

GUIDE FOR THE SUBMISSION OF REMEDIAL ACTION WORKPLANS

State of New Jersey
Christine Todd Whitman
Governor



New Jersey Department of Environmental Protection

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Commissioner

Site Remediation Program

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Site Remediation Program
CN-028
401 East State Street
Trenton, NJ 08625

Dear Citizen:

The following guidance is provided to assist responsible parties who are required to prepare and submit a Remedial Action Workplan (RAW) to the New Jersey Department of Environmental Protection for the purpose of remediating a contaminated site. It is important to note that this guidance is not intended to replace or supersede the Technical Requirements for Site Remediation, N.J.A.C. 7:26E, rather, it has been developed to assist in the preparation of RAWs developed in accordance with these rules. It is intended that this document will assist consultants in submitting acceptable RAWs thereby improving upon the 30% -50% RAW approval rate experienced within the Site Remediation Program. The information contained in this document expands on the regulatory guidelines and provides insight to the Department's technical evaluation criteria for several remedial technologies.

This document has been prepared by the Bureau of Underground Storage Tanks in consultation with all the Site Remediation Programs and focuses on the remedial technologies most frequently encountered in the Underground Storage Tank Program. Please note that the guidance contained in this document has been routinely provided to responsible parties via Departmental comment letters. This guidance should not be used to reduce the regulatory flexibility allowed under N.J.A.C. 7:26E. Site specific requests for variances and determination of substantial compliance should continue to be directed to the case manager in accordance with N.J.A.C. 7:26E-1.6.

The Department will review the RAW to determine compliance with:

N.J.A.C. 7:14B et seq. Regulations Implementing the Underground Storage of Hazardous Substances Act

N.J.A.C. 7:26E et seq. Technical Requirements for Site Remediation

N.J.A.C. 7:26C et seq. Procedures for Department's Oversight of the Remediation of Contaminated Sites

P.L. 1993, c.139 (S1070) Industrial Site Recovery Act (ISRA)

Utilization of the recommendations in this guidance document will facilitate the preparation of RAWs which are administratively complete, technically justifiable, and in compliance with applicable regulations. Documents prepared in this manner may also help to reduce cleanup costs and Department oversight costs.

Please note that all persons performing work on regulated underground storage tanks, including the preparation of RAWs, must be certified per N.J.S.A. 58:10A-24.1-8. I am hopeful that this document will help responsible parties and their consultants prepare acceptable work products with less Department oversight. Comments regarding this document are encouraged and should be directed to Kevin Kratina at (609) 633-7141 and submitted to the letterhead address.

Sincerely,

Richard Gimello, Assistant Commissioner
Site Remediation Program

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Guide for the Submission of Remedial Action Workplans

REMEDIAL ACTION WORKPLANS

A Remedial Action Workplan (RAW) can be required by the New Jersey Department of Environmental Protection (department) in oversight documents or pursuant to Industrial Site Recovery Act (ISRA) or Underground Storage Tank (UST) program.

All RAWs must include a site summary (described in section I of this guide), a summary of cleanup goals (described in section II) and information on permits required for the implementation of remedial action (described in section III). The kinds of information to be included in the site summary depend upon which remedial technology is proposed for the cleanup. Section IV of this guide covers the requirements for most of the commonly used technologies.

Following department approval of a RAW, Remedial Action Progress Reports will be required. Information to be included in progress reports is in Section V.

Several checklists which have proven helpful in the preparation and review of RAWs are included in the guide. These are listed in Section I.10.

I. Site Summary

The site summary should include descriptions of the site and the discharge(s), a summary of all sampling data, a discussion of the areas of environmental concern, a receptor evaluation, and a summary of the proposed remedial action. Organization of the site summary is to be as follows:

A. Introduction: Site acreage, site use during the release, current site use, local land use, topography, geology, and hydrogeology.

B. Summary of Areas of Environmental Concern: Source of the discharge, discovery, investigation, and description of the discharge, and remedial actions taken to date (N.J.A.C. 7:26E-6.2(a)1 & 2).

1. Include site maps and tables showing compound-specific results of all previous soil and ground water sampling, and any items required in the department's most recent correspondence.
2. Tables and maps are to be prepared in the format required for Remedial Investigation Reports done in accordance with N.J.A.C. 7:26E-4.9. Refer to Appendix 2 "Guidelines for Data Presentation" for additional information on maps and tables.
3. Vertical and horizontal extent of soil contamination are to be fully delineated pursuant to N.J.A.C. 7.26E-4 (Technical Requirements for Site Remediation - Remedial Investigations). The areal extent of contamination is to be shown on a scaled plot plan which includes depths, locations, and concentrations for all samples.
4. Vertical and horizontal extent of ground water contamination are to be fully delineated pursuant to N.J.A.C. 7.26E-4. The areal extent of contamination is to be shown on a scaled plot plan which includes the extent of the contaminant plume (isopleth maps), locations of all monitoring wells, and concentrations.

5. All soil and ground water samples are to be collected in accordance with sampling protocols outlined in the "NJDEPE Field Sampling Procedures Manual" (May 1992 edition).
6. Any alternative sampling technologies (soil gas surveys, hydropunch, etc.) used at the site shall be discussed. The discussion shall include a scaled plot plan showing sampling locations, sampling depths, and concentration levels. The department's most recent "Alternative Ground Water Sampling Techniques Guide" should be consulted for the appropriateness of the technique.
7. Current ground water elevation contour maps and a table showing current and historic depth to ground water and ground water elevations in monitor wells are to be included.

C. Receptor Evaluation: An evaluation of surface water bodies and wells, basements, utility conduits and other structures that may be impacted from a vapor hazard or as a result of ground water contamination.

1. A well search is to identify all irrigation, monitoring and domestic wells located within a one-half mile radius of the site (including on-site wells) and all industrial wells, public supply wells and wells with water allocation permits located within a one mile radius of the site. The well search and all additional requirements of the receptor evaluation shall be completed in accordance with N.J.A.C. 7:26E-4.4(h)1 through 5. If the receptor evaluation was previously conducted and submitted to the department, the RAW may reference and summarize the previous submittal.
2. Potential receptors such as basements and utility conduits shall be evaluated over a minimum distance of 1,000 feet, described and plotted on a scaled site map. Their subsurface configuration and top and bottom depths shall be included in the RAW.

Note: If the information/data required in Items A-C, above, have been previously submitted to the department in the form of a Site Investigation Report and/or a Remedial Investigation Report in accordance with N.J.A.C. 7:26E-3 and 4, a summary of this information will be sufficient.

D. Remedial Action Selection Report (a.k.a. Effectiveness Analysis and Certification): An analysis and certification that the proposed remedial action meets the criteria contained in Section 35 (g) of P.L. 1993, c.139 (also known as S-1070 and the Industrial Site Recovery Act (ISRA)).

1. The analyses are to include long and short term effectiveness, implementability, timeliness, cost differential of permanent and nonpermanent remedies (if applicable), and community concerns. Note that the Effectiveness Analysis and Certification supersedes the Remedial Alternative Analysis in N.J.A.C. 7:26E-5.

E. Summary of Proposed Remedial Actions: Remedial actions and technologies for each area of concern, media to be affected by each technology, and technical information supporting the proposed course of action (N.J.A.C. 7:26E-6.2(a)).

1. Detailed descriptions/specifications of the remedial technologies to be used, construction information, the media to be affected, and their volumes and vertical and horizontal extents, are required pursuant to (N.J.A.C. 7:26E-6.2(a)6). Scaled plot plans are to show where the remedial actions will be conducted.

The following shall be included where appropriate for the proposed remedial technology:

- a. the hydraulic conductivities of aquifers and confining units (include calculations and assumptions);
- b. predicted capture zones (include calculations and maps);

- c. optimum number of ground water and/or air withdrawal points for contaminant control; optimum pumping rates (include calculations);
- d. trench configuration;
 - e. ground water velocity prior to pumping (include calculations);
- f. grain size analyses; and,
 - g. soil Ph and total organic carbon content.
- h. results of any pilot tests, treatability studies and bench scale studies

Section IV of this guide gives more detail on site characterization, aquifer testing, pilot testing, system design, and monitoring requirements for specific remedial technologies.

F. Post Remedial: Post-remedial sampling and monitoring plans for each of the media affected.

G. QA/QC: Quality assurance project plan for proposed sampling and analysis (required pursuant to N.J.A.C. 7:26E-2.2 and 6.2(a)7).

H. Soil and Sediment Erosion: Soil and sediment erosion control and monitoring plan; dust and odor control and monitoring plan, if applicable (N.J.A.C. 7:26E-6.2(a)10).

I. Site Specific Health and Safety Plan: This shall address on-site and off-site concerns (N.J.A.C. 7:26E-6.2(a)11).

J. Site Restoration Plan and Remedial System Dismantling Plan: See N.J.A.C. 7:26E-6.2(a)12 & 13.

K. Proposed Costs: Cost estimate for the proposed remediation (N.J.A.C. 7:26E-6.2(a)14).

This shall include:

- a. capital costs;
- b. operation and maintenance costs;
- c. monitoring system costs;
- d. laboratory costs;
- e. engineering, legal and administrative costs;
- f. contingency costs; and
- g. remedial costs incurred to date (see below).

L. Total Cost to Date: Summary of total costs of remedial actions to date.

These costs shall be broken down as follows:

- a. tank removal and disposal costs;
- b. capital costs including monitoring systems and equipment;
- c. mobilization costs: operation and maintenance including labor, utilities and repairs;
- d. consulting and labor costs including engineering, environmental, legal and administrative costs;
- e. analytical/laboratory costs;
- f. sample collection costs; and
- g. disposal costs including transportation, waste transfer fees and facility tipping fees.

M. Schedule: Specific schedule of implementation. The schedule is to include milestones in accordance with N.J.A.C. 7:26E-6.5(a)15. Appendix 13 provides additional information on the Remedial Action Schedule.

N. Treatment and Disposal Methods: Treatment and disposal methods for contaminated ground water or soil (N.J.A.C. 7:26E-6.3 and 6.4).

O. Checklists: Administrative checklist (Appendix 1) for guidance in formulating the RAW, checklists for RAWs using soil vapor extraction (Appendix 8), natural remediation (Appendix 11), and pump and treat systems (Appendix 12).

