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Solid Waste and Emergency Response (0S-110W)
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EPA

# VISITT Vendor Information Form Version 3.0

To be completed for participation in the:

# Vendor Information System for Innovative Treatment Technologies ( VISITT ) Version 3.0

***NOTE:*** You may submit data electronically instead of typing or writing responses on the enclosed Vendor Information Form. Each Form is accompanied by one 3.5" IBM-compatible diskette. If you need additional diskettes, call the VISITT Hotline.

Completion of this form is voluntary. Any questions, call VISITT Hotline: 800/245-4505 or 703/883-8448.

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## A Letter to Technology Vendors

One of this country's greatest challenges is cleaning up its many petroleum/hazardous waste sites. The nature and extent of contamination varies widely at these sites, and it is becoming increasingly clear that acceptable and cost-effective remedies will require the expedited development of new treatment technologies. EPA established the Technology Innovation Office (TIO) within the Office of Solid Waste and Emergency Response to promote greater development and use of these new remediation methods.

A serious obstacle to technology development and use is the lack of readily available and current technology information. To address this problem, TIO has developed an automated database - the *Vendor Information System for Innovative Treatment (VISITT)* - for use by state, federal, and private sector professionals responsible for cleanup of petroleum/ hazardous waste sites. *VISITT Version 2.0*, which we made available this June, contains detailed information on the availability, performance, and cost of 231 innovative technologies offered by 141 vendors. The database is available free of charge to the public, and there are currently almost 8,000 registered users. In addition, we announced its availability to over 15,000 people who have expressed an interest in remediation technologies.

Although we've made a good start, we know that previous versions of *VISITT* did not include some of the companies in this growing industry. This booklet describes the types of technologies that we are including in the database. If you offer one of these technologies, I encourage you to complete the *Vendor Information Form* in Appendix D, and submit it by the November 1, 1993 deadline. Submittals received by that date will be considered for inclusion in the third release of *VISITT* in 1994.

EPA believes that *VISITT* offers an unprecedented opportunity for developers and vendors of innovative treatment technologies to showcase their capabilities and to improve communication among technology developers, users, and the investment community. To fully appreciate the advantages of participating in *VISITT*, you must see it for yourself. IBM-compatible diskettes and a user manual are available free of charge. To order *VISITT* diskettes and user manual, and to become a registered user, fill out the order and registration form in Appendix F and mail or fax it to:

U.S. EPA/NCEPI
P.O. Box 42419
Cincinnati, OH 45242-0419
Fax number: 513-891-6685

Submittal of the information requested in this form is completely optional. We do, however, urge all vendors who offer (or are developing) relevant innovative treatment technologies to respond. With your help, we expect that this cooperative EPA/industry effort will play a significant role in making new technologies available to remediate our nation's petroleum/hazardous waste sites.

Walter W. Kovalick, Jr., Ph.D.
Director
Technology Innovation Office

# GENERAL INFORMATION

## I. Synopsis

The U.S. Environmental Protection Agency (EPA) has recently developed an automated database, the *Vendor Information System for Innovative Treatment Technologies (VISITT)*, for use by state, federal, and private sector professionals responsible for cleanup of the nation's petroleum/hazardous waste sites. *VISITT Version 2.0*, which was made available in June 1993, contains 231 innovative technologies offered by 141 vendors. IBM-compatible diskettes and a user manual are available free of charge. To order VISITT diskettes and user manual, and to become a registered user, fill out the order and registration form in Appendix E and mail or fax it to:

U.S. EPA/NCEPI
P.O. Box 42419
Cincinnati, OH 45242-0419
Fax number: 513-891-6685

*VISITT* contains information on innovative treatment technologies, those for which a lack of cost and performance data inhibit their routine use to cleanup petroleum/ hazardous waste sites. Exhibit 1 gives a partial list of innovative technologies eligible for inclusion in *VISITT*. The database is designed to serve as a tool to screen these

**EXHIBIT 1**

**PARTIAL LIST OF INNOVATIVE TREATMENT TECHNOLOGIES OF INTEREST**

Acid Extraction
Adsorption - In Situ
Air Sparging - In Situ Ground Water
Bioremediation - In Situ Ground Water
Bioremediation - In Situ Lagoon
Bioremediation - In Situ Soil
Bioremediation - Not otherwise specified
Bioremediation - Slurry Phase
Bioremediation - Solid Phase
Bioventing
Chemical Treatment - Dechlorination
Chemical Treatment - Other
Chemical Treatment - In Situ Ground Water
Delivery/Extraction Systems
Electrical Separation
Magnetic Separation
Materials Handling/Physical Separation
Off-Gas Treatment
Pneumatic Fracturing
Pyrolysis
Slagging - Off-Gas Treated
Soil Flushing - In Situ
Soil Vapor Extraction
Soil Washing
Soil/Ground Water Multi-Phase Extraction
Solvent Extraction
Thermal Desorption - General
Thermal Desorption - Off-Gas Treated
Thermally Enhanced Recovery In Situ
Vitrification - General
Vitrification - Off-Gas Treatment

technologies for remediation of contaminated petroleum/hazardous waste sites, and to direct users to more complete information. The investment community may also use this database to identify potential investment opportunities.

The Technology Innovation Office (TIO) of the Office of Solid Waste and Emergency Response (OSWER) is conducting this *Third Invitation for Submittals* for developers and providers of innovative treatment technologies. The information submitted by applicants on the *Vendor Information Form (VIF)* (Appendix D and enclosed diskette) will be considered for inclusion in the third version of the database.

EPA believes that *VISITT* offers an unprecedented opportunity for developers and purveyors of innovative treatment technologies to showcase their capabilities. Innovative technologies are undergoing rapid change, which makes it difficult to maintain current information on their developmental status and commercial availability. This database should play an important role in the efficient expansion of this industry by tracking this changing market and improving communication between technology developers and users.

