logs, "as built" drawings of all

monitoring wells, well construction techniques and materials, geologic logs, and copies of all well installation permits;

3. A map, drawn to scale, showing all soil sample and monitoring well locations in relation to known disposal areas or other sources of contamination. Monitoring wells should be surveyed to a known benchmark and groundwater elevations to a known datum. Soil sample locations should be surveyed to a known benchmark or flagged with a secure marker until after the remedial action is completed;

   Note: As provided in G.S. 89C-2, it is unlawful for any person to practice land surveying in North Carolina, as defined in G.S. 89C, unless such person has been duly registered as a registered land surveyor.

4. A description of all field and laboratory quality control and quality assurance procedures followed during the remedial investigation (see Appendix B, Section B.9);

5. A description of procedures used to manage drill cuttings, purge water and decontamination water;

6. A summary of site geologic conditions, including a description of soils and vadose zone characteristics;

7. A description of site hydrogeologic conditions (if groundwater is, or may become, contaminated), including current uses of groundwater, notable aquifer characteristics, a water table elevation contour map with groundwater flow patterns depicted, and tabulated groundwater elevation data;

8. Tabulated analytical results for all sampling (including sampling dates and soil sampling depths) and copies of all laboratory reports including quality assurance/quality control documentation;

   Note: Where a GC/MS library search is conducted, a summary of the nature of any tentatively identified compounds (TICs) eliminated from further analyses and reporting should be provided in the report, including reasons for discounting the constituent as a site contaminant. Refer to Section B.6.1.1.2 in Appendix B for further information on evaluating TICs**.**

9. Where contaminants exceed cleanup levels, soil, groundwater, surface water and sediment contaminant delineation maps for each primary contaminant of concern, including scale and sampling points with contaminant concentrations;

10. If contaminant concentrations exceed unrestricted use remediation standards in soils or groundwater at depths greater than five feet below ground surface, cross sections including scale and sampling points with contaminant concentrations;

11. A description of procedures and the results of any special assessments such as geophysical surveys, soil gas surveys, test pit excavations, or if volatile contaminants are present at the site, structural vapor intrusion evaluations (please refer to the DWM Vapor Intrusion Guidance);

12. Results of the water supply and sensitive environment receptor survey outlined in section 2.1.1 of this guidance, if not provided in a previous document;

13. Color copies of site photographs, if collected, that provide documentation of the investigation results;
14. The signature and seal of licensed professionals (e.g., licensed geologist, registered professional engineer, etc., if such work is included). A single document may require the signature and seal of more than one professional; and
15. Appropriate certification statements or forms (see Appendix A).

3.0 Remediation Goals and Standards

Remediation goals and standards are established in a manner consistent with CERCLA/SARA and the National Contingency Plan, as required by N.C.G.S. 130A-310.3.

3.1 Soil Remediation Goals

Soil contamination must be remediated to (1) levels that are protective of human health through direct contact and (2) levels that do not leach to groundwater and cause exceedance of the North Carolina groundwater quality standards under 15A NCAC 02L or a site-specific standard for a risk-based cleanup per N.C.G.S. 130A 310.65 through 310.77. Preliminary Soil Remediation Goals (PSRGs) are provided as part of the Inactive Hazardous Site Guidance Documents on the Branch's website. Final soil remediation goals should be based on acceptable risk for the intended property use (restricted or unrestricted) and can be determined using the DEQ Risk Calculator available for download from the DEQ Risk-Based Remediation website.

3.1.1 Human-Health-Based Direct Contact Soil Remediation Goals

In addition to direct exposure to contaminated soils through dermal contact, ingestion and inhalation, the following conditions must be considered when determining the final cleanup levels for soils:

1. Could the property become agricultural (crops, livestock, etc.), with possible uptake of contaminants by plants and livestock?
2. Could surface waters, wetlands, or other sensitive ecological receptors be affected by contaminated soils?
3. Can soil contamination cause a structural vapor intrusion risk to future structures?

3.1.1.1 Unrestricted-Use Goals

The "human health-based" Preliminary Soil Remediation Goals (PSRGs) established for unrestricted (residential) land use considers both adult and child (1 to 6 years of age) exposure to contaminated soil. These residential or unrestricted use PSRGs or values based on cumulative risk are to be used when no limit on site use is desired.

3.1.1.2 Restricted Use Goals

Preliminary commercial/industrial contaminant remediation goals are available in the PSRG table and can be used as final remedial goals. Less conservative cleanup levels can also be based on cumulative risk for a non-residential property use and can be determined using the DEQ Risk Calculator. Any remedy that does not meet residential/unrestricted use will require the recordation of Branch- approved land use restrictions as part of the RAP. Engineered controls, such as permanent barriers, supported by land use restrictions may allow higher concentrations to remain in place. Note that the extent of contamination must be delineated using unrestricted use goals even if restricted use remediation goals are planned.

3.1.1.3 Averaging Soil Contaminant Concentrations

Average contaminant concentrations in soil may be used to compare with the health-based PSRGs for both unrestricted and restricted land use. However, averaging cannot be used to demonstrate that soil concentrations are protective of groundwater. Averaging should only be conducted in areas of consistent use and generally uniform release of contaminants (e.g., former waste lagoons, spray fields, orchards, etc.) All of the following conditions apply to the use of such averaging:

- Only sample points within 1/4-acre sectors may be averaged for comparison to unrestricted-use levels. For restricted industrial use (land use restrictions approved as part of the RAP), averaging over larger areas can be performed if the access and use across the area is consistent. Remote areas and areas of less frequent access may not be included in the industrial restricted-use averaging.
- No single sample point may exceed ten times the site-specific adjusted cleanup level for all contaminants except lead. For lead, no single sample point used in an average may exceed 1000 ppm for unrestricted-use and no more than three times the site-specific cleanup level for restricted-use.
- The quarter-acre zone may be a circle or a square or triangle of generally equal sides. One dimension of the zone's perimeter may not be disproportionately longer than another. An exception would be a greenway corridor.
- Samples must generally be evenly spaced over the zone of averaging.
- Only samples of the same vertical horizon may be averaged (0-6 inches for surface samples and no more than 5-foot vertical spread for subsurface samples.
- Only actual sample data may be used for all points included in the average and not published averages for background concentrations.
- The laboratory practical quantitation limit must be used for points where concentrations are at or below laboratory reporting limits. Sample data should not have elevated reporting limits (see Background Adjustments on the previous page).
- Composite sample results may be included in an average but must be weighted proportionally to the area they represent. For example, if one composite sample in an area represents ½ of the area and 5 others represent 1/10 of the area each, then the concentration of the first composite should be multiplied by 5, added to the sum of

the other concentrations and then divided by 10 to compute the average concentration.

- For characterizing soil concentrations over a 1/4-acre area, a sampling grid with 50-foot grid node spacing should be established. The average concentration for each compound within a 1/4-acre area is presumed to represent the entire 1/4-acre area. If the average concentration for any compound exceeds unrestricted-use remedial goals, the 1/4-acre area would require cleanup or land use restrictions. For very large areas (e.g., a 500-acre orchard), an alternative is to collect samples in multiple 1/4-acre sectors within the overall contaminated area that represent the range of environmental conditions present (i.e., various geologic and geographic conditions such as slope vs. valley, wetter vs. drier, etc.). Grids with a 50-foot node spacing should be established across these representative areas. The highest 1/4-acre average from all the areas tested would be presumed to reflect the overall area. This approach requires the area to be consistent in use and accessibility and requires land use restrictions as part of the remedy.
- For unique circumstances, contact the Inactive Hazardous Sites Branch for further guidance.