II. Cleanup Goals or Levels

The department's most recent guidance on soil cleanup criteria is in the Site Remediation Newsletter (April 1994). Actual cleanup goals at a particular site, however, are determined by the department on a case-by-case basis, and may differ from goals cited in the newsletter. Differences can be based on site specific human health and environmental exposure pathways, the presence of contaminants not addressed in the newsletter, site specific physical characteristics, and other factors. When cleanup criteria are modified from goals previously established for that particular site, the department will notify the responsible party expeditiously. It should be noted that pursuant to Section 36 (e) of P.L. 1993, c.139, after the establishment of a remediation standard, the department can not require a responsible party to remediate to a more stringent standard unless the difference is at least an order of magnitude. Additional requirements are provided in Section 35 (f) of P.L. 1993, c.139 for the use of alternative soil remediation standards.

Any proposals to remediate to levels not consistent with those in the newsletter are to be submitted to the Case Manager. Proposals must specify site specific circumstances and technical rationale which allow or necessitate less stringent cleanup goals, and identify specific areas to be under exception, media to be affected, and concentrations to be attained.

It should also be noted that if soil contamination is not remediated to contaminant concentrations which are at or below the Residential Cleanup Criteria, the appropriate institutional controls, in the form of a Declaration of Environmental Restriction (DER), are required to be implemented prior to the department's issuance of a No Further Action letter pursuant to P.L. 1993, c.139. A model DER is included as Appendix 3. In addition, engineering controls will be required if the concentrations exceed the Non-Residential Criteria. Depending on the current or anticipated use of the property, engineering controls may also be required if concentrations exceed the Residential Cleanup Criteria. Additional information regarding this matter can be found in the Winter 1995 edition of the Site Remediation News.

Ground Water Quality Standards (N.J.A.C. 7:9-6) have been adopted and appear in the New Jersey Register (February 1, 1993).

If it is determined that ground water quality criteria have been exceeded due to a discharge, it will be necessary to establish a Classification Exception Area (CEA). Pursuant to N.J.A.C. 7:9-6.6, the department will establish a CEA for the area of the aquifer that is and will continue to be impacted above the applicable ground water quality criteria. As required in the Technical Requirements for Site Remediation, specifically N.J.A.C. 7:26E-4.4(g)3, the responsible party must determine the full horizontal and vertical extent of ground water contamination exceeding the applicable ground water quality criteria. This will allow the department to establish the boundaries of the CEA. The responsible party must also estimate the duration of the CEA as indicated in the Ground Water Quality Standards at N.J.A.C. 7:9-6.6(d). The CEA will remain in effect until contaminant concentrations have decreased to the applicable ground water quality criteria. The department will be providing additional guidance regarding the establishment of CEAs in the near future.

III. Permits and Approvals

A summary of any permits and approvals necessary to implement the cleanup must be included in the RAW (N.J.A.C. 7:26E-6.2(a)8). All permit applications and requests for approvals are to be submitted either prior to or at the same time as the RAW submission. Copies of all cover letters are to be provided with the RAW.

Among the permits and approvals most commonly needed for the implementation of remedial action are:

POTW approval (Approval for discharge to a Publicly-Owned Treatment Works). The department will not approve a RAW which proposes to discharge to a POTW without the prior written consent of the POTW.

TWA (Treatment Works Approval). Required if ground water will be treated prior to discharge to surface water or to a POTW.

NJPDES-DGW (New Jersey Pollutant Discharge Elimination System - Discharge to Ground Water) Permit. Required for any remedial system which involves direct discharge to ground water (re-injection, overland flow, etc.), and some on-site soil treatment technologies which include a discharge to ground water. The assigned case manager will process the NJPDES-DGW permit and therefore the permit application should be sent directly to the case manager. A NJPDES-DGW permit for re-injection will act as a Treatment Works Approval for discharge to ground water. Note, however, that, in accordance with N.J.A.C. 7:10-13 et seq., a licensed operator is required for the treatment system.

NJPDES-DSW (New Jersey Pollutant Discharge Elimination System - Discharge to Surface Water) Permit. Required if ground water remediation activities result in a discharge to surface water. NJPDES-DSW Category B Permits are for Industrial/Commercial Surface Water Discharge. Category B4B Permits are for General Ground Water Petroleum Products Clean-up (GPPC).

NJPDES-SIU (New Jersey Pollutant Discharge Elimination System - Significant Indirect User) Category L (Indirect Discharge to POTW) Permit. Required for discharge to a POTW in excess of 25,000 gallons per day.

Air discharges. Air discharges from any remedial systems require a permit approved by the New Jersey Office of Air Quality Regulation, Bureau of New Source Review.

Surface or ground water withdrawal in excess of 100,000 gallons per day (or 10,000 gallons or more in critical aquifers) requires approval by the Bureau of Water Allocation.

The recently established Office of Permit Information Assistance (OPIA) provides permit information to the public and assists permit applicants with permit coordination for projects needing permits from more than one program.

OPIA can be reached at (609) 984-0857. Other numbers for permit information are:

NJPDES-DSW or SIU: Bureau of Permit Management, (609) 984-4428

TWA: Bureau of Connection and Construction, (609) 984-4429

Air Permits: Bureau of New Source Review, (609) 292-6716

Ground Water Withdrawal: Bureau of Water Allocation, (609) 292-2957.

Please refer to N.J.A.C. 7:26E-7 for a more comprehensive listing of other potential permits.

The investigation and remediation of contamination which has migrated off-site can often delay the progress of a case.

To assist in this process, P.L. 1993, c.139, provides a cause of action for persons to obtain access to properties not owned by that person for the purpose of conducting remedial activities at that site. Please refer to Appendix 4 for additional information regarding this provision.

Please note that pursuant to N.J.A.C. 7:26E-1.7, the department may require additional work beyond the minimum technical requirements whenever necessary to ensure adequate protection of human health and the environment.

Examples of these scenarios are provided at N.J.A.C. 7:26E-1.7.

IV. Remedial Technologies

The following provides information which should be included in all technically complete Remedial Action Workplans proposing 1) ground water extraction, which may include free product recovery (pump and treat), 2) soil vapor extraction, 3) air sparging, and 4) natural remediation. Remedial actions proposed and implemented according to this guidance will provide the information necessary for evaluation pursuant to N.J.A.C. 7:26E-6 (Technical Requirements

for Site Remediation, Subchapter 6 -Remedial Action). Please note that detailed guidance regarding UST removals and soil excavation proposals can be found in Subchapter 6 of the Technical Requirements for Site Remediation and within the Underground Storage Tank Regulations.

A. Ground Water Extraction and Free Product Recovery Proposals

1. Site Evaluation and Characterization - This information/data is required as part of any Remedial Investigation and Remedial Selection process as per the Technical Requirements for Site Remediation. The below guidance should help the presentation of this information to assist in the department's evaluation as it pertains to the above remedial technology.

a. Geologic characterization - Geologic information in Remedial Investigation Report/Remedial Action Workplans is to provide general and site-specific information on conditions affecting ground water flow. Special emphasis should be given to geologic information which characterizes heterogeneity and anisotropy of the aquifer. Examples of geologic information to be included are soil boring and well logs, fracture orientation measurements, geologic formation characteristics, and depositional environment.

b. Aquifer characterization and pump test data - Site specific aquifer characterization and testing is essential for evaluating ground water extraction and free product recovery systems. Criteria essential for evaluation of any such remediation plan include:

- i. aquifer thickness and depth,
- ii. natural horizontal groundwater flow direction and gradient,
- iii. water table fluctuations,
- iv. hydraulic conductivity,
- v. transmissivity,
- vi. storage coefficient and specific yield,
- vii. effective porosity.

If hydraulic conductivity and transmissivity were not determined adequately in the remedial investigation phase for prediction of the pumping rate necessary to capture the plume, further aquifer testing will be required. The remedial actions being considered should be taken into account when designing the aquifer test. As a general rule, a long duration constant rate pump test will provide more reliable data than a short duration step drawdown test. Likewise a step drawdown test will provide more reliable data than a slug test.

2. System Design - Information on the design (in accordance with N.J.A.C. 7:26E-6.2) and operation of ground water extraction and free product recovery systems is to include, at minimum:

a. Discussion of how the site geology and soils may affect ground water flow patterns and how the system is tailored to address site specific geologic conditions. Include calculations, if any, used to determine well placement;

b. A scaled site map with locations and numbers of all recovery wells and trenches;

c. Construction as-builts or proposals for all recovery wells or trenches to be used for ground water extraction or monitoring;

d. Pumping rates proposed to optimize system operation, drawdown, and capture zone. Calculations for the estimated capture zone should be included. All assumptions and the sources of the input parameters are to be included;

e. A scaled site map showing the predicted capture zone;

- f. Treatment plans for ground water and disposal plans for treated effluent;
 - g. If ground water will be re-injected, any effects the re-injection will have on ground water flow and contaminant migration. State whether or not the re-injected ground water will be recaptured;
 - h. Projected time for the remediation of the ground water contamination; and,
 - i. A post-remedial sampling proposal completed in accordance with N.J.A.C. 7:26E-6. The proposal shall include locations, frequency, and types of analyses to be done on all samples to be used for verification of the remediation.
3. System Monitoring - A monitoring plan adequate to demonstrate whether or not the corrective action is successfully remediating the contamination must be included in accordance with N.J.A.C. 7:26E-6. Any areas of ground water contamination which will not be under hydraulic control must meet the criteria for natural remediation. Proposals prepared according to criteria for natural remediation must be included for these areas. For areas under hydraulic control, the plan should include:
- a. Background ground water quality data;
 - b. A specific monitoring schedule which includes submission of quarterly reports of conditions at the source area of contamination, downgradient and sidegradient compliance monitoring points, and sentinel wells (if appropriate). Compliance monitoring points are downgradient and sidegradient monitoring wells used to determine the effectiveness of corrective action through compliance with the approved ground-water clean up levels;
 - c. Scaled ground water elevation contour maps and contaminant isopleth maps; and,
 - d. Tables including, but not limited to, ground water levels, ground water elevations, and analytical data. In addition, graphs showing changes in contaminant concentration or free product thickness with changes in ground water elevation are beneficial.

B. Soil Vapor Extraction Proposals

This information on soil vapor extraction proposals is modified from "Information Required for Soil Venting Pilot Tests and Systems" (Site Remediation Newsletter, Summer 1994). Additional information and references can be found in the newsletter article.