One of EPA's highest priorities is the generation of new methods to treat contaminated soil, sludge, solids, sediments, and solid-matrix waste and to treat ground water or nonaqueous phase liquids (NAPL) in situ. *VISITT* applies to only innovative treatment technologies that address these media/wastes. **EPA will not accept information on the more widely available technologies: incineration, solidification/stabilization, and above-ground groundwater treatment.** Technologies must address remediation of contaminated sites, not industrial wastes generated on an ongoing basis. Nor does this database currently address innovative measurement, monitoring, or containment technologies.

The purpose of *VISITT* is to facilitate the increased use, both domestically and abroad, of innovative treatment technologies available in the U.S. Firms that respond may be located either inside or outside the United States; however, non-U.S. firms should intend to operate commercially within the U.S.

Technologies of interest include those at any stage of development, from bench to pilot to full scale. However, EPA desires information only on those technologies that respondents intend to commercialize, rather than those on which they are conducting academic research only.

Information submitted by applicants on the *VIF* by **November 1, 1993**, will be considered for inclusion in the third release of *VISITT* in 1994. After November 1, EPA will review applications as time and resources permit. To remain in the database, all vendors must verify or update submitted information during the update cycle. Vendors now in VISITT 2.0 will receive copies of completed VIFs, as they

now appear in the database, for review and updating. These vendors only need to complete a new VIF if they wish to submit additional technologies for consideration.

## II. Contents of This Booklet

This booklet contains three sections. General Information gives background to *VISITT* and this *Third Invitation for Submittals*. Appendix A contains instructions for completing the *Vendor Information Form (VIF)*, definitions of terms used in the form, and a key to contaminant groups. Appendix B contains information on business classification that is useful for answering question 2e of the VIF. Appendix C contains definitions used in VISITT. Appendix D contains contaminant group information. Appendix E contains the blank *VIF* to be submitted. Appendix F contains the VISITT registration and order form.

The *VIF* consists of six parts, which are listed in Exhibit 2. *Part 1* must be completed in order for the vendor to be included in *VISITT*. This part contains questions on the name and location of the vendor and on the description, status, and application of the technology. *Part 2* is required for applicants with full-scale technologies; *Part 3* is required for applicants with pilot-scale technologies. *Parts 4 through 6* are optional, and apply to technologies at any scale of development. Although the completion of some information is optional, EPA encourages vendors to complete as much of the questionnaire as possible. Lastly, this submittal package includes an IBM-compatible computer diskette, which contains an automated version of the blank *VIF*.

**EXHIBIT 2**

**CONTENTS OF *VENDOR INFORMATION FORM***

Part 1: General Information and Technology Overview
Part 2: Full-Scale Equipment/Capabilities
Part 3: Pilot-Scale Equipment/Capabilities
Part 4: Bench-Scale Treatability Study Capabilities
Part 5: Representative Applications, Client References, and Performance Data
Part 6: Literature and Technical References

## III. Why Is This Database Needed?

The impetus for *VISITT* is the Agency's need to increase the availability and use of treatment technologies that can cost effectively clean up petroleum/hazardous waste sites, and to promote the export of these technologies. The database provides a service to vendors who are developing and applying new technology by creating a

vehicle to make known the application and performance of their technologies to the full range of users. *VISITT* now is used by thousands of professionals responsible for the cleanup of Superfund sites, RCRA facilities, State sites, Federal facilities, and leaking underground storage tank (UST) sites. The database allows users to screen technologies for engineering feasibility studies, and to identify vendors who provide treatability studies and cleanup services.

## IV. Why Should You Participate?

*VISITT* is an excellent opportunity for vendors to promote their capabilities. The system allows the vendor to provide substantial information on the applicability, performance, and current use of their technologies. The database is publicly available free-of-charge on computer diskette, and EPA is studying online access. We reach cleanup personnel and investors throughout the U.S. and abroad by widely advertising *VISITT* in trade journals, at conferences, and through direct mailings to an extensive list of potential users. Currently there are almost 8,000 registered users of *VISITT* including over 500 users from 52 other countries.

## V. What Innovative Technologies Are Eligible for Inclusion?

EPA includes only certain innovative treatment technologies in *VISITT*. These are technologies to treat the particular remedial problems identified earlier: treatment of contaminated soil, sludge, sediments, and solid-matrix wastes; and treatment of ground water or nonaqueous phase liquids (NAPL) in situ. Innovative treatment technologies that treat off-gases generated from a primary treatment technology also are included in *VISITT*. Exhibit 1 contains a partial list of eligible innovative technologies. This list is based primarily on the technologies submitted to EPA for the current version of *VISITT*. EPA will continue to expand this list to include additional innovative technologies submitted.

Incineration, solidification/stabilization, and above-ground groundwater treatment technologies will not be accepted. EPA recognizes that these technologies are vital to the clean up of petroleum/hazardous waste sites, and that some innovative approaches utilizing these technologies are being developed and used. However, the Agency believes that, for the most part, information on these technologies is readily available and that there is a greater need to disseminate information on technologies for which there is far less information.

As noted earlier, this *VISITT* submittal also does not apply to technologies related to (1) treatment of industrial wastes generated on an ongoing basis, (2) measurement, (3) monitoring, or (4) containment.

## VI. Should Confidential Business Information (CBI) Be Submitted?

Confidential business information should not be submitted, because EPA plans to make all submitted information available to the public. However, applicants may write "available on a case-by-case basis" as their response to those questions for which they have information, but would prefer not to make this information generally available.