3.1.2 Protection of Groundwater Soil Remediation Goals

In addition to meeting health-based remediation goals, soil must be remediated to levels that protect groundwater. Soils that leach contaminants in excess of the groundwater remediation goals will require further remediation. Groundwater remediation goals are either the lower of the15A NCAC 02L standards or federal maximum contaminant levels (MCLs), or natural background concentrations for unrestricted groundwater use, or risk-based cleanup levels (for restricted groundwater use). Multiple methods are available to evaluate the leachability of contaminated soil.

1. The Branch provides Protection of Groundwater screening levels for individual contaminants in the PSRG table. These protection of groundwater soil screening levels may be used as final remedial goals, but the values are based on an equation with conservative assumptions and default values that do not fit most site conditions, so one of the other methods may be more useful.
2. Site-specific aquifer data (porosity, bulk density, and organic carbon content) can be used in place of the default values in the equation at the end of the PSRG table. Only the parameters noted should be modified and only site-specific data should be used. All calculations and data must be provided in the RI.
3. If groundwater data in the area of concern has been collected and shows that the contaminants do not exceed (1) the final and interim 15A NCAC 02L standards or are below quantitation limits for those contaminants without numeric standards and (2) the release occurred fifteen or more years ago, the protection of groundwater is considered to have been met. Note that quantitation limits may not exceed the standards or otherwise must be lowest achievable limits.

4. Collect and analyze soil samples in the areas of highest contaminant concentration using the Synthetic Precipitation Leaching Procedure (SPLP) or Toxicity Characterization Leaching Procedure (TCLP). TCLP is a procedure that uses organic acids to simulate typical landfill conditions. For this reason, SPLP may be a more appropriate procedure because it is more representative of leaching under natural rainfall conditions. If contaminant concentrations in the soil leachate exceed their respective groundwater remediation goals, those soils require remediation.
5. Determine a soil protection of groundwater remediation goal by plotting sample pairs of total and leachable (using SPLP or TCLP) concentrations and finding the total concentration that corresponds to a leachable concentration at the 15A NCAC 02L Standard. Several soil samples need to be collected from various locations within the area of concern representing the higher and lower concentrations.
6. If the soil contaminant concentrations (in mg/kg) for both metals and organics (totals analysis) do not exceed values of twenty times the corresponding groundwater remediation goals (in ug/L), then the leachability criterion is considered met. The 20 times multiplier represents the dilution of the soil sample during the SPLP and TCLP extraction.

3.2 Sediment Remediation Goals

For intermittent streams, the procedures that are used to establish remedial goals for soil should be used as described in Section 3.1. Remediation goals for sediment in perennial streams and other surface waters must meet all the following:

1. The health-based soil remediation goals listed in the PSRG table (or the upstream "background" concentrations if higher);
2. Levels that ensure contaminated sediment will not cause exceedance of the remediation goals for groundwater and surface water; and
3. Levels that ensure protection of aquatic receptors. Maximum sediment contaminant concentrations must be compared to USEPA Region 4 ecological risk screening levels for sediment located at http://www2.epa.gov/risk/region-4-ecological-risk-assessment-supplemental-guidance.

To demonstrate compliance with the Branch's preliminary sediment remediation goals for the protection of aquatic receptors, the laboratory must achieve sample quantitation limits less than or equal to the USEPA Ecological Screening Level. If this is not possible, it needs to be stated in the case narrative that the quantitation limits are the lowest that can be achieved using EPA-approved methods.

If site ecological screening levels for sediments are exceeded, the remediating party needs to contact the Branch with a request for the Branch to determine the need for further ecological evaluation. The request should provide the following information:

1. A topographic map with roads and surface water features clearly identified;

2. A map drawn to scale with locations of all sampling points;
3. A summary table containing maximum contaminant concentrations, upstream contaminant concentrations, USEPA aquatic screening levels and sample quantitation limits. All contaminant concentrations that exceed screening levels should be clearly identified and highlighted. Also, concentrations that have no screening level should be clearly identified and highlighted;
4. A statement that indicates whether the contaminated surface water body is perennial or intermittent;
5. A discussion of potential mobility of contaminated sediment and potential for contaminants to leach into surface water;
6. The names and classifications of all downstream surface water bodies *if* they are potential recipients of contaminated surface water or sediment;
7. The identity of adjacent or downstream wetlands that could be affected; and
8. An estimate of the width and depth of the contaminated surface water body.

3.3 Surface Water Remediation Standards

Remediation goals for surface water are the NC DEQ Division of Water Resources 15A NCAC 02B standards or confirmed upstream background concentrations. However, if surface water contamination is causing sediments to exceed cleanup criteria, remediation of surface water will be necessary to eliminate this effect. Violation of the 15A NCAC 02B standards will be evaluated based on the number of surface water samples, frequency of sampling, and magnitude of contaminant concentrations detected rather than just one sampling event.

3.4 Groundwater Remediation Standards

3.4.1 Unrestricted Use

The unrestricted-use groundwater remediation levels are the permanent and interim groundwater standards established under 15A NCAC 02L. If groundwater is or may be used for potable purposes in any area where the groundwater contaminant plume is currently located or may be located in the future, the remediation goal would be the lower of the 15 NCAC 02L standards or federal maximum contaminant level (MCL). For contaminants without 15A NCAC 02L standards, the remediating party should contact the Branch.

> *Note:* Remediation to below the practical quantitation limits or site-specific natural background levels (for metals only) is not required.

3.4.2 Restricted Use

Cleanup to levels higher than the state's 15A NCAC 02L groundwater quality standards is allowed for qualifying sites with stable or predictable groundwater contamination and permission from all affected property owners. N.C.G.S. 130A-310.65 through 310.77 specifies the fees and procedures for pursuing a groundwater risk-based remedy. Sites with extensive groundwater

monitoring data that demonstrate stable or predictable plume conditions are ideal candidates. Visit the DEQ Risk-Based Remediation website for the Administrative Procedures, the Risk Calculator, and the Technical Guidance document for preparing a risk-based RAP.

Note: Due to Branch review and approval and maintenance of land-use restrictions, there are additional fees associated with groundwater risk-based cleanups.

3.5 Naturally Occurring Background Levels

At some sites, local naturally occurring background concentrations (metals only) and/or anthropogenic background concentrations (PAHs, PCB and/or Dioxins) can contribute to the site's total contaminant concentrations and risk. Background contaminants can either be naturally occurring substances that are present in the environment in forms that have not been influenced by human activity, or anthropogenic substances that are present due to human activities not specifically related to the site. Background concentrations can serve as cleanup levels for those contaminants. Sufficient sampling should take place to statistically quantify these potential contributions to site in a legally defensible manner. Statistics play a major role in establishing background concentration levels, and methods vary widely in their degree of complexity. The methodology used to eliminate naturally occurring compounds or determine cleanup levels should be well-documented.

3.6 Practical Quantitation Limits

For contaminants with no PSRG, the laboratory's practical quantitation limits (using the analytical methods specified in Section B.6.1.2) may serve as unrestricted-use cleanup levels, provided that the laboratory's quantitation limits are not elevated more than 10 times laboratory's the Method Detection Limit (MDL) or published MDL for a contaminant. Contact the Branch if a contaminant does not have a PSRG.

4.0 Remedial Action

Once the remedial investigation has been completed, a Remedial Action Plan (RAP) must be prepared and submitted whenever contamination exceeds standards or allowed risk. Prior to approval, the RAP must be made available for public comment for at least thirty days. Any substantive comments must be evaluated, and the RAP revised as necessary before the RAP is approved.