- 1. Site Evaluation and Characterization - This information/data is required as part of any Remedial Investigation and Remedial Selection process as per the Technical Requirements for Site Remediation. The below guidance should help the presentation of this information to assist in the department's evaluation as it pertains to the above remedial technology.
 - a. Geologic characterization - Geologic and soils information is to provide general and site specific information on conditions affecting air flow and ground water flow. Special emphasis should be given to information which characterizes subsurface heterogeneity and anisotropy. Examples of geologic and soils information to be included are soil boring and well logs, fracture orientation measurements, geologic formation characteristics, and depositional environment. The soil boring logs or text should indicate silt and/or clay content, organic carbon content, and soil permeability. Fence diagrams or cross sections showing soil stratigraphy in the source area should be included.

- b. Artificially created areas of higher or lower permeability that could lessen the effectiveness of soil venting (for example, tank backfill or former building foundations) are to be identified. A scaled plot plan is to show the areal extent of these higher or lower permeability zones.
 - c. Aquifer characteristics and ground water measurements are to include depth to groundwater, seasonal variations, other variations, and parameters determined from pumping and/or slug tests.
 - d. Contaminant distributions in the unsaturated and saturated zones are to be discussed. Scaled plot plans are to show the zone of contamination, contaminant concentration isopleths, locations in which free product has been reported, and free product isopleths. Preferential potential pathways of migration resulting from stratigraphic variability are to be evaluated.
 - e. Age, characteristics, and composition of contaminants are to be included.
2. Pilot Testing - All sites proposed for soil venting shall be pilot tested. Pilot testing is to be conducted during the remedial investigation phase in accordance with N.J.A.C. 7:26E-4.9, so that the technical performance, effectiveness, and reliability of soil vapor extraction in achieving and maintaining compliance with remediation standards and health risk levels can be evaluated according to the criteria in section 35g. of P.L. 1993 c. 139 (S-1070).
- a. Air Pollution Control Permits for Pilot Testing - Soil venting can potentially discharge contaminants to the atmosphere. Unless the department determines that the proposal meets the criteria for a pilot test, an Air Pollution Control Permit and Certificate is required pursuant to N.J.A.C. 7:27-8.2(a)15. Prior to any pilot test, the responsible party shall obtain and submit the appropriate New Jersey Air Pollution Control Permit applications. The test may not begin until the department gives the responsible party written approval. See Appendix 7 for additional information.
 - b. The following information and results shall be submitted after pilot tests are completed:
 - i. A scaled plot plan showing all vent wells, trenches, and monitoring points used in the test;
 - ii. Design of wells and trenches used in the pilot test. List screen lengths and diameters, slot sizes, depths and specifications of filter pack and seals, borehole diameters and drilling methods;
 - iii. Vacuum pressures and flow rates from vent wells or trenches; times of readings (in minutes from the beginning of the test);
 - iv. Vacuum pressures from a minimum of three monitoring points; time of each change in vacuum pressure (in minutes from the beginning of the test);
 - v. A scaled plot plan showing vacuum isopleths for at least three different air flow rates;
 - vi. Vent gas concentration and composition at timed intervals through the test; time of sample extraction (in minutes from the beginning of the test). At least one sample shall be analyzed for volatile organics using EPA Method 18, 5030/8020. The sample shall be a combined sample of all vent gases from all venting points, and represent total influent gas concentrations prior to treatment. Other concentration measurements may be made using field equipment;
 - vii. Vapor concentrations from wells, monitoring points, and the trench system just before the end of the test. Samples may be analyzed using field equipment;

- viii. Ground water levels in the venting wells or trench system area before the beginning of the test, at each vacuum pressure level during the test, and just before the end of the test. Ground water levels are to be measured using a pressure transducer;
 - ix. Contaminant removal rates for the system. Calculations are to be shown;
 - x. Air permeability of the vadose zone. Calculations are to be shown; and,
 - xi. Estimated zone of influence. The zone of influence is to be shown on a scaled plot plan. Field data and assumptions used to make the estimate are to be tabulated and discussed. Calculations are to be shown. Note that the zone of influence shall be estimated from data collected in all directions from the extraction points.
3. System Design - Information on the design (in accordance with N.J.A.C. 7:26E-6.2) and operation of the proposed remediation system is to include, at minimum:
- a. Discussion of pilot test results. This should include problems identified in the test and design modifications to compensate for these problems;
 - b. Discussion of how the site geology may affect air and water flow, and how the system is tailored to address site specific geologic conditions. Include calculations, if any, used to determine well placement;
 - c. A scaled site map with numbers and locations of all vent wells, trenches, and monitoring points. The site map shall include the projected radius of influence of the system. Calculations used to estimate the radius of influence;
 - d. Construction as-builts or proposals for all wells, trenches, and monitoring points; a schematic diagram of the manifolding system used to connect multiple wells and trenches to the treatment system;
 - e. Air flow rates proposed to optimize system operation;
 - f. The method proposed for vent gas treatment;
 - g. If ground water is not going to be pumped to keep the vadose zone dewatered, an evaluation of the potential for ground water upwelling near venting wells and trenches. If there is a potential for upwelling, the proposal is to include evaluations as to whether the upwelling will affect 1) air flow through the area to be vented, or 2) contaminant migration within or into the ground water. Contaminant distribution and migration in the ground water is of particular concern where there is, or has been, soil contamination or free product;
 - h. The time projected for remediation of volatile organic contaminants to site specific cleanup criteria. This discussion shall be supported with projected removal rates and vacuum pressure data. If the volume of the spill is known, the remediation time may be calculated directly; and,
 - i. A post-venting (post-remedial) soil sampling proposal completed in accordance with N.J.A.C. 7:26E-6. The proposal shall include the location, depths, and analyses to be done on all soil samples to be used for verification of the remediation. A ground water monitoring program, which may be included as part of the system monitoring program, below, shall also be addressed as part of the post-remedial phase.
4. System Monitoring - A monitoring plan adequate to demonstrate whether or not soil venting is successfully remediating the contamination is an important part of the remedial effort. The following performance monitoring requirements shall be included:

- a. Monitoring and reporting, pursuant to N.J.A.C. 7:26E-6, is to include, at minimum:
 - i. Air flow rates (in standard cubic feet per minute). Air flow data are to be shown as tables;
 - ii. Vacuum pressures at wells, trenches, and monitoring points. Vacuum data are to be shown as tables;
 - iii. Laboratory analysis of the concentration and composition of the venting well gas using EPA Method 18, 5030/8020;
 - iv. Vapor concentrations at monitoring points. These can be measured using field monitoring equipment);
 - v. Scaled contour maps showing 1) vacuum pressures at wells, trenches, and monitoring points; and 2) vapor concentrations at wells, trenches, and monitoring points; and,
 - vi. Estimated removal rates of vapor and liquid product from the soil matrix.
 - b. Cleanup Verification - Proposed means of verifying that the cleanup has met the criteria intended from soil venting; justification for system shutdown. It is recommended that the proposal include:
 - i. Tables and graphs of monitoring data, including removal rates as a function of time, and,
 - ii. Tables and graphs showing trends in contaminant distribution in the vent gas as a function of boiling point. Changes over time in relative abundances may indicate significant decreases in the total abundance of more volatile compounds. Boiling points of a few common contaminants are:
 - Propane to Isopentane (-50° - 28° C)
 - Isopentane to Benzene (28° - 80° C)
 - Benzene to Toluene (80° - 111° C)
 - Toluene to Xylenes (111° - 144° C)
 - Xylenes to Methylnaphthalene (144° - 250° C).
 - iii. A Post Remedial soil sampling plan in accordance with N.J.A.C. 7:26E-6.4.
- A chemical index should be consulted for boiling points of compounds not listed above. Most chlorinated volatile organics have boiling points ranging between 74 and 121 degrees Celsius.

C. Air Sparging Proposals Combined With Soil Vapor Extraction

- Prior to the department approving an air sparging proposal, the responsible party must demonstrate that all volatile organic contaminants liberated during the air sparging will be captured utilizing soil vapor extraction.
- 1. Site Evaluation and Characterization - This information/data is required as part of any Remedial Investigation and Remedial Selection process as per the Technical Requirements for Site Remediation. The below guidance should help the presentation of this information to assist in the department's evaluation as it pertains to the above remedial technology.
 - a. Geologic characterization - Geologic and soils information is to provide general and site specific information on conditions affecting air flow and ground water flow. Special attention should be given to information which characterizes subsurface heterogeneity and anisotropy. Examples of geologic and soils information to be included are soil boring and well logs, fracture orientation measurements, geologic formation characteristics, and depositional environment. The soil boring logs or text should indicate grain size determined by sieve analysis, silt and/or clay content, organic carbon content, and soil

permeability. Fence diagrams or cross sections showing soil stratigraphy in the source area should be included.

- b. Artificially created areas of higher or lower permeability that could lessen the effectiveness of air sparging (for example, tank backfill or former building foundations) are to be identified. A scaled plot plan is to show the areal extent of these higher or lower permeability zones.
 - c. Aquifer characteristics and ground water measurements are to include depth to groundwater, seasonal variations, other variations, and parameters determined from pumping and/or slug tests.
 - d. Contaminant distributions in the unsaturated and saturated zones are to be discussed. Scaled plot plans are to show the zone of contamination, contaminant concentration isopleths, locations in which free product has been reported, and free product isopleths. Preferential potential pathways of migration resulting from stratigraphic variability are to be evaluated.
 - e. Age, characteristics, and composition of contaminants are to be included.
2. Pilot Testing - All sites proposed for air sparging shall be pilot tested. Pilot testing is to be conducted during the remedial investigation phase in accordance with N.J.A.C. 7:26E-4.9, so that the technical performance, effectiveness, and reliability of air sparging in achieving and maintaining compliance with remediation standards and health risk levels can be evaluated according to the criteria in section 35g. of P.L. 1993 c. 139 (S-1070).

a. Permits for Pilot Testing

Air Pollution Control Permit - Air sparging can potentially discharge contaminants to the atmosphere. Unless the department determines that the proposal meets the criteria for a pilot test, an Air Pollution Control Permit and Certificate is required pursuant to N.J.A.C. 7:27-8.2(a)15. Prior to any pilot test, the responsible party shall obtain and submit the appropriate New Jersey Air Pollution Control Permit applications. The test may not begin until the department gives the responsible party written approval. See Appendix 7 for additional information.