Applicants are encouraged to provide "sanitized" or masked information that will allow users to review general information on a vendor's experience, without revealing confidential information. For instance, in Part 5, which details project experience, you may provide a generic industry name, such as "organic chemical manufacturer" instead of the actual site name. A lack of information may discourage users from considering the technology further.

## VII. How Much Documentation is Required Regarding Performance and Other Technology Claims?

*VISITT* is intended to be a showcase for technology vendors. To optimize the usefulness of the data, EPA will review each submittal for clarity, completeness, and adherence to instructions. It is in the applicant's best interest to fill out each part of *VIF* as completely as possible since incomplete information may discourage users from considering the technology further.

EPA reserves the right to clarify or question information submitted. The respondent will be given the opportunity to review any substantive changes to the submittal that the Agency wishes to make, with two exceptions: (1) EPA may list Superfund sites or Federal facilities at which the vendor's technology has been used, and (2) EPA may add publicly-available references of which EPA is aware.

The Agency will not review submitted data for accuracy or quality; to do so would be too resource intensive and subjective, and would substantially delay dissemination. *VISITT* clearly states that vendors have supplied the information, and that the data have not been verified by the Agency. Applicants should expect that interested users will request additional information regarding applicability and performance of a particular treatment technology. The database contains the following disclaimer:

> Inclusion in the U.S. Environmental Protection Agency's *Vendor Information System for Innovative Treatment Technologies* does not mean that the Agency approves, recommends, licenses, certifies, or authorizes the use of any of the technologies. Nor does the Agency certify the accuracy of the data. This listing means only that the vendor has provided information on a technology that EPA considers to be eligible for inclusion in this database.

## VIII. EPA's Authority for Submittal and Burden Statement

EPA's authority for conducting this *Third Invitation for Submittals* is Section 311 of the Superfund Amendments and Reauthorization Act of 1986 (42 U.S.C. 9601 et seq.). Under Section 311, EPA may collect and disseminate information related to the use of innovative treatment technologies for remediation of hazardous waste sites.

EPA estimates that the vendor reporting burden for this collection of information will average 12 hours per response for completion of Part 1, and 28 hours for completion of the entire form. These estimates include the time applicants will require to review and maintain the data needed, and to complete and review the *VIF*. Send comments regarding this burden estimate, or any other aspect of reducing the burden, to Chief, Information Policy Branch, PM-223, U.S. Environmental Protection Agency, 401 M Street, S.W. Washington, D.C. 20460; and to Paperwork Reduction Project (OMB #2050-0114), Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503.

## IX. When and Where to File

EPA will review *Vendor Information Forms* received by **November 1, 1993**, for inclusion in the third release of *VISITT* in 1994. EPA will review responses received after November 1 as time and resources permit.

Vendors already included in *VISITT Version 2.0* will be contacted by EPA to verify or update submitted information. *VISITT* participants may also submit further technologies for consideration.

Send completed VIFs and diskettes to:

System Operator, VISITT
PRC Environmental Management, Inc.
1505 PRC Drive
McLean, VA 22102

# APPENDIX A
# INSTRUCTIONS

## INSTRUCTIONS

1. *Part 1* must be completed in its entirety in order to be considered for inclusion in *VISITT*. A clear and concise technology description is particularly important, since this may be the first information reviewed by the user.

2. Provide your Vendor Name on each page in upper right corner; you need provide Technology Type on each page only if you are submitting more than one form.

3. Applicants with full-scale technologies (Question 17a checked) must fill out *Part 2*. You may also complete this part if the technology is at pilot scale.

4. Applicants with pilot-scale technologies (Question 17b checked) must fill out *Part 3*. You may also complete this part if the technology is at full scale or bench scale.

5. *Parts 4 through 6* are optional, but it is in the applicant's best interest to complete these sections as thoroughly as possible. Incomplete information may discourage database users from considering the technology further.

6. To answer Part 1 questions 2c and 2d, refer to the business classification definitions provided in Appendix B.

7. To answer *Part 1, Question 9*, refer to the definitions of Technology Types provided in Appendix C. Appendix C also contains other useful definitions of terms used in the *VIF*.

8. You may submit responses on the computer diskette provided. **Important:** A printed hard copy of the form should accompany the diskette, in case the latter is damaged in transit.

9. Submit one copy of each completed *VIF* and the computer diskette (if appropriate) to the **System Operator, VISITT, PRC Environmental Management, Inc., 1505 PRC Drive, McLean, VA 22102.**

10. Questions regarding the *VIF* should be addressed to the **VISITT Hotline at 800/245-4505 or 703/883-8448.**

11. EPA welcomes any comments on the contents of this form. You may provide comments in writing to the address given in No. 8, above, or by calling the VISITT Hotline.

# APPENDIX A - INSTRUCTIONS FOR FILING BY COMPUTER DISKETTE

*Mail Completed VIF Diskette and Hard Copy To: PRC Environmental Management, Inc., VISITT System Operator, 1505 PRC Drive, McLean, VA 22102*

This appendix explains the use of the enclosed vendor information software package for applicants to the U.S. Environmental Protection Agency's (EPA) Vendor Information System for Innovative Treatment Technologies (VISITT). The enclosed software provides you with an efficient and easy way to complete your Vendor Information form (VIF). VIF 3.0 has been improved to make completing your VIF even easier.

The software produces a form that looks similar to the blank form in Appendix E.

## HARDWARE REQUIREMENTS

An IBM compatible microcomputer with the following characteristics is necessary to operate the enclosed software:

- DOS 3.3 or higher and Files=45 in config.sys
- A floppy disk drive for 3-1/2-inch double density diskette
- At least 640K of random access memory (RAM)
- Any conventional printer (optional)

## STARTING THE SOFTWARE

Insert the disk into the appropriate disk drive. If your 3-1/2-inch floppy disk drive is drive A:, type A:, press <Enter>, then at the A: prompt, type *VENDOR*. If your 3-1/2-inch disk drive is drive B:, type B:, press <Enter>, and then at the B: prompt, type *VENDOR*. The main menu will appear on your screen.