The public notice of the proposed RAP must be mailed after the Branch has approved the mailing list for and content of the public notice. At the time of public notice, the Branch may request that

Branch concurrence is required for any remedy proposed in the REC Program that would:
1) be conducted entirely on site and for which a permit waiver is desired under G.S. 130A-310.3(e);
(2) include institutional controls for restricted use of contaminated areas or media; or
(3) exceed the cost set forth in G.S. 130A-310.9(a)

the remediating party provide additional copies of the RAP for distribution to the local health director, register of deeds office, and the public library closest to the site as part of the public notice. If the Branch determines that there is significant public interest in a site, the Branch may hold a public meeting or public hearing. A RAP should not be implemented until permission is received in writing from the Branch, or it is approved and certified by the REC.

Note: Remedial actions that involve the emission or discharge of hazardous substances to the atmosphere should be conducted in a manner that provides for the protection of human health and the environment, and complies with any applicable permits, approvals, laws or other rules or regulations.

4.1 Remedial Action Plan

If the remedial action was already in progress prior to an Administrative Agreement and continuation of the same remedy is approved, any information previously prepared and submitted can instead be described and referenced in the RAP.

The RAP should describe the following information:

1. A discussion of the remedial investigation results including media contaminated, contaminants of concern, and the areal and vertical extent of contamination;
2. A brief statement of objectives for the remedial action;
3. An evaluation of available remedial alternatives using the following feasibility study criteria:
    a. protection of human health and the environment, including attainment of cleanup levels;
    b. compliance with applicable federal, state and local regulations;
    c. long-term effectiveness and permanence;
    d. reduction of toxicity, mobility and volume;
    e. short-term effectiveness, i.e., effectiveness at minimizing the impact of the site remedial action on the environment and the local community;
    f. implementability, i.e., technical and logistical feasibility, including an estimate of time required for completion;
    g. cost; and
    h. community acceptance.
4. A detailed description and conceptual design of the proposed remedy, for each contaminated medium including an evaluation of the potential for the remedy to affect sensitive environments identified;
5. A demonstration that the proposed remedy is supported by the remedial alternative feasibility study conducted pursuant to item 3 above;

6. A description of all activities necessary to implement the proposed method(s) of remedial action in compliance with applicable laws and regulations and in a manner, such that cleanup standards are met. These activities include, but are not limited to, well installation and abandonment, sampling, run-on/run-off control, discharge of treated waste streams, and management of investigation and remedial action derived wastes;

7. A description of any proposed treatability studies and additional site characterization needed to support the final design;

8. A description of procedures and a schedule for additional site characterization, treatability studies, final design, construction, operation and maintenance, system monitoring and performance evaluation, and progress reporting;

9. A description of the criteria for remedial action completion, including procedures for post-remedial and confirmatory sampling;

   Note: The RAP should include a work plan for monitoring and evaluating the remedy's performance and any lateral or vertical expansion of the extent of the contaminant and associated risk to receptors. The work plan should also describe post-remediation confirmation sampling. Confirmation sampling results should be submitted in Remedial Action Completion Reports. Branch guidance on confirmation sampling and analysis is provided in Appendix B;

10. A health and safety plan that assures that the health and safety of **nearby residential and business communities** will not be adversely affected by exposure to site contaminants and activities related to the remedial action. The plan should conform to all local, state, and federal regulations for health and safety;

11. Equipment and personnel decontamination procedures;

12. A schedule for completion of the remedial design, remedial action construction and implementation and periodic sampling and reporting;

13. All professional work must be signed and sealed by the appropriate professionals (e.g., licensed geologist, registered professional engineer, etc.). A single document may require the signature and seal of more than one professional; and

14. Appropriate certification statements or forms (see Appendix A).

4.2 Remedial Action Preconstruction Reports

A Preconstruction Report should be prepared and submitted in accordance with the terms of the Administrative Agreement prior to the beginning of construction activities for all remedies involving construction or equipment installation. This includes but is not limited to remedies such as injection treatments, capping or excavation. These reports should include the following elements:

1. The results of all treatability studies and additional site characterization work completed since the remedial investigation;
2. Final engineering design report, including a narrative description of process design, final plans and specifications, and an updated project schedule;
3. Copies of final registrations, permits and approvals; and
4. Appropriate certification statements or forms (see Appendix A).

4.3 Remedial Action Construction Completion Reports

When a remedy involving activities such as excavation, construction of borings, injection treatments or other active actions, a remedial action Construction Completion Report should be prepared and submitted. This report should include the following:

1. "As-built" plans and specifications;
2. A summary of major variances from the final design plans;
3. A summary of any problems encountered during construction; and
4. Appropriate certification statements or forms (see Appendix A).

4.4 Remedial Action Progress Reports

Remedial Action Progress Reports should be prepared and submitted in accordance with the terms of the Administrative Agreement. In general, quarterly Remedial Action Progress Reports are necessary for remedial actions greater than three months in duration. Groundwater Remedial Action Progress Reports may be prepared on an annual basis after the first full year of remedial action and the completion of four quarterly monitoring events. Remedial Action Progress Reports should contain at least the following:

1. A summary of operation and maintenance activities, observations and a discussion of major problems encountered;
2. Performance evaluation results, i.e., tabulated and graphical presentations of monitoring data and a comparison of remedial action performance to design goals;
3. A description of all field and laboratory quality control and quality assurance procedures followed during any sampling and analysis;
4. Copies of all laboratory reports including quality assurance/quality control documentation;
5. A map, drawn to scale, showing all soil sample and monitoring well locations; and
6. Appropriate certification statements or forms (see Appendix A).

4.5 Remedial Action Completion Report (Final Progress Report)

The Remedial Action Completion Report (final progress report) should be submitted in accordance with the terms of the Administrative Agreement. This report should include the information required under Section 4.4, above, and the following:

1. A summary of remedial action operating experience and effectiveness in meeting design goals, based on all performance monitoring data and progress reporting to date;
2. A discussion of criteria for remedial action completion, and a demonstration, supported by confirmatory sampling data, that such criteria have been satisfied; and
3. Appropriate certification statements or forms (see Appendix A).

5.0 No Further Action Determinations

After satisfactorily completing a voluntary remedial action, the work required under the Administrative Agreement is considered to be complete, and the Administrative Agreement is terminated. The site will then be assigned "No Further Action" status in the Inactive Hazardous Sites inventory. This change of inventory status does not preclude any future state action if new evidence of contamination is discovered at a later date. In accordance with N.C.G.S. 130A-310.7(c), any party wishing to receive a written "No Further Action" determination from the Branch must provide the request in writing.

Appendix A: Document Certification Requirements

Whether remedial action is conducted with direct Branch oversight or the Branch's Registered Environmental consultant program, certifications by the person overseeing the work are required to ensure the integrity of the work.

The specific certification requirements for both State-lead and REC work conducted in the Branch are outlined in Tables A-1 and A-2 below. All certifications must contain the notarized signature of the appropriate representative responsible for the remedial activities.

REC Certification Forms

REC work plans and reports must include notarized document certification forms from the remediating party and the RSM.

The specific certification forms cannot be reproduced in any way.

Separate REC work phase completion (WPC) forms must be used to certify the completion of work phases in accordance with .0306(b)(5) and (b)(6).

The signatures must be properly notarized using only the notary text shown on the forms.

The remediating party must sign and have notarized their document content certification **prior** to the RSM's certification.

Table A-1. State-Lead and REC Document Certification Statements and Forms.