NJPDES-DGW (New Jersey Pollution Discharge Elimination System - Discharge to Ground Water) permit - A NJPDES-DGW permit may be required if the responsible party injects anything other than air or oxygen. The injection of liquids during a pilot test, however, may be authorized under a permit-by-rule pursuant to N.J.A.C. 7:14A-2.15 (see the September 6, 1994 NJ Register).

b. The following information should be submitted for pilot tests:

- i. A scaled plot plan showing the location and number of sparging wells, vapor extraction wells, soil gas probes, and other monitoring devices;
- ii. Design of all wells used in the pilot test. List screen lengths and diameters, slot sizes, depths and specifications of filter pack and seals, borehole diameters and drilling methods;
- iii. Air flow rates at both injection and extraction points, air pressures, injected air temperatures; times of readings (in minutes from the beginning of the test);
- iv. Contaminant concentrations in vent wells or soil gas probes at different air flow rates, and at timed intervals through the test; times of sample extraction (in minutes from the beginning of the test). At least one sample shall be analyzed for volatile organics using EPA Method 18, 5030/8020. The sample shall be a combined sample of gases from all monitoring points, and represent gas

concentrations prior to treatment. Other contaminant concentration measurements may be made using field equipment;

v. Hydrogeologic conditions at the site before, during and after the pilot test. A table showing water levels, water elevation and dates of measurements. Evaluate any mounding effects, trends in contaminant concentrations, changes in dissolved oxygen, etc.;

vi. Contaminant removal rates for the system. Calculations are to be shown;

vii. Estimated zones of influence. The zones of influence of air sparging and soil vapor extraction systems are to be shown on a scaled plot plan. Field data and assumptions used to make the estimate are to be tabulated and discussed. Calculations are to be shown. Note that the zones of influence of air sparging and SVE shall be estimated from data collected in all directions from the sparge and extraction points.

3. System Design - Information on the design (in accordance with N.J.A.C. 7:26E-6.2) and operation of the proposed remediation system is to include, at minimum:

a. Discussion of pilot test results. This should include problems identified in the test and design modifications to compensate for these problems;

b. Discussion of how the site geology and soils may affect air flow patterns and how the system is tailored to address site specific geologic conditions including any man made structures such as basements, subsurface utilities, etc. Include calculations, if any, used to determine well placement;

c. A scaled site map with numbers and locations of all sparge and vent wells, and monitoring points. The site map shall include the projected radius of influence of the system. Calculations used to estimate the radius of influence are to be included;

d. Construction as-builts or proposals for all wells and monitoring points. Schematic diagrams of manifolding systems used to connect multiple wells and trenches to the sparging and treatment systems. The vertical delineation of ground water contamination must be determined and the sparge points installed with the screens below the contaminated zone;

e. Air flow rates proposed to optimize system operation;

f. The method proposed for vent gas treatment;

g. Discussion of changes in groundwater flow that may be caused by air sparging. The discussion is to evaluate methods to prevent the migration of contaminants from inside the zone of influence to outside;

h. The time projected for remediation of the volatile organic contamination to the site specific cleanup criteria; and,

i. A post-remedial sampling proposal completed in accordance with N.J.A.C. 7:26E-6. The proposal shall include locations, depths, and types of analyses to be done on all water and soil gas samples to be used for verification of the remediation. A ground water monitoring program, which may be included as part of the system monitoring program, below, shall also be addressed as part of the post-remedial phase.

4. System Monitoring - A monitoring plan adequate to demonstrate whether or not air sparging is effectively remediating the contaminant plume must be included in accordance with N.J.A.C. 7:26E-6. The effectiveness

of the corrective action measures shall be demonstrated at the source area and downgradient/sidegradient monitoring points using ground water quality and hydraulic monitoring. The plan shall include:

- a. Quarterly progress reports;
- b. Vapor and ground water sampling at monitoring points within and outside the zones of influence;
- c. Scaled water table contour maps and contaminant isopleth maps; and,
- d. Tables including, but not limited to, flow rate measurements at injection and extraction points, ground water levels, ground water elevations, and analytical data.

D. Natural Remediation Proposals

The department can not approve a Natural Remediation Compliance Program as the only remedy for ground water unless the following conditions have been met:

1. The down gradient extent of the dissolved phase contaminant plume is fully delineated;
2. All sources of contamination and free product, including residually contaminated soil (soil in areas presently or previously containing free product) have been identified and remediated. It may also be acceptable to concurrently conduct remediation of residual soil contamination in conjunction with natural remediation of ground water.
3. Levels of contamination, based on completed aquifer testing, do not currently extend to, and are not expected to migrate to, any potential human or ecological receptor within the criteria specified in item C, below.

All natural remediation proposals shall, at minimum:

1. Demonstrate that the contaminant degradability or site attenuation capacity is sufficient to allow remediation to the proposed levels within the estimated time for remediation;
2. Identify site-specific characteristics that make natural degradation and/or attenuation feasible. Characteristics may include favorable levels for vadose zone permeability, aquifer permeability, soil moisture content, oxygen level, CO₂ level, Ph, ReDox potential, organic matter content, nutrient levels, and microorganism counts. Values may be based on field or laboratory measurements. It is unacceptable to rely solely on extrapolation from literature or studies from other sites;
3. Propose a sentinel well system. Sentinel wells shall be located between the furthest down gradient edge of the plume and any potential human or ecological receptor, and be designed to detect ground water contamination prior to its reaching any receptor. Sentinel wells shall not exhibit any contaminants in excess of the Ground Water Quality Standards, N.J.A.C. 7:9-6, and may not be located more than five years travel time for the identified contaminants from the down gradient edge of the plume and no closer than one to three years travel time to the nearest receptor. Sentinel well location shall be based, in part, on aquifer testing, which may include ground water modeling. Testing shall adequately define aquifer characteristics including hydraulic conductivity, transmissivity, storativity and rate of ground water and contaminant flow (include retardation calculations). Documentation for access to off site sentinel wells shall be submitted;
4. A ground water monitoring proposal including, at minimum, collection and reporting of:

- a. Ground water quality and elevation data from monitoring wells in the former source area. Source area monitoring is intended to evaluate the adequacy of source control and track contaminant levels over time. Decreasing contaminant levels must be demonstrated in these wells;
 - b. Ground water quality and elevation data from downgradient monitoring wells within the contaminant plume. This data is intended to track the degradation and attenuation of the contaminant plume. Decreasing contaminant levels must also be demonstrated in these wells;
 - c. Ground water quality and elevation data from the sentinel well system. These wells are intended to detect contamination in the ground water prior to reaching any potential human or ecological receptor.
5. Documentation regarding the current and potential ground water uses based on a 25 year planning horizon;
 6. Verification of written notification to potentially effected down gradient property owners.

V. Progress Report Submittal

Remedial Action Progress Reports are to be submitted for the duration of the cleanup in accordance with N.J.A.C. 7:26E-6.5(b) and (c) and reproduced as Appendix 12 of this guide.

APPENDIX 1

ADMINISTRATIVE

CHECKLIST

FOR REMEDIAL

ACTION

WORKPLANS

Administrative Checklist For Remedial Action Workplans in accordance N.J.A.C 7:26E

Facility Name: _____

Case #: _____

UST #: _____

<u>General</u>	Check one:	YES	NO	N/A
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1. Table of Contents	_____	_____	_____
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Specific

1. Introduction and summary of site conditions, including areas of concern, data summary, scaled site maps, potential receptors, etc. (SI/RI Report or summary) (N.J.A.C. 7:26E-6.2(a)1 & 2)	_____	_____	_____
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2. Remedial Action Selection Report (aka Effectiveness Analysis and Certification) as per P.L. 1993, c. 139, Section 35	_____	_____	_____
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3. Soil remediation plan	_____	_____	_____
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a. Detailed description of remedial action and remedial technology for each area of concern (N.J.A.C. 7:26E-6.2(a)5)	_____	_____	_____
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b. Post-remedial sampling (N.J.A.C. 7:26E-6.3 & 6.4)	_____	_____	_____
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c. Cleanup goals (compound specific) (N.J.A.C. 7:26E-6.2(a)4)	_____	_____	_____
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d. Scaled site maps (N.J.A.C. 7:26E-4.9 and 6.2(a)6)	_____	_____	_____
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e. Permit requirements/applications (N.J.A.C. 7:26E-6.2(a)8)	_____	_____	_____
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f. System specifications and construction information (N.J.A.C. 7:26E-6.2(a)9)	_____	_____	_____
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g. Soil erosion and sediment control plan (N.J.A.C. 7:26E-6.2(a)10)	_____	_____	_____
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h. Soil disposal/soil re-use plan (N.J.A.C. 7:26E-6.4(b))	_____	_____	_____
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4. Ground water remediation plan	_____	_____	_____
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a. Plume(s) delineated	_____	_____	_____
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b. Wells properly constructed	_____	_____	_____
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c. Flow direction defined, including ground water elevation contour maps	_____	_____	_____
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	Check one:	YES	NO	N/A
d. Detailed description of remedial action and remedial technology for each area of concern (N.J.A.C. 7:26E-6.2(a)5)		_____	_____	_____
e. Cleanup goals (compound specific) (N.J.A.C. 7:26E-6.2(a)4)		_____	_____	_____
f. Remedial monitoring plan/effectiveness evaluation plan		_____	_____	_____
g. Hydraulic control information/maintenance		_____	_____	_____
h. Treated water discharge location		_____	_____	_____
i. Scaled site maps per N.J.A.C. 7:26E-4.9 and 6.2(a)6		_____	_____	_____
j. Permit requirements/applications (N.J.A.C. 7:26E-6.2(a)8)		_____	_____	_____
k. System specifications and construction information (N.J.A.C. 7:26E-6.2(a)9)		_____	_____	_____
5. Data presentation format and quality assurance project plan (N.J.A.C. 7:26E-6.2(a)7)		_____	_____	_____
6. Site Specific Health and Safety Plan (N.J.A.C. 7:26E-6.2(a)11)		_____	_____	_____
7. Site restoration plan and remedial system dismantling plan (N.J.A.C. 7:26E-6.2(a)12 & 13)		_____	_____	_____
8. Cost estimate (N.J.A.C. 7:26E-6.2(a)14)		_____	_____	_____
9. Schedule of implementation (N.J.A.C. 7:26E-6.2(a)15)		_____	_____	_____

Note: all "no" and "n/a" responses must be accompanied by supporting rationale.

APPENDIX 2

GUIDELINES

FOR DATA

PRESENTATIONS

Guidelines for Data Presentation

For a detailed description of all data analyses and presentation requirements, please refer to N.J.A.C. 7:26E-2.