## ENTERING INFORMATION

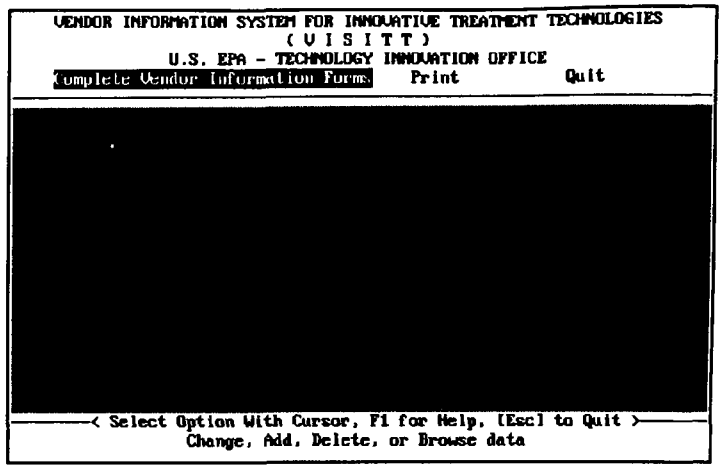
- From the main menu, you will be able to choose any of the options by using the left and right arrows on your keyboard and by pressing <Enter> while the cursor is positioned on an option you want.

- At the bottom of each screen, you will find the functions you can perform on that screen and their corresponding keys.

- The screen will prompt you when you can press the function one <F1> key for on-line help.

- The escape key <Esc> will take you back to the previous screen. The arrow keys will move the cursor to any available position on the screen.

- The function ten <F10> key selects chemicals and assigns them to the appropriate contaminant group.




**Main Menu**

When you are completing the information for the vendor form, you can choose one of four options: view <V>, add <A>, or edit <E>. These options will appear at the top of the screens, and you may choose whichever is appropriate. The page up <PgUp> and page down <PgDn> keys will allow you to move within the form once <V>, <A>, or <E> is chosen. By pressing <Esc>. you will return to the viewing mode.

## PRINTING FORMS

The VIF software has many print options. By moving the cursor to the print menu in the main menu, you can print the following:

- A VIF for a specific technology
- All completed VIFs
- A blank VIF

We recommend that you print out the VIF(s) for your own files, as well as for EPA submittal after completing the information.

## EXITING THE SOFTWARE

If you press <Esc> to return to the VIF software's main menu, you can exit by either pressing <Q>, or <Esc> and then <Enter>.

## OTHER INFORMATION

You can copy the VIF software onto your computer's hard drive by inserting the disk(s) into the floppy drive and by using the appropriate DOS copy command. This will allow you to save a copy of the software and your files.

# APPENDIX B
# BUSINESS CLASSIFICATION INFORMATION

## BUSINESS CLASSIFICATION INFORMATION

The following information is intended to be used as a reference to answer question 2e. SIC code information and definitions are given below. To determine if your company is a small and/or disadvantaged business first identify the SIC code for your company and secondly identify whether or not your company qualifies as a small business under that SIC code. Small and disadvantaged businesses are defined below.

Definition of SIC Code

**Standard Industrial Classification (SIC) Code** - refers to the four-digit number assigned by the government to classify establishments by the type of activity in which they are engaged. The codes are published by the Government in the Standard Industrial Classification Manual. The Manual is intended to cover the entire field of economic activities. It classifies and defines activities by industry categories and is the source used by the Small Business Administration (SBA) as a guide in defining industries for size standards. The number of employees or annual receipts indicates the maximum allowed for a concern, including its affiliates, to be considered small (Federal Acquisition Circular (FAC) 90-16, December 21, 1992, Federal Acquisition Regulation (FAR), 19.102(g)).

Most remediation firms should fall under one of the SIC codes defined below:

The following SIC code definitions are taken from the Standard Industrial Classification Manual, 1987, Office of Management and Budget.

*SIC code 4953: Refuse Systems (i.e., activities related to actual site cleanup)* Establishments primarily engaged in the collection and disposal of refuse by processing or destruction or in the operation of incinerators, waste treatment plans, landfills, or other sites for disposal of such materials. Establishments primarily engaged in collecting and transporting refuse without such disposal are classified in Transportation, Industry 4212.

Acid waste, collection and disposal of
Ashes, collection and disposal of
Dumps, operation of
Garbage: collecting, destroying, and processing
Hazardous waste material disposal sites
Incinerator operation
Landfill, sanitary: operation of
Radioactive waste materials, disposal of
Refuse systems
Rubbish collection and disposal
Sludge disposal sites
Street refuse systems
Waste materials disposal at sea

*SIC code 8711: Engineering Services (i.e., activities related to remedial investigations, feasibility studies, and remedial design)* Establishments primarily engaged in providing professional engineering services. Establishments primarily providing and supervising their own engineering staff on temporary contract to other firms are included in this industry.

Establishments providing engineering personnel, but not general supervision, are classified in Industry 7363. Establishments primarily engaged in providing architectural engineering services are classified in Industry 8712, and those providing photogrammetric engineering services are classified in Industry 8713.

Designing: ship, boat, and machine
Engineering services: industrial, civil, electrical, mechanical, petroleum, marine, and design
Machine tool designers
Marine engineering services
Petroleum engineering services

Definitions of Small and Disadvantaged/Minority Business

The following small business size standards established by the SBA are taken from FAC90-16 December 21, 1992, FAR 19.102.

| SIC Code | Description | Size |
|---|---|---|
| 4943 | Refuse Systems | $6.0 million |
| 8711 | Engineering Services | |
| | Military and Aerospace Equipment and Military Weapons | $13.5 million |
| | Marine Engineering and Naval Architecture | $9.0 million |
| | Other Engineering Services | $2.5 million |

The following information is taken from FAC 90-16 December 21, 1992, FAR 19.101.