Documents and Other Submissions	REC Document Certification Form	REC Work-Phase Completion Form*	State-Lead Certification Statements
Annual Progress Update Reports	DC-I and DC-II		The following statement individually signed and notarized by the RP and the consultant: "I certify that, to the best of my knowledge, after thorough investigation, the information contained in or accompanying this certification is true, accurate, and complete." If the document includes the relevant professional work, include: Any work that would constitute the "practice of engineering" as defined by G.S. 89C shall be performed under the responsible charge of, and signed and sealed by, a professional engineer registered in the state of North Carolina. Any work that would constitute the "public practice of geology" as defined by G.S. 89E shall be performed under the responsible charge of, and signed and sealed by, a geologist licensed in North Carolina.
Remedial Investigation Work Plan	DC-I and DC-II		
Remedial Investigation Report	DC-I and DC-II	WPC-II	
Remedial Action Plan	DC-I and DC-II	WPC-III	
Groundwater Remedial Action Initiation	DC-I and DC-II	WPC-V	
Progress Monitoring Reports	DC-I and DC-II		
Remedial Action Completion Report	DC-I and DC-II	WPC-VI, WPC-VII, or WPC-VIII	
Project Schedules, Data Summaries, Interpretations, Calculations	DC-I and DC-II		Not applicable

* WPC-I and WPC-IV are no longer used according to the re-adopted REC Rules effective July 1, 2020.

Table A-2. REC Program Work-Phase Completion (WPC) Form*

WPC Form	Title
II	Remedial Investigation Completion Certification
III	Proposed Remedial Action Plan Completion Certification
V	Groundwater Remedial Action Initiation
VI	Remedial Action Completion Certification
VII	Remedial Action Completion Certification "for Remedy with Land Use Restrictions"
VIII	Combined Remedial Investigation & Remedial Action Completion Certification "for No Action Remedy"

* WPC-I and WPC-IV are no longer used according to the re-adopted REC Rules effective July 1, 2020.

Appendix B: Sampling and Analyses

Environmental sample collection and analyses should only be performed by persons who are qualified by education, training, and experience. Procedures and methodologies employed for the collection and analysis of soil, sediment, water, vapor, air, and waste samples should follow the methods published by the United States Environmental Protection Agency (USEPA), the American Society for Testing and Materials (ASTM), the American Public Health Association (APHA), the National Institute for Occupational Safety and Health (NIOSH), the American Water Works Association (AWWA), or other organizations with expertise in the development of standardized analytical testing methods.

B.1 Soil Sample Collection

B.1.1 Phase I Sampling to Identify Contaminants

The purpose of the Phase I soil investigation is to identify all releases of hazardous substances to site soils, to characterize the chemical nature of such releases, and to collect sufficient sampling data to establish remediation goals.

Known or suspected spills and disposal areas must be identified by researching waste management records, vintage maps, aerial photographs; and other information and by conducting employee interviews. All areas known, suspected or having been contaminated by hazardous substances must be investigated. Areas known or suspected of being contaminated are those areas where there is some evidence (such as, but not limited to, allegations or indications of spills, visual observations, field instrument readings, laboratory data, and chemical odor) of a release of hazardous substances or of materials that contain or may contain hazardous substances. The necessary sampling strategy depends on whether or not there is visible evidence of contamination.

All soil sampling and boring locations should be documented using properly calibrated GPS equipment (in decimal degrees to 5 decimal places). Note that some data (e.g., monitoring well elevations and locations) will require survey-grade precision.

B.1.1.1 Visible Evidence of Contamination

At least one grab soil sample should be collected centrally from the most visibly contaminated location and horizon in each area of hazardous substance release or possible release.

B.1.1.2 No visible Evidence of Contamination

<u>Surface Release</u>

1. If no visible evidence exists in an area of a suspected *surface release* of contaminants, sampling should be conducted by first establishing a grid with grid line intersections (nodes) spaced no farther than 50 feet apart. Samples collected for all analyses except volatile

organics (VOCs) should be collected from at ground surface at each grid node. Samples collected for volatile organic analysis should be collected at a depth of 6 to 12 inches below ground surface. Compositing to reduce the total number of samples for non-VOC analyses may be conducted as follows:

≤ 62,500 square feet: No more than four adjacent grid node (250 ft. x 250 ft.) samples may be composited.

> 62,500 square feet: A greater number of adjacent grid node samples may be composited, but a minimum of five resulting composite samples should be submitted for laboratory analysis.

Samples for VOC analyses should be collected at each node as unmixed grab samples without compositing. If the area exceeds 15,000 square feet, a minimum of five samples should be collected from locations that are evenly distributed across the area of suspected contamination. Field screening methods may be used to select the locations of these unmixed samples. For areas greater than 62,500 square feet, at least five additional samples should be collected by compositing grab samples from at least 25% of the nodes which generally reflect an even distribution across the area. These composited samples will be used for qualitative purposes only.

Note: For extremely large sites (sites several acres in size), contact the Branch to discuss site specific conditions.

2. In addition to 1 above, if the actual contaminants released are unknown, mobile contaminants or contaminants that have been detected in groundwater at the site, a soil boring should be advanced to the water table. The boring should be centrally located in the area of concern and adequately sampled at intervals from ground surface to the water table. Examples of sampling intervals include 0 to 6 inches below ground surface, every five feet from 6 inches to the water table, and at the water table. Additional sampling depths should also be chosen based on visual and field-screening evidence. Samples collected for volatile organic analysis should be unmixed grab samples.

Subsurface Release

1. The results of the historical research should be used to conduct geophysical surveys and test trenching. Geophysical surveys should be conducted by scanning areas of concern on parallel and perpendicular traverses spaced no further than 30 feet apart. Closer spacing may be necessary when using a metal detector. Grids should be established in all areas that yield anomalous readings during the scanning phase. Grid nodes should be spaced no greater than 10 feet apart. Readings should be recorded at each grid node and mapped. If areas are excluded from the survey due to instrument interference, the remediating party should provide a written justification for exclusion along with a map delineating the features causing the interference with the Remedial Investigation Report.

2. Once the subsurface disposal area has been identified, it should be sampled according to whether there is visible evidence of contamination or no visible evidence as described above. If the suspected subsurface disposal area cannot be located using the methods described above, a soil boring should be advanced through the suspected disposal area in accordance with the procedures for surface releases above.

B.1.1.3 Waste Material Sampling

Waste materials (e.g., fly ash, sludge, concrete, wood, etc.) that are known or suspected to contain hazardous substances that may cause an exposure hazard and contaminate other media should be evaluated using the same procedures as if it were contaminated soil. Laboratory analyses are necessary to determine if the contaminants in the waste materials exceed the Branch's remedial goals.

B.1.2 Subsequent Sampling to Delineate Extent of Contamination

Delineating the extent of soil contamination requires sampling all ditches, culverts or other drainage features that may have received runoff from known-contaminated areas. Field screening methods, such as soil gas testing and immunoassay test kits, may be used to help define the extent of contamination. If these methods are used, soil samples should also be collected at the expected vertical and lateral boundaries of each contaminated area and sent to the laboratory for confirmation.

B.2 Groundwater Sample Collection

B.2.1 Phase I Sampling to Identify Contaminants

If the water table is within five feet of the ground surface, the contaminants are known to extend to within a five-foot depth of the water table, or the contaminants are somewhat mobile (such as VOCs and leachable metals) the uppermost groundwater aquifer should be sampled. At least one well should be installed centrally *within each area of release* meeting one or more of the above criteria. Where contaminants are believed to be "floaters" due to density and solubility in water, well screens should be positioned across the water table. Where contaminants are believed to be "sinkers," the well screen should be positioned just above the bedrock surface. In many cases, insufficient information on the nature of hazardous substance releases at the site will make it necessary to perform the Phase I groundwater field work after the Phase I soil work is completed.