I. Data Requirements

A. The following information shall be included with the results of sampling:

1. Logs for all soil borings and wells.
2. Soil profile logs for all excavations.
3. Monitoring Well Certification Forms: Form A (As-Built Certification) and Form B (Location Certification) shall be completed for each monitoring well installed. Form A shall be submitted with the results of sampling. Because additional wells are sometimes required to complete a hydrogeologic investigation, Form B may be submitted after completion of the installation of all required ground water monitoring wells, unless required prior to that time by the department. As-built diagrams of all wells shall be included with Form A.
4. A minimum of two ground water elevation contour maps, including depth to ground water and reference point elevation, with depth to water readings taken at least 30 days apart. A table shall be constructed with each contour map that includes the following data for each well:
 - a. monitoring well number;
 - b. elevation of the top of well casing;
 - c. total depth of well from top of casing;
 - d. depth to the screened or open bore hole section of the well from the top of well casing;
 - e. length of screened or open bore hole section of the well;
 - f. depth to ground water prior to purging and sampling from top of well casing;
 - g. elevation of ground water prior to purging and sampling; and,
 - h. thickness of immiscible product prior to purging and sampling (if present).

If applicable, depth to ground water readings taken prior to purging shall be used for contouring purposes. Any corrections made to the static water level due to the presence of free product shall be reported, along with the thickness of the product layer.

5. The following information before purging a monitoring well:

- a. date, time and weather conditions;
- b. well number and well permit number;
- c. photoionization detector (PID) readings collected from the well immediately after the cap is removed;
- d. check for free product and measure thickness, if present;
- e. pH, dissolved oxygen, temperature and specific conductivity;
- f. total depth of well from top of casing or surveyor's mark, if present;
- g. depth from top of casing to the top of screen;
- h. depth from top of casing to water; and,
- i. estimated water volume in well.

6. The following information after purging a monitoring well:

- a. start and end time of purging;
- b. purge method;
- c. purge rate(s);

- d. total volume purged;
- e. depth to water after purging; and,
- f. pH, dissolved oxygen, temperature and specific conductivity.

7. The following information before sampling a monitoring well:

- a. depth from top of casing to water before sampling.

8. The following information after sampling a monitoring well:

- a. start and end time of sampling;
- b. pH, dissolved oxygen, temperature and specific conductivity; and,
- c. sampling method.

Any comments concerning field observations during the ground water sampling event, i.e. slow recharge, turbidity, odor, sheen, PID readings, etc. shall also be reported.

9. A scaled site map which lists the concentrations of all significant contamination found at all sampling locations. The map shall contain all well and soil boring locations. The labeling of data shall be keyed to facilitate interpretation, especially at locations where more than one type of contaminant is found. The use of contaminant isopleth maps is also encouraged.

B. Hand bailing should not be used as an evacuation method for the purging of monitoring wells unless prior departmental approval has been obtained. When the depth to ground water is less than 25 feet, a surface pump should be used. A submersible pump may be used when the depth to ground water exceeds 25 feet. The pump or tubing intake should not be fixed throughout purging. Rather, the pump or tubing intake should be carefully raised and lowered within the first six feet of the water column to ensure that the column of water to be sampled has been purged sufficiently. The rate for the last well volume purged should not exceed one gallon per minute. This will ensure minimal disturbance of the water to be sampled. Please refer to the May, 1992 edition of the "NJDEPE Field Sampling Procedures Manual" for additional guidance.

C. Ground water samples shall not be collected within the first two weeks following development of the wells.

D. The case manager shall be notified at least two weeks prior to the drilling of monitoring wells.

II. Data Format

A. The results of sampling shall be provided in a tabular format. Information shall include the sample number, location, interval and depth of sample, and the sample matrix.

B. Laboratory deliverables shall be identified and separated from the submittal, discussion, conclusions and data summary sheets. The attached Laboratory Deliverables checklist shall be completed and returned with all analytical data packages.

LABORATORY DELIVERABLES

THIS FORM MUST BE COMPLETED BY THE LABORATORY OR ENVIRONMENTAL CONSULTANT AND ACCOMPANY ALL DATA SUBMISSIONS

The following laboratory deliverables shall be included in the data submission. All deviations from the accepted methodology and procedures, or performance values outside acceptable ranges shall be summarized in the Non-Conformance Summary. The "Technical Requirements for Site Remediation", N.J.A.C. 7:26E, which became effective on July 1, 1993, provide further details. The document shall be bound and paginated, contain a table of contents, and all pages shall be legible. Incomplete packages may be returned or held without review until the data package is completed.

It is recommended that the analytical results summary sheets, listing all targeted and non-targeted compounds with the method detection limits and the laboratory and/or sample numbers, be included in one section of the data package and in the main body of the report.

Check if Complete

- 1. Cover Page, Title Page listing Lab Certification number, facility name and address, and date of report _____
- 2. Table of Contents _____
- 3. Summary Sheets listing analytical results for all targeted and non-targeted compounds _____
- 4. Summary Table cross-referencing field ID numbers vs. Lab ID numbers _____
- 5. Document bound, paginated and legible _____
- 6. Chain of Custody submitted _____
- 7. Samples submitted to lab within 48 hours of sample collection _____
- 8. Methodology Summary submitted _____
- 9. Laboratory Chronicle and Holding Time Check _____
- 10. Results submitted on a dry weight basis (if applicable) _____
- 11. Method Detection Limits _____
- 12. Lab Certified by NJDEP for parameters or appropriate category of parameters or lab is a member of the USEPA CLP _____

Laboratory Manager or Environmental Data Consultant's Signature

GC/MS ANALYSIS CONFORMANCE/NON-CONFORMANCE SUMMARY FORM

Yes No

1. Chromatograms Labeled/Compounds Identified _____
(Field Samples and Method Blanks)

2. GC/MS Tune Specifications
a. BFB Meets Criteria _____
b. DFTPP Meets Criteria _____

3. GC/MS Tuning Frequency -
Performed every 24 hours for 600 series and 12 hours for 8000 series _____

4. GC/MS Calibration -
Initial Calibration performed before sample analysis and continuing calibration performed within 24 hours of sample analysis for 600 series and 12 hours for 8000 series _____

5. GC/MS Calibration Requirements
a. Calibration Check Compounds _____
b. System Performance Check Compounds _____

6. Blank Contamination -
If yes, list compounds and concentrations in each blank: _____

a. VOA Fraction _____

b. B/N Fraction _____

c. Acid fraction _____

7. Surrogate Recoveries Meet Criteria _____

If not met, list those compounds and their recoveries which fall outside the acceptable range:

Yes No

a. VOA Fraction _____

b. B/N Fraction _____

c. Acid fraction _____

If not met, were the calculations checked and the results qualified as "estimated"? _____

8. Matrix Spike/ Matrix Duplication Recoveries Meet Criteria _____
(If not met, list those compounds and their recoveries which fall outside the acceptable range)

a. VOA Fraction _____

b. B/N Fraction _____

c. Acid fraction _____

9. Internal Standard Area/Retention Time Shift Meet Criteria _____

10. Extraction Holding Time Met _____

If not met, list number of days exceeded for each sample:

11. Analysis Holding Time Met _____

If not met, list number of days exceeded for each sample:

Additional Comments: _____

Laboratory Manager: _____ Date: _____

GC ANALYSIS CONFORMANCE/NON-CONFORMANCE SUMMARY FORM

Yes No

1. Chromatograms Labeled/Compounds Identified _____
(Field Samples and Method Blanks)

2. Standards Summary Submitted _____

3. Calibration - Initial Calibration performed before sample analysis and continuing calibration performed within 24 hours of sample analysis _____

4. Blank Contamination - If yes, list compounds and concentrations in each blank: _____

a. VOA Fraction _____

b. B/N Fraction _____

c. Acid Fraction _____

d. Pesticides/PCB's _____

e. Other _____

5. Surrogate Recoveries Meet Criteria _____

If not met, list those compounds and their recoveries which fall outside the acceptable range:

a. VOA Fraction _____

b. B/N Fraction _____

c. Acid Fraction _____

d. Pesticides/PCB's _____

e. Other _____

YesNo

6. Matrix Spike/ Matrix Duplication Recoveries Meet Criteria _____
(If not met, list those compounds and their recoveries which fall outside the acceptable range)

a. VOA Fraction _____

b. B/N Fraction _____

c. Acid fraction _____

d. Pesticides/PCB's _____

e. Other _____

7. Retention Time Shift Meet Criteria (If applicable) _____

8. Were samples run on dissimilar columns? _____

9. Extraction Holding Time Met _____

If not met, list number of days exceeded for each sample:

10. Analysis Holding Time Met _____

If not met, list number of days exceeded for each sample: _____

Additional Comments:

Laboratory Manager: _____ Date: _____

METAL ANALYSIS CONFORMANCE/NON-CONFORMANCE SUMMARY FORM

NOYES

1. Calibration Summary Meet Criteria _____

2. ICP Interference Check Sample Results Summary Submitted
(if applicable) / Meet Criteria _____

3. Serial Dilution Summary Submitted
(if applicable) / Meet Criteria _____

4. Laboratory Control Sample Summary Submitted
(if applicable) / Meet Criteria _____

5. Blank Contamination - If yes, list compounds and concentrations
in each blank:

6. Matrix Spike/ Matrix Spike Duplication Recoveries Meet Criteria _____
(If not met, list those compounds and their recoveries
which fall outside the acceptable range)

7. Extraction Holding Time Met _____

If not met, list number of days exceeded for each sample: _____

8. Analysis Holding Time Met _____

If not met, list number of days exceeded for each sample: _____

Additional Comments: _____

Laboratory Manager: _____ Date: _____

PHC ANALYSIS CONFORMANCE/NON-CONFORMANCE SUMMARY FORM

NOYES

1. Blank Contamination - If yes, list the sample and the _____
corresponding concentration in each blank:

2. Matrix Spike/ Matrix Spike Duplicate Recoveries Meet Criteria _____
(If not met, list the sample and corresponding recovery
which falls outside the acceptable range)

3. IR Spectra submitted for all standards, blanks, and samples _____

4. Chromatograms submitted for all standards, blanks, and samples
if GC fingerprinting was conducted _____

5. Extraction Holding Time Met _____

If not met, list number of days exceeded for each sample: _____

6. Analysis Holding Time Met _____

If not met, list number of days exceeded for each sample: _____

Additional

Comments:

Laboratory Manager: _____ Date: _____

APPENDIX 3

MODEL DECLARATION OF ENVIRONMENTAL RESTRICTION

Model Declaration of Environmental Restriction

DECLARATION OF ENVIRONMENTAL RESTRICTIONS

Prepared by:

[Signature]

[Print name below signature]

This Declaration of Environmental Restrictions, made as of the ____ day of _____, 19__, by [Name and address of current property owner or owners] (together with his/her/its/their successors and assigns, collectively "Owner").