**Small business concern** - means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on government contracts, and qualified as a small business under the criteria and size standards in 13 CFR Part 121. Such a concern is "not dominant in its field of operation" when it does not exercise a controlling or major influence on a national basis in a kind of business activity in which a number of business concerns are primarily engaged. In determining whether dominance exists, consideration shall be given to all appropriate factors, including volume of business, number of employees, financial resources, competitive status or position, ownership or control of materials, processes, patents, license agreements, facilities, sales territory, and nature of business activity.

**Small disadvantaged/minority business concern** - means a small business concern that is at least 51 percent unconditionally owned by one or more individuals who are both socially and economically disadvantaged, or a publicly owned business that has at least 51 percent of its stock unconditionally owned by one or more socially and economically disadvantaged individuals and that has its management and daily business controlled by one or more such individuals. This term also means a small business concern that is at least 51 percent unconditionally owned by an economically disadvantaged Indian tribe or Native Hawaiian Organization, or a publicly owned business that has at least 51 percent of its stock

unconditionally owned by one of these entities, that has its management and daily business controlled by members of an economically disadvantaged Indian tribe or Native Hawaiian Organization, and that meets the requirements of 13 CFR 124.

(a) "Socially disadvantaged individuals" means individuals who have been subjected to racial or ethnic prejudice or cultural bias because of their identify as a member of a group without regard to their qualities as individuals.

(b) "Economically disadvantaged individuals" means socially disadvantaged individuals whose ability to compete in the free enterprise system is impaired due to diminished opportunities to obtain capital and credit as compared to others in the same line of business who are not socially disadvantaged. Individuals who certify that they are members of named groups (Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Subcontinent-Asian Americans) are to be considered socially and economically disadvantaged.

(1) "Subcontinent Asian Americans" means United States citizens whose origins are in India, Pakistan, Bangladesh, Sri Lanka, Bhutan, or Nepal.

(2) "Asian Pacific Americans" means United States citizens whose origins are in Japan, China, the Philippines, Vietnam, Korea, Samoa, Guam, the U.S. Trust Territory of the Pacific Islands (Republic of Palau), the Northern Mariana Islands, Laos, Kampuchea (Cambodia), Taiwan, Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Republic of the Marshall Islands, or the Federated States of Micronesia.

(3) "Native Americans" means American Indians, Eskimos, Aleuts, and Native Hawaiians.

(c) "Native Hawaiian Organization" means any community service organization serving Native Hawaiians in, and chartered as a not-for-profit organization by, the State of Hawaii, which is controlled by Native Hawaiians, and whose business activities will principally benefit such Native Hawaiians.

(d) "Indian tribe" means any Indian tribe, band, nation, or other organized group or community of Indians, including any Alaska Native Corporation as defined in 13 CFR 124.100 which is recognized as eligible for the special programs and services provided by the U.S. to Indians because of their status as Indians, or which is recognized as such by the State in which such tribe, band, nation, group, or community resides.

**Women-owned** - as used in this form, means a business that is at least 51 percent owned by a woman or women who are U.S. citizens and who also control and operate the business.

# APPENDIX C
# DEFINITIONS

## DEFINITIONS

EPA has developed the following technology definitions for the purpose of categorizing the types of innovative remediation technologies that are currently contained in VISITT 2.0. The definitions are based on the descriptions of the technologies submitted by vendors, and for inclusion in the VISITT system.

### I. Technology Types

***Acid Extraction*** - This technology is used to remove hazardous metals from excavated soils and sludges through the application of an acidic solution. It is a liquid-solid extraction technology that operates on the principle that the metals of concern will be preferentially solubilized and thereby removed from the waste. Further treatment of the metal-containing acid solution will be required.

***Adsorption - In Situ*** - In this technology, containerized adsorptive materials (for example, various organic polymers, activated carbon, and sponge material) are placed directly in ground water to remove various hazardous compounds. This technology also would include systems that drill wells and place adsorptive materials in the air space above the ground water, in order to achieve reductions of relatively volatile compounds. The use of this technology will depend to a large extent on site-specific soil and ground water characteristics.

***Air Sparging - In Situ Ground Water*** - This technology reduces concentrations of hazardous compounds in ground water by injecting air below the water table. The injected air creates air bubbles in the ground water. The air bubbles contact dissolved/adsorbed-phase contaminants and nonaqueous phase liquids (NAPL) in the aquifer, causing contaminants to volatilize. The volatilized contaminants are transported by the air bubbles into the vadose zone. Removal of the contaminants transferred to the vadose zone would be accomplished by another technology, usually soil vapor extraction. The application and effectiveness of this technology will depend to a large extent on site-specific soil and groundwater conditions.

**Bioremediation** (see below for definitions of specific types) - This technology uses microorganisms to degrade organic contaminants. The microorganisms breakdown the organic contaminants by using them as a food source. End products of the degradation are typically $CO_2$ and $H_2O$. Nutrients such as phosphorous, nitrogen, or oxygen may be added to enhance the biodegradation process. The VISITT database identifies six subcategories of this technology, based on the type and media treated.

***Bioremediation - In Situ Ground Water*** - The defining characteristic of this technology is an injection system (typically injection wells) to circulate microorganisms, nutrients, and oxygen through contaminated groundwater or saturated soils to biodegrade contaminants. In most instances ground water is pumped, treated to some extent,

and then reinjected with additives that enhance biodegradation. Common system design consists of a central withdrawal of ground water and reinfiltration upgradient of the treated area. Biodegradation relies on contact between microorganisms and contaminants dissolved in the ground water or adsorbed to saturated soils.