If the remediating party decides not to install a well within an area due to grossly contaminated conditions or concern for rupturing buried vessels, a minimum of three wells must then be installed immediately surrounding the suspect area. Once groundwater flow patterns are clearly defined, a well will be necessary on the hydraulically down-gradient perimeter of the area of concern. A previously installed well may be appropriately located. Depending on the size of the area and nature of the release, additional monitoring wells may be necessary once the source is removed or remediated.

A professional land surveyor, registered in North Carolina, must survey all monitoring well locations from a USGS known datum. Groundwater elevation data should be collected during each sampling event. If subsequent water table elevation data indicate a significant change in the direction of groundwater flow, additional wells will be necessary to adequately evaluate groundwater contamination. At least one sample must be collected from each monitoring well and analyzed according to Section B.6.

B.2.2 Subsequent Sampling to Delineate Extent of Contamination

If hazardous substances are present in groundwater, additional groundwater assessment will be required to delineate their lateral and vertical extent. Sufficient data are needed to understand groundwater flow direction and pathways in the aquifer(s). The lateral and vertical extent of groundwater contaminant plumes must be defined to the 15A NCAC 02L standards.

B.3 Surface Water and Sediment Sample Collection

B.3.1 Phase I Sampling to Identify Contaminants

Surface water assessment will be necessary if there is a potential for contaminants to migrate to surface water via surface runoff or through a discharge of contaminated groundwater to a surface water body. If a surface water assessment is necessary, water and sediment samples should be collected at the probable point of entry. In addition, at least one water and one sediment sample must be collected immediately upstream of the site and one water and one sediment sample collected immediately downstream of the site.

For surface waters that are very shallow (less than six inches deep) or turbulent, highly turbid samples may be collected in a separate collection container and then decanted into the sample container. Samples for organic analysis must be decanted into the sample container immediately. Samples for metals analysis may be allowed to settle for a few minutes prior to decanting. All collection containers must be made of the same materials as the sample container. They must be pre-cleaned and handled in the same manner.

These samples need only be analyzed for contaminants previously detected in other media at the site unless a non-permitted direct discharge of a hazardous substance from the site to surface water has occurred. If such a discharge has occurred, samples should be analyzed for the Phase I analyses described in Section B.6.1.

B.3.2 Subsequent Sampling to Delineate Extent of Contamination

If contamination is detected in any downstream sample above concentrations detected in upstream samples, additional surface water/sediment assessment will be needed. The purpose of the next phase(s) of surface water/sediment investigation is to define the downstream extent of contamination to concentrations less than or equal to the 15A NCAC 02B standards for surface water and the residential PSRGs for soil.

B.4 Background Sample Collection

B.4.1 Natural Soil Metals Concentrations

Site-specific background soil samples should be collected to establish natural metals concentrations if metals are a contaminant of concern at the site. Samples should be located away from roadways, railways, parking areas and other potential sources of contamination. Because natural metals concentrations are highly variable, the Branch recommends collecting a minimum of five background soil samples. Background soil samples should be collected from depths and soil types that are representative of contaminated soils but should not be collected from topsoil (0-6 inches). Statistical methods for establishing representative background concentrations may be used. Sample concentrations that are obvious outliers should not be used to establish background concentrations.

B.4.2 Area-wide Soil Anthropogenic Background

Background soil samples should also be collected at any site having known or suspected Dioxin, PAH, and/or PCB contamination in order to establish area-wide anthropogenic background levels. These samples should be collected at various distances from the site. If the results indicate over a large area, no increase in concentration toward the site and after any obvious outliers are removed, the upper end of the range of concentrations detected can be used as the anthropogenic level.

B.4.3 Natural Groundwater Metals Concentrations

If metals exceed groundwater remediation goals for the site, groundwater samples should be collected upgradient of any on-site sources of contamination to established natural background conditions.

B.4.4 Normal Application of Agricultural Chemicals

Arsenic and 1,2-dichloropropane are sometimes found in groundwater due to normal application of pesticides. Other pesticides, if applied properly, are not as commonly found in groundwater due to their lower solubility. Many former agricultural properties, however, will have levels of pesticides or nitrates remaining in soils due to natural application. Federal and state laws generally exempt concentrations associated with normal application of agricultural chemicals. Overuse and improper use do not qualify for that exemption. If the presence of agricultural chemicals can be shown to be due to normal application, their remediation is not required by the IHSRA and by most state and federal remediation law.

B.4.5. Upstream Surface Water Background Concentrations

If surface water assessment is necessary, background (upstream) surface water and sediment samples should be collected to establish natural or anthropogenic background conditions. Samples should be collected upstream of any on-site sources of contamination. If contamination

is found upstream of the site in concentrations greater than the downstream concentrations, downstream delineation may not be necessary.

B.5 Investigation-Derived Waste

Investigation-derived waste or IDW (may include drill cuttings and muds, sampling materials, purge water, soil and residuals from testing) generated as part of assessment activities may be discharged or stored in the area of contamination and are not subject to RCRA permitting as long as the material: (1) stays on site and remains in the contaminated area, (2) is secured, (3) does not increase the spread of contamination or concentrations in a particular medium, (4) does not cause mobilization of contaminants, and (5) does not introduce contamination to uncontaminated soil (causing an increase in contaminant concentrations). In residential and public use areas, IDW will require off-property management unless it meets unrestricted use levels and disposal permission has been granted by the property owner. IDW cannot be transferred and discharged to another area of concern.

B.6 Sample Analyses

Environmental consultants should provide the laboratory with copies of Sections B.6 and B.7 of this Guidance document to ensure that appropriate analyte lists are used in the analysis of samples.

B.6.1 Phase I Analyses to Identify Contaminants

B.6.1.1 Analytical Parameters

In most cases the parameters listed below must be included in the first phases of testing each contaminated medium. As most of the sites managed by the Branch are pre-regulatory, non-permitted discharges, little information is available on the nature of the discharge. Where property uses, activities and chemical usage at a property are clearly known and limited, some of the analyses listed below can be excluded. Each Phase I sample should be analyzed for the following unless there is documentation indicating that a specific analysis is not necessary:

1. Hazardous substance list metals (totals analysis) including antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium and zinc. Hexavalent chromium is the most toxic of the chromium species. Hexavalent chromium testing is only needed for soils if total non-speciated chromium soil concentrations in the Phase I samples exceed the site-specific natural background concentrations and the hexavalent chromium soil remedial goal. For groundwater, hexavalent chromium analyses is not needed as the 15 A NCAC 02L groundwater standard is for total chromium.

   If coal ash is known or suspected to have been discharged at the site, the following additional toxic, non-hazardous substance metals should be included in the testing of groundwater: boron, molybdenum, strontium.

2. All of the volatile and semi-volatile compounds listed on the most current USEPA Contract Laboratory Program (CLP) Target Compound List using analytical methods specified in Section B.6.1.2 with a library search (using the National Institute of Standards and Technology mass spectral library) to produce a list of tentatively identified compounds (TICs). The library search should identify TICs for the largest 10 peaks in each analytical fraction (VOCs and SVOCs) that have reasonable agreement with reference spectra (i.e., relative intensities of major ions agree within ± 20%). The list of identified TICs should not include laboratory control sample compounds, surrogates, matrix spike compounds, internal standards, system monitoring compounds or target compounds. The library search for TICs during the first assessment phase should be done on samples from the "worst case" location in each area of concern or if the "worst case" location is not known, then on a representative number of samples across the area.