WITNESSETH:

WHEREAS, Owner is the owner in fee simple of certain real property (the "Property") designated as Lot____, Block____, on the tax map of the [City/Borough/ Township/Town] of [Name of municipality], _____ County, more particularly described on Exhibit A attached hereto and made a part hereof; and

WHEREAS, the New Jersey Department of Environmental Protection ("department") has issued a remedial approval on -- --, 19--, in Case #/Case Name ----- concerning the Property in which the department has approved the use of non-residential soil standards, institutional controls, and/or engineering controls in accordance with P. L. 1993 c. 139 (S-1070); and

WHEREAS, this Declaration itself is not intended to create any interest in real estate in favor of the department, nor to create a lien or encumbrance against the Property, but merely is intended to reflect the regulatory and statutory obligations imposed as a condition of using non residential standards: and

WHEREAS, the areas described on Exhibit B attached hereto and made a part hereof (the "Affected Areas") contain contaminants;

WHEREAS, the type, concentration and specific location of the contaminants are described on one or more diagrams, maps and/or tables on Exhibit B attached hereto and made a part hereof; and

[Other WHEREAS clauses may be added to provide notice of additional site-specific concerns, such as:

WHEREAS, to prevent the potential for migration of the contaminants and unacceptable risk of exposure to the contamination to humans or the environment, an [impermeable/permeable] surface cover is in place at the Property, at the location shown on Exhibit B; and]

WHEREAS, in accordance with the remedial approval, and in consideration of the terms and conditions of the remedial approval, and other good and valuable consideration Owner has agreed to subject the property to certain statutory and regulatory requirements which impose restrictions upon the use of the Property, and to restrict certain activities at the Property, as set forth below; and

WHEREAS, Owner intends to notify all interested parties that such regulatory and statutory restrictions shall be binding upon and enforceable against Owner and Owner's successors and assigns while such own and/or operate at the Property.

NOW, THEREFORE, Owner agrees to be subject to the regulatory and statutory requirements applicable to those who seek to remediate property to non-residential standards and hereby notifies all interested parties, Owners, and operators that the applicable regulations and statutes require of Owner and operators while owning or operating the Property as follows:

1. Restricted Uses. Owner, and all Operators of such portions of the Property, shall not allow any of the following uses of the following portions of the Property:

<u>Portion of the Property</u>	<u>Restricted Use</u>
The Affected Areas as identified in Exhibit B.	The use shall be restricted pursuant to Paragraphs 2 and 3.
[Describe other portions of the Property by reference to Exhibits referenced in the WHEREAS clauses above]	[Describe nature of restricted use]

2. Emergencies. In the event of an emergency which presents a significant risk to human health, safety, or the environment, the application of Paragraph 1 above may be unilaterally suspended, by Owner, provided the Owner:

- i. Immediately notifies the department of the emergency;
- ii. Limits both the actual disturbance and the time needed for the disturbance to the minimum reasonably necessary to adequately respond to the emergency;
- iii. Implements all measures necessary to limit actual or potential, present or future risk of exposure to the residual contamination to humans or the environment; and
- iv. Implements restoration of the Affected Areas to the pre-emergency conditions to the extent reasonably possible, and provides a report to the department of such emergency efforts.

3. Alterations, Improvements, and Disturbances. Owner and operators shall not make, nor allow to be made, any alteration, improvement, or disturbance in, to, or about the Affected Areas which creates an unacceptable risk of exposure to contamination in the Affected Areas to humans or the environment, or results in a disturbance of any engineering control designed to contain or reduce exposure to the contaminants, without first obtaining the express written consent of the department, which consent shall be given or withheld at the reasonable discretion of the department. Nothing herein shall constitute a waiver of the Owner's obligation to comply with all applicable laws and regulations.

Express written consent of the department is not required for alteration, improvement, or disturbance that meets the following:

- provides for restoration of any disturbance of an engineering control to pre-disturbance conditions within sixty days,
- does not allow an exposure level above those noted under Restricted Uses, provided that all applicable worker health and safety laws and regulations are followed during the alteration, improvement, or disturbance

4. Notice to Lessees and Other Holders of Property Interests.

(a) Owner shall cause all leases, grants, and other written transfers of interest by the Owner in the Affected Areas and adjacent to the Affected Areas to contain a provision expressly requiring all holders thereof to take the property subject to the use restriction and not to violate any of the conditions of this Declaration of Environmental Restrictions.

(b) Nothing contained in this paragraph 4 shall be construed as limiting any obligation of Owner to provide any notice required by any law, regulation, or order of any governmental authority.

5. Enforcement of violations. The restrictions provided herein are for the benefit of, and shall be enforceable against any person who knowingly violates this Declaration, solely by the department. A violation of this Declaration of Environmental Restrictions, shall not have an adverse impact on the status of the ownership of and title to the Property. To enforce violations of this Declaration of Environmental Restrictions, the department may initiate an action in Superior Court or as otherwise allowed by law against any person who is in any way responsible for a violation hereof and seek all available

remedies, including without limitation, penalties and injunctive relief. Such enforcement proceedings shall not be initiated against past owners or operators who have not violated this Declaration.

6. Severability. If any court or other tribunal determines that any provision of this Declaration is invalid or unenforceable, such provision shall be deemed to have been modified automatically to conform to the requirements for validity and enforceability as determined by such court or tribunal. In the event that the provision invalidated is of such a nature that it cannot be so modified, the provision shall be deemed deleted from this instrument as though it had never been included herein. In either case, the remaining provisions of this Declaration shall remain in full force and effect.

7. Successors and Assigns. This Declaration shall be binding upon Owner and upon Owner's successors and assigns, and the department, its agents, contractors, and employees, and to any other person performing remediation under the direction of the department.

8. Termination and Modification.

(a) This Declaration shall terminate only upon filing of an instrument, executed by the department, in the office of the [Clerk/Register of Deeds and Mortgages] of [Name of county] County, New Jersey, expressly terminating this Declaration.

(b) Owner may request in writing at any time that the department modify or terminate this Declaration of Environmental Restrictions or execute termination proceedings based on, for example, the owner's proposal that the property does not pose an unacceptable risk to human health or the environment. Within 90 calendar days after receiving the request the department shall either:

- i. execute the termination or modification Declaration; or
- ii. issue a draft notice of intent to deny.

The department shall set forth in a draft notice of intent to deny the request its basis for its decision. The owner can respond to the draft denial by providing new or additional information or data. The department shall review any such new or additional information and issue a final decision to execute the agreement or deny the request within 60 calendar days of the department's receipt of the owner's response.

IN WITNESS WHEREOF, owner has executed this Declaration as of the date first written above.

[If Owner is an individual]

WITNESS:

[Print name below signature] [Print name below signature]

-----[If Owner is a corporation]

ATTEST: [Name of corporation]
_____ By: _____

[Print name and title] [Print name and title]

-----[If Owner is a general or limited partnership]

WITNESS: [Name of partnership]
_____ By: _____

_____, General Partner
[Print name and title] [Print name and title]

(If Owner is an individual)

STATE OF [State where document is executed]

SS.:

COUNTY OF [County where document is executed]

I certify that on _____, 19____, [Name of Owner]

personally came before me, and this person acknowledged under oath, to my satisfaction, that this person [or if more than one person, each person]

- (a) is named in and personally signed this document; and
- (b) signed, sealed and delivered this document as his or her act and deed.

Notary Public
(Print name and title)

[If Owner is a corporation]

STATE OF [State where document is executed]

SS.:

COUNTY OF [County where document is executed]

I certify that on _____, 19____, [Name of person executing document on behalf of Owner] personally came before me, and this person acknowledged under oath, to my satisfaction, that:

- (a) this person is the [secretary/assistant secretary] of [Owner], the corporation named in this document;
- (b) this person is the attesting witness to the signing of this document by the proper corporate officer who is the [president/vice president] of the corporation;
- (c) this document was signed and delivered by the corporation as its voluntary act and was duly authorized;
- (d) this person knows the proper seal of the corporation which was affixed to this document; and
- (e) this person signed this proof to attest to the truth of these facts.

[Print name and title of attesting witness]

Signed and sworn before me on _____, 19____.

Notary Public
[Print name and title]

[If Owner is a partnership]

STATE OF [State where document is executed]

SS.:

COUNTY OF [County where document is executed]

I certify that on _____, 19 [Name of person executing document on behalf of Owner] personally came before me, and this person acknowledged under oath, to my satisfaction, that this person:

- (a) is a general partner of [Owner], the partnership named in this document;
- (b) signed, sealed and delivered this document as his or her act and deed in his capacity as a general partner of [owner]; and
- (c) this document was signed and delivered by such partnership as its voluntary act, duly authorized.

Notary Public

[Print name and title]

EXHIBIT A

Tax Map

EXHIBIT B

Description of Affected Areas

Contaminant Concentration Location

[List contaminants][List concentrations][Describe
location of
contaminants by
reference to
exhibits A,B,C

APPENDIX 4

GUIDELINES

FOR OBTAINING

OFF-SITE ACCESS

Guidelines for Obtaining Off-Site Access
N.J.S.A. 58:10B-16 ATTACHMENT
P.L. 1993 c.139 (S-1070)

Please be advised that Subchapter 16 of the above referenced statute provides a cause of action for persons to obtain access to property not owned by that person for the purpose of conducting remediation activities on that site. This provision applies to all site remediation cases within the New Jersey Department of Environmental Protection (department).

N.J.A.C 58:10B-16 requires that a person seeking access must first attempt to reach an agreement with the property owner. The party seeking access must make "good faith efforts" to reach an agreement with the property owner. Should the party seeking access fail to reach an agreement concerning access, the person responsible to conduct the remediation shall seek an order from New Jersey Superior Court directing the property owner to grant reasonable access to the property.

Be further advised that the department will not seek civil or civil administrative penalties for the failure of a responsible party to perform a remediation on a property not owned by that person within the time schedule required by the applicable statute and/or regulation if the following conditions have been satisfied:

- 1) The failure to perform the remediation was the result of an inability of that person to enter upon real or personal property owned by another person, **and**
- 2) The person took all appropriate action pursuant to this section to obtain access to the property.

The department shall evaluate whether the responsible person took "all appropriate action to obtain access to the property" based on compliance with the following requirements.