***Bioremediation - In Situ Lagoon*** - This technology is similar to Bioremediation - Slurry Phase, but it is in situ. The target media may have a considerably higher moisture content. It may be close to a slurry in consistency. The various microbes and nutrients may be added by injection, sprayed on top of lagoon and mixed or applied in another manner. In many situations the media may also be stirred or aerated to promote bioremediation. Applications for this technology would include petroleum/hazardous waste sites such as sludge lagoons.

***Bioremediation - In Situ Soil*** - The target media for this technology are subsurface soils in the vadose zone above the water table. In this technology, various microbes, nutrients and/or an oxygen source are added, sometimes through injection wells, to the soil to biodegrade contaminants. In general, subsurface soil moisture is required, and soils must be relatively permeable. One method of in situ soil bioremediation is bioventing, which is defined later.

***Bioremediation - Not Otherwise Specified*** - The technologies listed in this category are bioremediation technologies that did not specify one of the processes listed in the other subcategories or were not described in enough detail to be included into one of the other subcategories.

***Bioremediation - Slurry Phase*** - This technology mixes excavated soil, sludge, or sediment with water to form a slurry that is mechanically agitated in an environment (usually a tank or reactor vessel, although in situ lagoon applications are possible) with appropriate ambient conditions of nutrients, oxygen, pH, and temperature to biodegrade contaminants. Upon completion of the process, the slurry is dewatered and the treated material disposed.

***Bioremediation - Solid Phase*** - In this system, excavated soils are placed in a tank, building, or on a lined treatment bed. Nutrients and other additives are tilled into the soil using conventional equipment to facilitate microbial growth. The tillage equipment may provide aeration for the soil as well. Water is provided via a sprayer or sprinkler system. The VISITT system includes composting and land farming or treatment in this category.

***Bioventing*** - This technology combines soil vapor extraction methods with bioremediation. It involves a system of vapor extraction wells that induce air flow in the subsurface through air injection or through the use of a vacuum. The increased air flow increases the amount of oxygen available for microbial degradation. The rate of air flow is typically less than it would be with soil vapor extraction alone. The

air flow is reduced to enhance bioremediation of volatile compounds, while decreasing their extraction. A nutrient solution may be injected with the air or percolated into the soil to enhance biodegradation.

***Chemical Treatment - Dechlorination*** - This category includes any chemical treatment technology that results in the removal or replacement of chlorine atoms bonded to hazardous compounds to produce less toxic compounds. Treatment typically takes place in a tank or other reactor vessel.

***Chemical Treatment - In Situ Ground Water*** - This technology treats ground water and/or saturated soil in situ through chemical treatment technology. In this technology chemicals may be injected into the ground water to convert hazardous compounds to less hazardous compounds. This technology is different from conventional pump and treat technologies in that the ground water and/or saturated soil is treated in situ rather than pumped above ground, treated, and then reinjected.

***Chemical Treatment - Other*** - Hazardous compounds are converted to less hazardous or nonhazardous compounds through chemical reactions. The chemical reactions may be induced through the addition of other compounds or through exposure of the contaminant to light (photo-initiated reactions). Treatment technologies that fall under this classification operate at moderate temperatures and pressure. Treatment typically takes place in a tank or other reactor vessel.

***Delivery/Extraction Systems*** - These technologies do not treat hazardous wastes directly but facilitate the use of other waste treatment technologies. Such technologies may provide a means of in situ treatment in cases in which such treatment previously was not feasible. Such VISITT technologies include horizontal wells and other in situ delivery systems. In cases in which the delivery and extraction technology is integrally linked to the use of a particular treatment, the technology has been placed in the same technology category as the technology to which it is linked.

***Electrical Separation*** - The operating principle of this technology is the establishment of an electric field that will allow positive and negative ions to migrate through the contaminated material and thereby be removed. The effectiveness of this technology will depend to a great extent on the electrolytic nature of the waste.

***Magnetic Separation*** - This technology separates and concentrates contaminants or particles based on their magnetic susceptibility. A magnetic field or energy gradient is applied to a matrix or waste stream. The magnetic field or gradient deflects the magnetically susceptible particles and thereby separates them from nonmagnetic particles.

*Materials Handling/Physical Separation* - These technologies do not treat hazardous waste directly but facilitate the use of other hazardous waste treatment technologies or separate the waste into phases, making further treatment easier. In VISITT, such technologies include innovative technologies to dewater waste, separate phases, and to remove debris. In cases in which material handling/physical separation technology is linked integrally to the use of a particular treatment (for example, a specialized reactor for bioremediation), the technology also has been placed in the same technology category as the technology to which it is linked.

*Off-Gas Treatment* - This technology is specifically designed to treat the off-gas generated by another innovative treatment technology such as thermal desorption or soil vapor extraction. Treatment of the gases may involve a chemical reaction to convert the gases to less hazardous compounds. Other treatments may involve a physical process such as absorption of the gases onto a substrate where they can be further treated. The VISITT database contains only innovative off-gas treatment technologies.

*Pyrolysis* - This technology, also referred to as cracking, breaks down large hydrocarbon molecules into molecules with lower molecular weight. This is achieved in the absence of oxygen (i.e., no oxidation) by high temperature alone. The process often takes place in a moving-bed or fluidized-bed reactor. The products of the process include low molecular weight hydrocarbons and stack gases. Catalysts may be used to promote the pyrolysis process. Some pyrolysis systems may require air emission control systems for gases generated.