   Any TICs that are hazardous substances, that have reasonable agreement with reference spectra, and are detected in more than one sample in an area of concern should be included in all subsequent analytical work unless the compound is a laboratory contaminant, naturally occurring, or documented from an anthropogenic source. Check with the laboratory on possible procedures to quantify the TICs so that cleanup levels can be determined. A summary of the nature of any TICs eliminated from future analysis and reporting should be provided in the Remedial Investigation Report, including reasons for discounting the constituent.

3. 1,4-Dioxane if chlorinated solvents such as 1,1,1- trichloroethane (TCA) or trichloroethylene (TCE) are present, or if it is a suspected contaminant of concern. It is often associated with certain chlorinated solvents because of its widespread use as a stabilizer. It is also a by-product present in many goods and is used as a purifying agent in the manufacture of pharmaceuticals.

4. Pesticides, PCBs, dioxins, cyanide, formaldehyde, nitrates, nitrites, ammonia, phosphorus, and any other CERCLA hazardous substances or pollutants not mentioned here if suspected to have been discharged at the property.

   a. If cyanide is a known or suspected contaminant of concern, cyanide should be analyzed using total cyanide methods.

   b. If PCBs are a known or suspected contaminant of concern in soils, Phase I soil samples should be collected in the area of highest concentration and analyzed using both total PCB analysis and congener-specific analysis. The congener analysis should specify the dioxin-like PCB congeners. The sum of the dioxin-like PCB congener concentrations should be subtracted from the Total PCB analytical result. The resulting concentration must then be compared to the Branch's allowable concentrations for non-dioxin like PCBs. If concentrations detected are less than soil remedial goals for both the individual dioxin-like congeners and for the total non-dioxin like congeners, no additional PCB sampling is required. If concentrations exceed applicable remedial goals, more gross delineation can be performed using total PCB analyses and then the perimeter of the extent of contamination samples run

for the dioxin-like congeners found at the site. In areas where PCBs are detected, soil samples should also be collected and analyzed for VOCs because they are commonly present as carriers for PCBs. Final confirmation samples must also be analyzed using congener specific analyses. Arochlor analyses should not be used unless trying to finger print manufacturer of PCB fluid.

If soils are found to exceed PSRGs, an evaluation of anthropogenic background concentrations may be warranted. Groundwater samples should be analyzed for *Total* PCBs and the results compared to the 15A NCAC 02L standards.

B.6.1.2 Analytical Methods

The analytical methods used should be the *most recent* versions of the analytical methods tabulated below. For SW-846 Methods, the latest edition of SW-846, including any subsequent updates which have been incorporated into the edition, must be used. Sampling must be planned so that required holding times for analytical methods are met. The laboratory's reporting limits should be at or below remedial goals.

Soil and Sediment Samples

Volatile Organic Compounds[1]	SW-846 Method 8260
1,4-Dioxane[2]	SW-846 Method 8270
Semi-volatile Organic Compounds[1]	SW-846 Method 8270
Metals[3] (excluding hexavalent chromium), Pesticides, PCB congeners, total PCBs, Dioxins, Cyanide, Formaldehyde and any other analytes not covered by above methods	USEPA method or method published in *Standard Methods for the Examination of Water and Wastewater* having detection limits below unrestricted use remedial goals or having the lowest detection limit. For PCB congeners use USEPA Method 1668.
Hexavalent chromium (if total chromium exceeds the site-specific natural background concentrations and the remedial goal for hexavalent chromium)	SW-846 Method 3060A[4] alkaline digestion coupled with a USEPA method or method published in *Standard Methods for the Examination of Water and Wastewater* having detection limits below unrestricted use remedial goals or otherwise having the lowest detection limit.

Water Samples (including groundwater, surface water and TCLP/SPLP leachate)

Volatile Organic Compounds[1]	SW 846 Method 8260
1,4-Dioxane [2]	SW-846 Method 8270 SIM using d8 isotope analysis.
Semi-volatile Organic Compounds[1]	SW-846 Method 8270
Metals[3, 5], Pesticides, PCBs, Dioxins, Cyanide, Formaldehyde and any other analytes not covered by above methods	USEPA method or method published in *Standard Methods for the Examination of Water and Wastewater* having the lowest detection limits or having detection limits below the 15A NCAC 02L standards
Hexavalent chromium (if total Cr exceeds 2 times the site-specific natural background concentrations and the applicable remedial goal for hexavalent Cr, and Cr is a known or suspected contaminant at the site)[6, 7]	USEPA Method 218.7 or Method 218.6 as modified by USEPA Region IV.

1. *Analyses must include the USEPA Target Compound List plus a library search as described in Section B.6.1.1(2).*
2. *Samples for 1,4-Dioxane analysis should not be collected with passive- or diffusive-bag samplers. Also, avoid use of Alconox and Liquinox for precleaning of sampling equipment and containers. Methods 8260 and 8260 SIM is not recommended due to interference issues between 1,4-dioxane and some chlorinated solvents, particularly TCE and 1,2-DCE.*
3. *SW-846 Method 6010 does not have detection limits below the unrestricted use standards/15A NCAC 02L standards for all of the hazardous substance list metals. Therefore, ICP-MS should be used when conducting first phase metals scans. For metals, ICP-MS is preferred over ICP due to lower quantitation limits. However, ICP should be used for certain metals where interference issues exist.*
4. *SW-846 Method 3060A extraction for soil and sediment samples allows for a 30-day holding time prior to extraction.*
5. *Rapid analyses of samples are recommended to lessen the contact time with the acid preservative. Filtration of groundwater and surface water samples before digestion is not permitted. Highly turbid water samples for metals analysis should be collected in accordance with Section B.3.1.*
6. *Hexavalent chromium analysis is not needed for groundwater samples as the 15A NCAC 02L standard for total chromium is based on the more toxic hexavalent chromium species. This level must be met for all chromium in groundwater. The listed methods can be used for surface water and for ecological assessment purposes.*
7. *Samples collected for hexavalent chromium analyses must be field filtered within 15 minutes of collection. Each sample must be collected in a separate pre-preserved container from those for other metals analyses. Method 218.7 or Method 218.6 as modified by USEPA Region IV should be used. Method 218.7 requires low turbidity and allows for a 14-day holding time. USEPA Region IV has developed a modification to Method 218.6 that allows for a 28-day holding time. Bottles must be pre-preserved as specified in the modification to the Method. Laboratories should contact the USEPA in Region IV for the methodology. Otherwise, any USEPA Method or Standard Method may be used. However, other methods have a 24-hour holding time. Selection of methods and pre-preservation of bottles should be discussed with the laboratory prior to sample collection.*

B.6.2 Subsequent Analyses

B.6.2.1Analytical Parameters

After the first phase of sampling is conducted, any samples subsequently collected need only be analyzed for the following compounds.

1. TICs that meet the criteria in Section B.6.1.1(2) that are retained as site contaminants must be quantified in subsequent phase analyses using a USEPA Method or method published in *Standard Methods for the Examination of Water and Wastewater* (latest edition) having the lowest method detection limit (MDL) or one that achieves the 15A NCAC 02L standards for water samples and Branch unrestricted use remediation goals for soil.

2. All CERCLA hazardous substances detected (including those with qualified estimated concentrations), unless the contaminant concentration is proven through sampling to be the result of a naturally-occurring condition, area –wide anthropogenic background or the contaminant is a common laboratory contaminant detected in concentrations below that detected in the method blank. If a compound that is not a common laboratory contaminant is detected in both the blank and a sample, another phase of sampling is necessary to demonstrate the absence or presence of the contaminant.
3. Potential degradation compounds (which are also CERCLA hazardous substances) of those CERCLA hazardous substances detected at the site.
4. If total chromium concentrations in the Phase I *soil* samples exceed the site-specific natural background concentrations and the hexavalent chromium soil remedial goals, hexavalent chromium analyses are required.
5. If laboratory sample dilutions were performed on Phase I samples, subsequent phase samples must be analyzed for the entire analytical fraction previously diluted in addition to the above items. Sample dilutions raise analytical detection limits and can mask the presence of other constituents at lower concentrations.