- a) The responsible party shall send a written request for off site access to the property owner within ten days after receiving written notice from the department that the responsible party must conduct remediation activities at an off site property. The request shall include a site map indicating the scope of access required and the proposed locations of remediation activities and shall request that the property owner respond in writing within thirty days. This letter shall be sent certified mail/return receipt requested or by similar means. A copy of the letter and signed receipt shall be sent to the department upon receipt by the responsible party.
- b) The responsible party must immediately initiate remediation activities upon receipt of permission from the off site property owner.
- c) Should the off site property owner fail to respond within thirty days, the responsible party shall send a second request to the property owner. The responsible party seeking access shall request that the property owner respond in writing within fifteen days. The responsible party must specifically inform the property owner that the responsible party will initiate an action in New Jersey Superior Court pursuant to N.J.A.C 58:10B-16 if an access agreement cannot be obtained or if the property owner does not respond within the established time frame. This letter shall be sent certified mail/return receipt requested or by similar means. A copy of this letter and signed receipt shall be sent to the department upon receipt by the responsible party.
- d) Should the off site property owner fail to respond to the second request for off site access or deny the responsible party's request for off site access or for any reason the responsible party fails to reach an agreement with the off site property owner, the responsible party shall immediately initiate an action in New Jersey Superior Court to obtain an order granting reasonable access to the property as required by N.J.A.C 58:10B-16.
- e) Submit any additional information or documentation required by N.J.S.A. 58:10B-16.

Please review the relevant sections of N.J.S.A. 58:10B-16 as it may pertain to the above referenced case. Should you have any further questions regarding this matter, please contact your assigned case manager.

APPENDIX 5

MONITORING WELL

CERTIFICATION

FORM A

Monitoring Well Certification - Form A - As-Built Certification

(One form must be completed for each well)

Name of Owner: _____

Name of Facility: _____

Location: _____

UST Registration Number: _____ Case Number: _____-_____-_____-_____

ISRA Case Number: _____

CERTIFICATION

Well Permit Number: _____-_____-_____-_____

Owner's Well Number (As shown on the application or plans): _____

Well Completion Date: _____

Distance from Top of Casing (cap off) to
ground surface (to one-hundredth of a foot): _____

Total Depth of Well to the nearest 1/2 foot: _____

Depth to Top of Screen (or Top of Open Hole)
From Top of Casing (to one-hundredth of a foot): _____

Screen Length (or length of open hole) in feet: _____

Screen or Slot Size: _____

Screen or Slot Material: _____

Casing Material: (PVC, Steel or Other-specify): _____

Casing Diameter (inches): _____

Static Water Level From Top of Casing at the Time
of Installation (to one-hundredth of a foot): _____

Yield (gallons per minute): _____

Development Technique (specify): _____

Length of Time Well is Developed/Pumped or Bailed: _____ Hours _____ Minutes

Lithologic Log: Attach

Authentication

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Name (Type or Print) Signature

_____ Seal
Certification or License No.

Certification by Executive Officer or Duly Authorized Representative

Name (Type or Print) Signature

Title Date

SIGNATORY REQUIREMENTS

The form entitled "Monitoring Well Certification - Form A - As-Built Construction Certification", must be signed by one of the following: a New Jersey licensed Professional Engineer; a licensed New Jersey Well Driller; a geologist certified by any state; a geologist certified by the American Institute of Professional Geologists; an individual certified by the American Institute of Hydrology; any other person approved by the department.

Form B, "Location Certification", must be signed and sealed by a Licensed New Jersey Land Surveyor.

APPENDIX 6

MONITORING WELL

CERTIFICATION

FORM B

THIS FORM MUST BE COMPLETED BY THE PERMITTEE AND/OR SURVEYOR

Monitoring Well Certification-Form B-Location Certification

Name of Owner:

Name of Facility:

Location:

UST Registration Number: _____ Case Number: ____-____-____-_____

ISRA Case Number: _____

LAND SURVEYOR'S CERTIFICATION

Well Permit Number:

____-____-____-____-____

This number must be permanently affixed to the well casing.

Longitude (to nearest second):

West _____

Latitude (to nearest second):

North _____

Elevation of Top of Inner Casing (cap off)
(to one-hundredth of a foot):

Source of elevation datum (benchmark, nail, etc.) and year. (If an alternate datum has been approved by the department, identify here, assume datum of 100', and give elevation.)

Source: _____

____ 1927 ____ 1983 approximated actual

Elevation: _____

Owners Well Number (As shown on application or plans):

Elevations are to be determined by double run, three wire leveling methods using balanced sights, commencing from a well marked and described point. This beginning point shall either be derived from federal or state benchmark if not more than 1000 feet from the site or from an alternate datum approved by the department. Tolerances should meet third order standards, which are $0.05 \text{ ft} \times (\text{mile})^{1/2}$. For sections less than 0.1 mile, let miles = 0.1.

AUTHENTICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

PROFESSIONAL LAND SURVEYOR'S SIGNATURE

PROFESSIONAL LAND SURVEYOR'S NAME
(Please print or type)

SEAL

PROFESSIONAL LAND SURVEYOR'S LICENSE #

APPENDIX 7

APPLICATION

REQUIREMENTS

FOR AIR POLLUTION

CONTROL PERMITS

Application Requirements For Air Pollution Control Permits

I.Pilot Test Permits

****Note - These application requirements are written specifically for petroleum hydrocarbon compounds. If chlorinated volatile organics or other non-petroleum compounds are to be vented and treated, different application requirements may apply. Please contact the Bureau of New Source Review at (609) 292-6716 for further information.****

To obtain an air permit for pilot testing, the responsible party must submit an administratively complete air pollution control permit application at least forty-five (45) days prior to the commencement of pilot testing. An administratively complete application must include the following:

- a. Completed application forms (VEM-003, VEM-004, and DEQ-069 forms)
- b. Appropriate fees
- c. Narrative description of the project
- d. Projected implementation schedule
- e. Sketches and diagrams of the system to be utilized
- f. Design information
- g. Proposed emission rates and concentrations of all air contaminants with and without controls and calculations
- h. laboratory data or a laboratory summary of the types and concentrations of the contaminants in the soil or water
- i. source of the contamination
- j. maximum length of the study
- k. outline of air sampling to be conducted

II. Soil Venting System Permits

To obtain an air permit for the operation of a soil venting system, the responsible party must submit an administratively complete air pollution control permit application at least six to nine months prior to the commencement of the operation. An administratively complete application must include the following:

- a. All of the above-listed requirements for an administratively complete pilot test permit (I.a. through I.k.) must also be submitted for a soil venting system permit
- b. Identification and listing of applicable federal and state regulations
- c. Documentation with applicable regulations
- d. State of the Art (SOTA) analysis (see NOTE below)
- e. Health risk screening results

III. General Information for all Permits

The Bureau of New Source Review shall be contacted if the above-referenced application forms are required or if additional information is requested by the responsible party. In addition, all completed application forms shall be sent to this Bureau and not to the department's Site Remediation Program. The address and telephone number of the Bureau of New Source Review are as follows:

Attn: Chief
Bureau of New Source Review

CN-027
401 East State St., Floor 2
Trenton, NJ 08625-0027
(609) 292-6716

NOTES:

State of the Art (SOTA) Guidelines

An air pollution control (APC) device, which must incorporate advances in the art of air pollution control technology for the kind and amount of contaminants emitted, must be installed unless all of the following four criteria are met:

1. The types and amounts of air contaminants emitted are predictable and,
2. The emission rate of volatile organic compounds (VOCs) are less than 0.5 pounds per hour (lb/hr) and,
3. The emission rate of any toxic substance (TXS), as listed in Table 1 of N.J.A.C. 7:27-17, is less than 0.1 lb/hr and, 4. The air contaminant emissions from the equipment will not result in any deleterious effects on human health and welfare. If any hazardous substances are emitted, air dispersion modeling and health risk assessments will be conducted to determine acceptability.

For further guidance on "State of the Art" Policy, refer to the department's General Technical Manual #1001, and for further guidance on soil venting refer to Technical Manual #1204. These are available at a cost of \$6.00 per copy from the Bureau of Revenue, Maps and Publications, Sales Office CN-417, 428 East State Street, Trenton, New Jersey, 08625, Attention: Edward Ricks. The equipment design information shall include specifications and performance guarantees for source equipment and APC devices.

APPENDIX 8

ADMINISTRATIVE

CHECKLIST FOR

SOIL VENTING

PILOT TESTS

Administrative Checklist For Soil Venting Pilot Tests and Systems

Please note that this checklist is for administrative use only. For a complete overview of the department's guidelines on this subject, please refer to the department's "Information Required for Soil Venting Pilot Tests and Systems." All information required below shall be included as part of a Remedial Action Workplan in accordance with N.J.A.C. 7:26E-6.

Site Characterization

Check One: YES NO N/A

- | | | | |
|---|-----|-----|-----|
| 1. Full vertical and horizontal definition of each contaminated medium | ___ | ___ | ___ |
| 2. Characterization of the affected geologic formation(s) and/or aquifer(s) | ___ | ___ | ___ |
| 3. Receptor survey and plot plan | ___ | ___ | ___ |
| 4. Discussion of man-made areas of high permeability | ___ | ___ | ___ |
| 5. Discussion of pilot test results and conclusions | ___ | ___ | ___ |

Pilot Test

- | | | | |
|--|-----|-----|-----|
| 1. Air permit or written approval obtained | ___ | ___ | ___ |
| 2. Tabulated raw data from vent test | ___ | ___ | ___ |
| 3. Removal rates and air permeability calculations | ___ | ___ | ___ |
| 4. Plot plan of venting and monitoring points | ___ | ___ | ___ |
| 5. Vacuum isopleths | ___ | ___ | ___ |

System Design

- | | | | |
|--|-----|-----|-----|
| 1. System schematics | ___ | ___ | ___ |
| 2. Description of the method of vent gas treatment | ___ | ___ | ___ |
| 3. Post-remedial soil sampling plan | ___ | ___ | ___ |
| 4. Contingency plan (if applicable) | ___ | ___ | ___ |

System Performance Monitoring

- 1. Quarterly monitoring data _____
- 2. Isopleths and contour maps submitted _____
- 3. Annual report and discussion of results _____

Cleanup Verification

- 1. Final report - incl. post remedial sampling results and discussion of system performance _____

APPENDIX 9

GROUND WATER

NATURAL

REMEDICATION

CHECKLIST

Ground Water Natural Remediation Checklist

I. Evaluation of Remedial Investigation (Y or N)

- A. Soil investigation/delineation completed
- B. Receptor evaluation completed
- C. Ground water delineation completed

II. Unacceptable scenarios (Y or N)

- A. History of non-decreasing contaminant concentrations
- B. Excessive dissolved contaminant concentrations
- C. Receptors previously impacted
- D. Free product present

III. Evaluation of the Remedial Action Workplan (Y or N)

- A. Soil remediation proposed or completed
- B. Sentinel well(s) installed at proper distance between source and receptor(s)
- C. Travel time calculation for contaminants from pump/slug test (include retardation calculations)
- D. Contaminant degradability documented
- E. Site specific information supporting favorable degradation rate
- F. Documentation regarding current or potential ground water use for 25 year horizon
- G. Written notification to potentially affected down gradient property owners
- H. Monitoring plan

APPENDIX 10

GROUND WATER

PUMP AND TREAT

CHECKLIST

Ground Water Pump and Treat Checklist

Use this checklist when preparing RAW proposals for Pump and Treat (P&T) Systems.