*Slagging* - This technology applies to hazardous wastes that contain substantial concentrations of metals (approximately 5 percent or greater). This system operates in a high-temperature environment of 3,900°F (2,150°C) or higher. The conditions may be oxidizing or reducing. In the high temperature environment, such metals as zinc, lead, and cadmium may be vaporized, along with other volatile compounds, such as halides, while less volatile metals such as copper or nickel coalesce into a molten alloy. The remaining components, such as metal oxides, melt into a molten slag. Some slagging systems may require air emission control systems for acid gas, metal vapors, and particulate. The VISITT database identifies a separate subcategory of this technology in cases in which treatment of the off-gas generated by this process is specified. For slagging technologies listed under this category, no off-gas treatment is specified.

*Slagging - Off-Gas Treated* - As defined here, this technology includes all slagging systems that are followed by some type of off-gas treatment system such as systems that liquify and recover volatilized constituents, adsorb off-gas with carbon, use a non-flame low temperature catalytic destruction process, or use incineration (that is, destruction of organic constituents in a controlled flame combustion process).

***Soil Flushing In Situ*** - This technology consists of circulating substantial volumes of water through a contaminated area to flush hazardous waste compounds from the contaminated site. Water is introduced into the soil through injection wells, trenches, or sprinklers. The water circulates through the contaminated soil and is extracted through extraction wells or by other means. The principal defining characteristic of this technology is its ability to essentially isolate the injected water within the contaminated subsurface volume, and then to recover the water for aboveground treatment. The treated water is recycled through the contaminated area. Treatment chemicals may be added to the water to help remove the hazardous constituents of concern (for example, water can be slightly acidified to help flush toxic metals from the waste site). As is the case with air sparging in situ ground water, the use of this technology depends to a great extent on site-specific soil and ground water conditions.

***Soil/Ground Water Multi-Phase Extraction*** - This technology extracts contaminants simultaneously from both the saturated and the unsaturated zone soils in situ. It usually is applied in tandem with a soil vapor extraction system. These technologies apply soil vapor extraction techniques to contaminants trapped in saturated zone soils, which are more difficult to remove than are those in the unsaturated zone. In some instances, this result may be achieved by sparging the section of a well that penetrates the ground water table. Other methods also may be employed.

***Soil Vapor Extraction*** - This technology applies a vacuum to a series of extraction wells to create an air flow through the vadose zone. Air also may be injected through injection wells to enhance air flow. As air moves through the soil, volatile contaminants move from the soil and pore water to the air. The contaminated air is withdrawn often with entrained water. This technology typically strips volatile organic compounds from the soil. Further treatment of the extracted vapors usually is required.

***Soil Washing*** - This ex situ technology uses water and mechanical action to remove hazardous constituents that adhere physically to soil particles. It makes use of the fact that contaminants have a tendency to adhere to the organic carbon and fine-grained soil fraction (silt and clay) as opposed to the coarse grain mineral fraction (sand and gravel). Surficial contamination is removed from the coarse fraction of the soils by abrasive scouring. The wash water may be augmented with a leaching agent, surfactant, pH adjustment, or chelating agent to help remove organics or heavy metals. The spent wash water will require further treatment and most likely will be recycled back to the treatment unit. The residual fines, which concentrate the contaminant, also will require further treatment.

***Solvent Extraction*** - Similar to acid extraction, this technology focuses on the removal of organic compounds, from contaminated material instead of on the removal of metals. This is an ex situ liquid-solid and liquid-liquid extraction that operates on

the principle that the organic constituents of concern can be preferentially removed from the waste to the solvent phase. The solvent used can be varied depending on the organic compounds to be treated. As with acid extraction, the contaminated solvent solution will require further treatment.

***Thermal Desorption*** - This technology uses heat in a controlled environment to cause various organic compounds to volatilize and thereby be removed from contaminated material. In some cases an inert gas is used to carry the desorbed organics. The processes are planned and designed to avoid combustion by using lower temperatures, usually 300°F - 1200°F (150°C -650°C), in the primary unit or by operating in a reduced-oxygen atmosphere. Higher temperatures may be used when there is no oxygen present in the desorption chamber. Constituents that are volatilized will require further control. The VISITT database identifies a separate subcategory of this technology if treatment of the off-gas generated by this process was specified. Technologies listed under this category did not specify any type of off-gas treatment.

***Thermal Desorption - Off-Gas Treated*** - As defined here, this technology includes all thermal desorption systems that are followed by some type of off-gas treatment system such as systems that liquify and recover volatilized constituents, adsorb off-gas with carbon, use a non-flame low temperature catalytic destruction process, or use incineration (that is, destruction of organic constituents in a controlled flame combustion process).

***Thermally Enhanced Recovery In Situ*** - This technology typically uses heat to volatilize contaminants in soil. Once volatilized, the contaminants can be extracted. Some systems inject hot air or steam directly into the soil to induce vaporization of various volatile and semivolatile organic compounds. Injection of the hot air or steam may occur either through injection wells or by other devices such as hollow-stem augers. In other cases, the heat may be generated by means other than steam, such as electric current or heating by radio frequency. The vaporized compounds are extracted directly from the soil through the use of vapor extraction wells. The hot air or steam (thermal treatment) enhances volatilization of the contaminant, thus increasing removal rates and facilitating the volatilization of less volatile compounds that would not have been extracted with such nonthermal treatments such as soil vapor extraction. Further treatment of the extracted vapors usually is required.

***Vitrification - General*** - This technology treats wastes containing primarily metals and high concentrations of silicates (soil-like material). This technology uses heat, usually applied through electrical power, to melt contaminated soils and sludges to form a stable glass and crystalline structure having very low leaching characteristics. The contaminated waste typically is heated to a range of 2,900°F to 3,600°F (1,600°C to 2,000°C), well above the soil's melting point. In some cases, vitrifying agents may be added. Metals are encapsulated in the glass-like structure of the melted silicate

compounds, and most organic compounds are destroyed. Constituents that are volatilized will require further control. In VISITT, this technology also includes systems that produce a ceramic-like treated waste. The VISITT database identifies a separate subcategory of this technology in cases in which treatment of the off-gas generated by this process is specified. For technologies listed under this category no off-gas treatment is specified.