B.6.2.2 Analytical Methods

Subsequent phase samples should be analyzed using the methods specified above for Phase I samples. Other USEPA-approved Methods or methods published in *Standard Methods for the Examination of Water and Wastewater* (latest edition) may be substituted, if the substitute methods achieve equal or lower MDLs or if they achieve the 15A NCAC 02L standards for water samples and the unrestricted use remediation goals for soils.

B.7 Data Reporting

Laboratory reports submitted with remedial investigation reports must include the items listed below.

1. The laboratory report must state that the laboratory is either certified for applicable parameters under 15A NCAC Subchapter 02H .0800 and provide its certification number, or that it is a contract laboratory under the USEPA's Contract Laboratory Program. Full CLP documentation packages are not required.
2. A signed statement from the laboratory that the samples were received in good condition, at the required temperature and that analysis of the samples complied with all procedures outlined in the analytical method used, unless otherwise specified. Any deviation from the methods, additional sample preparation, sample dilution and unrectified analytical problems, must be justified in a narrative with the laboratory report.
3. Laboratory sheets for all analytical results, including sample identification, sampling dates, date samples were received by laboratory, extraction dates, analysis dates, analytical methods used, dilution factors and sample quantitation limits.

Note: The laboratory must provide a written explanation for any sample having sample quantitation limits that exceed 10 times the laboratory or published MDLs.

4. All constituents detected must be reported even if they were not definitively quantified. All estimated concentrations with data qualifiers must be reported.
5. Laboratory sheets for all laboratory quality control samples, including results for bias and precision and control limits used. The following minimum laboratory quality control sample reporting information must be provided: (a) at least one matrix spike and one matrix spike duplicate per sample delivery group or 14-day period, whichever is more frequent (control limits must be specified); (b) at least one method blank per sample delivery group or 12-hour period, whichever is less; and (c) system monitoring compounds, surrogate recovery required by the method and laboratory control sample analysis (acceptance criteria must be specified). All samples that exceed control limits/acceptance criteria must be flagged in the laboratory report.
6. The results of any library searches performed for "tentatively identified compounds." See Section B.6.1.1 (2).
7. The laboratory report should include the names of the individuals performing each analysis, the quality assurance officer reviewing the data and the laboratory manager.
8. Data quality should be reviewed and validated by both the remediating party's environmental consultant and the laboratory. Any quality control concerns, data qualifiers or flags should be evaluated and discussed in the associated report.
9. Completed chain-of-custody with associated air bill (if applicable) attached.

B.8 Confirmation Sampling and Analyses

The following sections provide general guidance on "post-remediation" sampling and analyses needed to demonstrate compliance with Branch remediation goals. At most sites, the remediating party will need to prescribe additional sampling and analysis based on site-specific conditions.

Confirmation sampling should demonstrate that all contaminants identified during the remedial investigation meet applicable remedial goals or acceptable risk for the desired land use. All confirmation samples should be analyzed for all contaminants identified during the remedial investigation. Confirmation samples need to be analyzed using USEPA methods or *Standard Methods for the Examination of Water and Wastewater* (latest edition) with detection limits less than or equal to Branch remediation goals, or those with the lowest available detection limits for each contaminant of concern.

B.8.1 Soil Confirmation Sampling

B.8.1.1 Post In-Situ Remediation

For in-situ soil remedies, a confirmation sampling plan should be designed to verify that the entire soil column has been remediated to below the established remediation goals. To

demonstrate that remedial goals have been attained, the remediating party should design a three-dimensional sampling grid that meets the four requirements below.

1. Design a surface sampling grid over the area(s) of concern. Grid nodes should be no more than 50 feet apart.
2. At each grid node, specify "candidate" sampling locations at the surface, at 0 - 6 inches below ground surface, and at 5-foot intervals (or less) down to the vertical limit of contamination. The result is a three-dimensional grid of "candidate" sampling locations that encompasses the area of concern.
3. Select at least two candidate locations at each grid node for sample collection, using a combination of random and biased selection. Biased samples should be collected from known "hot spots" and from soil zones that are known to be resistant to in-situ methods (e.g., clay lenses).
4. Same-depth samples from up to four adjacent grid nodes may be composited. Samples at different depths may not be composited. For samples submitted for volatiles analysis, at least five samples or 25% of the node samples, whichever is greater, need to be unmixed grab samples. Field screening methods may be used to select these unmixed samples, or the unmixed samples should be collected from locations that are evenly distributed across the area of suspected contamination. The remaining samples should be collected as either unmixed grab samples or composited samples. Composited samples will be used for qualitative data only. For very large areas (multiple acres), the remediating party may propose an alternate approach.

B.8.1.2 Post Ex-Situ Remediation

Post-Excavation Sampling

Post-excavation sampling plans need to be designed to verify that all soils/wastes above the established remediation goals have been removed. Excavations should be sampled using the four requirements below.

1. Design a sampling grid over the base and sidewalls of the excavation. Grid nodes should be no more than 50 feet apart. At each grid node, collect a sample from 0-3 inches into the base or sidewall.
2. For very small excavations, collect at least one composite sample from the base and one composite sample from each sidewall. Composite samples should consist of at least four aliquots each. VOC samples should be unmixed grab samples.
3. Biased samples should also be collected from areas of residual contamination, based on visible or field-screening evidence.
4. For excavations <62,500 square feet (surface area), samples from up to four adjacent grid nodes may be composited. For excavations > 62,500 square feet (surface area), a greater number of grid nodes may be composited, but a minimum of five resulting composite samples should be submitted for laboratory analysis. For all excavations, samples from

different sidewalls may not be composited. For samples submitted for volatiles analysis, at least five samples or 25% of the node samples, whichever is greater, should be unmixed grab samples. Field screening methods may be used to select these unmixed samples, or the unmixed samples should be collected from locations that are evenly distributed across the area of suspected contamination. The remaining samples should be collected as either unmixed grab samples or composited samples. Composited samples will be used for qualitative data only. For very large areas (multiple acres), the remediating party may propose an alternate approach.

Treated Soil Stockpiles

Treated soils/wastes must meet the established remediation goals before they can be replaced on site. Treated soil stockpiles should be sampled using the following four procedures.

1. Stockpiles should be divided into equal segments of approximately 100 cubic yards each.
2. Within each segment, use either random or biased selection to locate at least three hand-auger borings. Samples should be collected from two depths within each boring (minimum six samples per segment).
3. Use visible or field-screening evidence to collect additional biased samples from areas of residual contamination.
4. Samples may be composited only within each segment. For samples submitted for volatiles analysis, at least 25% should be collected as unmixed grab samples.

B.8.2 Groundwater Confirmation Sampling

Groundwater confirmation sampling must demonstrate that site groundwater has been remediated to below the established remediation goals. Demonstrate this using the following procedures.

B.8.2.1 Active Groundwater Remediation

1. A minimum of four quarters of monitoring following system implementation should demonstrate the remedy's effectiveness.
2. Groundwater remediation systems may be shut down when two consecutive semi-annual (twice a year) sampling events demonstrate that *all* monitoring wells (on-property and off-property) are free of contamination above Branch remediation goals. To account for the effects of seasonal fluctuations in the water table, semi-annual sampling events should be conducted in winter and summer.
3. Following system shutdown, data from two additional sampling events (spaced at least 3 months apart) should demonstrate that *all* monitoring wells are free of contamination above the established remediation goals and contaminant concentrations are not increasing.