	<u>YES</u>	<u>NO</u>
I. <u>Site Characterization</u>		
1. ○ Summary of Geology/Hydrology Provided?	_____	_____

If Yes, Formation, strike and dip, fracture orientation, etc.		
○ Boring logs and monitoring well records submitted?	_____	_____

If yes, are wells screened properly?	_____	_____

2. ○ Were potable wells identified in the area?	_____	_____

If Yes Give Distance: _____ ft.		
○ Are potable wells impacted?	_____	_____

3. Depth to GW and concentrations tabulated?	_____	_____

4. Contaminant isopleth maps submitted?	_____	_____

5. Ground Water Elevation Contour map submitted?	_____	_____

6. Liquid Phase Hydrocarbons (LPH) present? _____

_____**LNAPL** _____**DNAPL**

NOTE: ○ If yes, and if there is enough data to allow it, construct hydrographs depicting depth to water versus depth to product over time.

○ If no, and if warranted, construct hydrographs depicting depth to water versus BTEX concentrations and/or contaminant concentrations over time.

This allows for a quick evaluation of whether the increase and/or decrease in LPH thickness or contaminant concentration is a function of fluctuations in water table elevation or biodegradation.

7. Has the horizontal extent of GW contamination been identified? _____

II. Aquifer Mechanics

YES NO

8. Aquifer Testing Conducted? _____

If Yes, type of test: _____ **Slug Test,** _____ **Pump Test**

○ If pump test was conducted, the following should be included with the RAW:

a. determine the following aquifer characteristics: hydraulic conductivity (k), transmissivity (T), storativity (S) and an estimate of the rate of contaminant flow in the aquifer. Based on the aquifer coefficients, the following information shall be included in the RAW:

- calculations and maps showing the predicted capture zones;
- calculations of the optimum pump rate and number of ground water and/or air withdrawal points required to control the plume; and
- calculation of the ground water velocity prior to pumping.

b.If a model to further define characteristics of the groundwater flow system is used, the following information shall be submitted to the department along with a justification as to why the model was selected in accordance with N.J.A.C. 7:26E-4.4 (g)3.iii(2):

- specific details on the type of model;**
- input parameters used and referenced;**
- boundary conditions used; and**
- limitations of the model.**

9. Values

YES NO

a. Hydraulic Conductivity

K = _____

- **source of information** _____
- **calculations included?** _____

b. Transmissivity ?

T = _____

- **source of information** _____
- **calculations included?** _____

c. Storativity ?

S = _____

- **source of information** _____
- **calculations included?** _____

d. Effective Porosity ?

n_e = _____

- **source of information** _____

e. Aquifer Thickness ?

b = _____

- **source of information** _____

f. Total Organic carbon content ?

f_{oc} = _____

- **source of information** _____
- **calculations included?** _____

g. Seepage Velocity ?

V_s = _____

- **calculations included?** _____

III. System Design

YES NO

10. Detailed description of remedial action provided?

- **Number/location of recovery wells/trench included?**

- **Estimated optimum pumping rate supplied?**

Pumping Rate(s) _____

11. Estimated capture zone supplied?

If Yes, calculations included?

12. Will the projected capture zone encompass the entire plume?

If No, will capture zone encompass entire source area:

Note: can natural remediation be applied to portion of the plume not covered by the P&T system (ie. plume defined, sentinel wells, travelling distance to the nearest receptor, contaminant concentrations, etc.)?

15. Treatment method(s) supplied? _____

16. ○ Will treated GW be re-injected? _____

If yes, how? via _____ Trench or _____ Recovery Wells?

**where? _____ In the Source Area, _____ Upgradient,
_____ Downgradient, or _____ Sidegradient.**

○If Yes, a NJPDES-DGW Permit will be required.

○Are there background wells or piezometers to monitor the ground water quality in that area? _____

If no, is there a secondary treatment unit to provide safety for unexpected breakthrough in the system? _____

○ If there is re-injection in the source area via re-injection well(s), are recovery wells installed within the re-injection point(s) to ensure capture of the contaminant plume? _____

23. Will SVE be utilized in conjunction with the P & T? _____

If Yes, has proper evaluation been conducted for the SVE? _____

IV. System Monitoring

24. ○ Has a monitoring proposal been submitted? _____

If Yes, does the proposal include quarterly sampling during first year, at a minimum, of system operation? _____

○ **Background Monitoring points available/identified?** _____

_____ **If Yes, is proposal acceptable?** _____

_____ **list wells** _____

○ **Source Area defined?** _____

_____ **If Yes, is proposal acceptable?** _____

_____ **list wells** _____

○ **Compliance Monitoring points identified?** _____

_____ **If Yes, is proposal acceptable?** _____

_____ **list wells** _____

APPENDIX 11

CONTOUR MAP

REPORTING

FORM

Contour Map Reporting Form

This reporting form shall accompany each ground water elevation contour map submittal. Use additional sheets as necessary.

1. Did any surveyed well casing elevations change from the previous sampling event? Yes ___ No ___. If yes, attach new "Well Certification -Form B" and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

2. Are there any monitor wells in unconfined aquifers in which the water table elevation is higher than the top of the well screen ? Yes___ No ___. If yes, identify these wells.

3. Are there any monitor wells present at the site but omitted from the contour map ? Yes___ No ___. Unless the omission of the well(s) has been previously approved by the department, justify the omissions.

4. Are there any monitor wells containing separate phase product during this measuring event ? Yes___ No ___. Were any of the monitor wells with separate phase product included in the ground water contour map ? Yes___ No ___. If yes, show the formula used to correct the water table elevation.

5. Has the ground water flow direction changed more than 45° from the previous ground water contour map ? Yes___ No ___. If yes, discuss the reasons for the change.

6. Has ground water mounding and/or depressions been identified in the ground water contour map ? Yes ___ No ___. Unless the ground water mounds and/or depressions are caused by the ground water remediation system, discuss the reasons for this occurrence.

7. Are all the wells used in the contour map screened in the same water-bearing zone ? Yes ___ No ___. If no, justify inclusion of those wells.

8. Were the ground water contours computer generated ___, computer aided ___, or hand-drawn ___ ? If computer aided or generated, identify the interpolation method(s) used.

APPENDIX 12

REMEDIAL ACTION

PROGRESS

REPORT

The following is a reprint from N.J.A.C. 7:26E-6.5(b) [Remedial Action Progress Report]

(b) A progress report shall include, at a minimum, the following information:

1. Specification/reporting of all remedial actions accomplished during the reporting period;
2. Proposal of any deviations from and/or modifications to the approved remedial action workplan. All modifications shall be approved by the department prior to enactment;
3. Reporting of problems or delays in the implementation of the remedial action workplan. Proposed corrections shall be presented with changes to the approved project schedule and shall be approved by the department. A revised schedule shall be submitted as part of the progress report. The status of all permit applications shall be included in this schedule;
4. Identification of the remedial actions for the next reporting period;
5. Presentation annually of the actual costs of remediation incurred to date;
6. If required in an oversight document pursuant to N.J.A.C. 7:26C or by ISRA or UST, the following shall be provided:
 - i. Tabulation of all sample results received during this period with sample date, sample location, laboratory identification, matrix sampled, depth, analyses performed, analytes detected, and concentrations detected and submission of a report summarizing the data and presenting conclusions; and
 - ii. Tabulation of waste classification and/or characterization samples collected including the physical state of the material (solid, liquid, sludge), the volume of material, number of samples collected, analyses performed and results.
7. A listing of all types and quantities of waste generated by the remedial action during the reporting period and to date. Include the name of the disposal facilities, and transporters' dates of disposal, and if appropriate, the manifest numbers of each waste load; and
8. Any additional support documentation that is available (for example, photographs) shall be submitted.

APPENDIX 13

REMEDIAL ACTION

SCHEDULE

7:26E-6.5 Remedial Action Schedule

The following is a reprint from N.J.A.C. 7:26E-6.5(a) [Technical Requirements for the Remedial Action Schedule]

(a) If the Remedial Action activities at a site are being performed pursuant to N.J.A.C. 7:26C or the ECRA or UST programs, and require more than three months for completion, a schedule for completion of the remedial action by task and final completion schedule is required in addition to progress reports at a frequency which shall be specified by the department in the oversight document or by the ECRA or UST program. The remedial action schedule shall contain the following element:

1. Schedules shall utilize monthly timeframes, when possible, for the initiation or completion of tasks;
2. The remedial action workplan shall not list specific dates as these will be contingent upon department approval of the remedial action workplan;
3. After remedial action workplan approval is obtained, the schedule shall be revised to identify the projected month/year for each task;
4. All tasks for all areas of concern shall be identified in the schedule;
5. Contractor bidding/review/acceptance process timeframe shall be included in the schedule;
6. The schedule shall consider timeframes for permit applications (municipal, NJDEPE, etc.) and final permit approvals. A critical path schedule shall be included when any permits are involved because certain tasks cannot proceed without permit approval;
7. When projecting dates for submission of reports to the department, the schedule shall consider review time of not only the person preparing the report but all other persons who are deemed necessary to finalize the report;
8. The schedule shall identify all anticipated report submittal (month/year) to the department including, without limitation, progress reports, ground water monitoring reports, post-remediation data reports for individual areas of concern, construction design reports and final remedial action reports. Laboratory analysis time shall be accounted for in projecting report submittal dates;
9. The schedule shall allow for department review time of submitted reports;
10. The schedule shall include time for obtaining waste classification from the department for disposal or treatment of waste material generated during remediation;
11. The schedule shall include a timeframe for site restoration (backfill, regrade, pave, etc.) and department final inspection; and
12. The schedule shall include projected date for full compliance with the department program overseeing the remediation.