    Note: For remedial alternatives using injection, the first confirmation sampling event must occur after reagent is spent.

B.8.2.2 Passive Groundwater Remediation

For sites using passive groundwater remedial alternatives (e.g., monitored natural attenuation, phytoremediation, etc.), data from four consecutive sampling events (spaced at least three months apart) should demonstrate that (1) contaminant concentrations throughout the site meet above Branch remediation goals and (2) contaminant concentrations are not generally increasing over time.

B.8.3 Surface Water/Sediment Sampling

Confirmation sampling must demonstrate that site surface water and sediment have been remediated to concentrations below Branch remediation goals. Four consecutive quarterly sampling events should demonstrate that concentrations in downstream samples are less than or equal to concentrations in upstream samples or to Branch remediation goals.

B.9 Quality Assurance for Sampling and Analysis

1. Unless otherwise noted below, field procedures relating to sample collection techniques, sample containers, sample preservation, sample holding times equipment decontamination and field measurement procedures, should comply with the most current version of the U. S. Environmental Protection Agency (USEPA) Region IV Science and Ecosystem Support Division (SESD) *Field Branches Quality System and Technical Procedures.* This information is available from the USEPA Region IV SESD at: http://www.epa.gov/region4/sesd/fbqstp/.
2. The remediating party should employ analytical and environmental monitoring data, to support recommendations or conclusions with respect to assessment, removal, treatment, or containment actions, which are scientifically valid and of a level of precision and accuracy commensurate with their stated or intended use.
3. The remediating party should only use laboratories certified to analyze applicable certifiable parameters under 15A NCAC 02H .0800, or a contract laboratory under the United States Environmental Protection Agency Contract Laboratory Program to analyze samples collected pursuant to rules under this Section.
4. Laboratory and other reports of analyses of aqueous samples should be reported as mass per unit volume; such reports of analyses of solid samples should be reported as mass per unit mass.
5. Field QC samples: (i) minimum of one duplicate sample, per medium, per container type, per field day; (ii) equipment rinsate blanks and trip blanks (VOC analysis) are strongly recommended.

   Note: If site conditions, sample frequency or number of samples warrant more limited QA/QC testing, contact the Branch.
6. Other than composited samples, all soil, sediment and waste samples for volatiles analysis should be collected directly into sample containers without mixing.

7. All laboratory reports containing the results of sample collection and analyses must include the following information:
    a. the date, location, and time of sampling;
    b. specification of all sample filtration or preservation procedures used;
    c. the date of receipt of the sample at the laboratory, and the date(s) the sample was extracted and analyzed;
    d. the name and address of the laboratory, and proof of certification under 15A NCAC 02H .0800 or the USEPA Contract Laboratory Program;
    e. the sample matrix description and identification number(s);
    f. the sample preparation and analytical method name(s) and number(s);
    g. the laboratory report including, results of the analysis, in clearly expressed concentration units;
    h. the sample quantitation limit of each reported analyte based upon analytical conditions (any quantitation limits exceeding 10 times the MDL must be justified with supporting information);
    i. details of any known conditions or findings which may affect the validity of analytical data, including but not limited to equipment blank, trip blank, method blank, surrogate, spiked sample, or other quality control data;
    j. the laboratory's written justification for any sample dilution, additional sample preparation, or deviation from specified analytical methods;
    k. laboratory sheets for all laboratory quality control samples, including results for bias and precision and control limits used. The following minimum laboratory quality control sample reporting information must be provided: (a) at least one matrix spike and one matrix spike duplicate per sample delivery group or 14-day period, whichever is more frequent (control limits must be specified); (b) at least one method blank per sample delivery group or 12-hour period, whichever is less; and (c) system monitoring compounds, surrogate recovery required by the method and laboratory control sample analysis (acceptance criteria must be specified). All samples that exceed control limits/acceptance criteria must be flagged in the laboratory report;
    l. the results of any library searches performed for “tentatively identified compounds”;
    m. a signed statement from the laboratory that the samples were received in good condition, at the required temperature and that analysis of the samples complied with all procedures outlined in the analytical method used, unless otherwise specified; and
    n. complete chain of custody documentation for each sample.
8. Data quality should be reviewed and validated by both the remediating party and the laboratory. Any quality control concerns, data qualifiers or flags should be evaluated and discussed in the associated report.
9. All constituents detected must be reported even if they were not definitively quantified. All estimated concentrations with data qualifiers must be reported.

Appendix C: Sensitive Environment Contacts

CONTACT	NAME & CONTACT INFORMATION	SENSITIVE ENVIRONMENT
NC Division of Conservation, Planning, and Community Affairs – Natural Heritage Program	Visit the Natural Heritage Program's interactive maps of Natural Heritage resources to search for records within 2 miles of your project area or the database search tool for record summaries by county and USGS 7.5-minute topo map. You can also download GIS shapefiles of our data; see the "GIS Download" page for details. Email inquiries to: natural.heritage@ncdcr.gov	State Parks Areas Important to Maintenance of Unique Natural Communities Sensitive Areas Identified Under the National Estuary Program Designated State Natural Areas State Seashore, Lakeshore and River Recreational Areas Rare species (state and federal Threatened and Endangered) Sensitive Aquatic Habitat State Wild & Scenic Rivers
National Park Service - Public Affairs Office	Anita Barnett, EEO Counselor & Environment Protection Specialist: Planning and Compliance Division Anita_Barnett@nps.gov (404) 507-5706 http://www.nps.gov/rivers	National Seashore, Lakeshore and River Recreational Areas National Parks or Monuments Federal Designated Wild & Scenic Rivers
US Forest Service	Heather Luczak, Forest NEPA Coordinator heather.luczak@usda.gov (828) 257- 4817	Designated and Proposed Federal Wilderness and Natural Areas National Preserves and Forests Federal Land Designated for the Protection of Natural Ecosystems

NC Division of Water Resources	Nora Deamer, Basin Planner Nora.Deamer@ncdenr.gov (919) 707-9119 Ian McMillan, Branch Supervisor Ian.Mcmillan@ncdenr.gov (919) 707-9026 Ask for Clean Water Act 305b report	State-Designated Areas for Protection or Maintenance of Aquatic Life
NC Forest Service	Craig Clarke, Director, Safety, Planning & Analysis craig.clarke@ncagr.gov (919) 857-4820	State Preserves and Forests
US Fish & Wildlife Service	Pete Benjamin, Field Supervisor Pete_benjamin@fws.gov (919) 856-4520 x 11	Endangered Species
NC Department of Natural and Cultural Resources	Renee Gledhill-Earley, Environmental Review Coordinator (919) 814–6579 renee.gledhill-earley@ncdcr.gov	National and State Historical Sites
NC Division of Coastal Management	Mike Lopazanski, Deputy Director Mike.lopazanski@ncdenr.gov (252) 808-2808 ext. 223 http://dcm2.enr.state.nc.us	Areas Identified Under Coastal Protection Legislation Coastal Barriers or Units of a Coastal Barrier Resources System
NC Wildlife Resources Commission	David Cox, Technical Guidance Supervisor David.Cox@ncwildlife.com (919) 707-0366	National or State Wildlife Refuges State lands designated for wildlife or game management Migratory pathways and feeding areas critical for maintenance of anadromous fish species within river reaches or lakes or coastal tidal waters Spawning Areas Critical for the Maintenance of Fish/Shellfish Species within River, Lake or Coastal Tidal Waters
US Army Corps of Engineers	Dorothy Harrington Dorothy.Harrington@usace.army.mil (919) 554-4884, x 28	Wetlands