***Vitrification - Off-Gas Treated*** - As defined here, this technology includes all vitrification systems that include some type of off-gas treatment, such as systems that liquefy and recover volatilized constituents, adsorb off-gas with carbon, or use a nonflame, low-temperature catalytic destruction process, or use incineration (that is, destruction of organic constituents in a controlled flame combustion process).

## II. Other Definitions

### Process Types

***Batch Process*** - Processing of the waste occurs without any waste entering or leaving the process vessel during treatment. An example of a batch treatment process would be a solvent extraction system where a fixed amount of solvent and waste are mixed for a given period of time prior to transfer to another treatment operation.

***Continuous Process*** - Untreated and treated wastes are simultaneously introduced and discharged from the particular treatment unit operation.

***Semicontinuous Process*** - Treatment operations are semicontinuous when 1) after the initial charge, no wastes are added to the process but some part of the waste is continuously discharge, or 2) no material is discharged from the process but wastes or treatment chemicals are continuously added for a finite period of time. An example of the former system could be a thermal desorption process where a fixed amount of waste is heated and vapors are continuously withdrawn.

### Soils and Soil Type Terms

***Soil*** - Any of the various types of natural surface materials present above bedrock.

***Soil Classification*** - As used in this form, the term is meant to describe any of five groupings of soil based on particle size. The soil groupings and associate particle size are as follows: clay (.0002 to .002 millimeters), silt (.002 to .02 mm), fine sand (.02 to .2 mm), coarse sand (0.2 to 2.0 mm), and gravel (greater than 2 mm).*[1]

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[1] Soil Survey Staff, 1975, Soil Taxonomy Handbook No. 436. U.S. Government Printing Office, p. 40 (Appendix 1).

## Media Terms

*Sludge* - A semi-solid material with a moisture content typically between 2 and 20 percent. The term is used here to identify the applicability of various technologies to a material that contains significant amounts of moisture but is relatively viscous and may present some problems with regard to pumping and mixing. Examples of sludges include residuals from treatment of metal wastes and the mixture of waste/soil at the bottom of a waste lagoon.

*Ground water in situ* - As used here, the term "ground water" refers to subsurface water found in the zone of saturation (that is, the fraction of the subsurface where all pore space is filled with water). Treatment of "ground water in situ" refers to treatment in place of ground water and/or treatment without excavation of the saturated soil to which contaminants may be adsorbed.

*Nonaqueous Phase Liquids (NAPL)* - Organic substances that are relatively insoluble in water. These substances will form immiscible layers in the subsurface.

*Dense Nonaqueous Phase Liquids (DNAPL)* - Organic substances that are relatively insoluble in water and are more dense than water. These substances will tend to migrate vertically through sand and gravel aquifers to the underlying confining layer where they will form an immiscible layer. They may also be referred to as "sinkers."

*Light Non-Aqueous Phase Liquids (LNAPL)* - Organic substances that are relatively insoluble in water and are less dense than water. These substances will tend to spread across the surface of the water table and form an immiscible layer on top of the water table. They are also referred to as "floaters."

## Engineering Terms

*Technology Limitations* - This term is meant to describe any contaminant, contaminant group, or waste parameter that can prohibit the applicability of a technology to a given waste, or adversely affect that technology in treating a particular waste. For example, biodegradation is inhibited by high concentration of toxic metals, and thermal desorption requires more energy in the presence of significant amounts of moisture. Other factors that may affect applicability and/or performance include soil particle size, oil and grease concentration, total organic carbon concentration (TOC), moisture content, cyanide concentration, and complex metals.

*Treatability Studies* - As used here, the term applies to treatment technology tests (usually at the bench or pilot scale) conducted to generate data on the untreated and treated concentrations (i.e., performance data) of various constituents, constituent groups, or pollutant parameters. These performance data are then used to assess

whether a particular technology is a viable option for cleanup of specific petroleum/hazardous waste sites or used to determine design parameters.

***Operating Principle*** - These are the underlying scientific explanation for "why" a treatment technology works. For example, the operating principle of thermal desorption is that the addition of energy (in this case, in the form of heat) can cause chemicals to volatilize (i.e., go from liquid to vapor phase) and thereby be separated from the waste of concern. (Note: An explanation of "how" heat is supplied to a various chemical is a description of the various treatment operations.)

***Transportable Technology*** - Any technology that can be moved, either completely assembled or in various parts and then reassembled at a hazardous waste site is considered to be a transportable technology.

***Fixed Technology*** - A technology that can only be used at the locations at which it is already assembled.

***In situ*** - As used here, the term is meant to describe the treatment of hazardous wastes in the media and at the location that they are found. In situ treatment does not involve any excavation of the wastes.

**Contaminant Terms**

***Contaminant*** - For the purpose of this information request, any of the hazardous substances that are listed later in this appendix are considered contaminants. These are the same substances that are designated as hazardous under CERCLA at 40 CFR 302.4.

***Contaminant Group*** - As used here, a term that applies to any of the generic names used to describe multiple contaminants that have similar chemical and/or physical properties. Two examples of contaminant groups are volatile organic compounds (VOCs) and radioactive metals.

***Pollutant Parameter*** - Any of the terms used to describe waste characteristics as a whole as opposed to discrete groups of individual contaminants. Pollutant parameters include biochemical oxygen demand (BOD), total organic carbon (TOC), pH, and moisture content.

# APPENDIX D
# KEY TO CONTAMINANT GROUPS

# CONTAMINANT GROUP CODES FOR HAZARDOUS SUBSTANCES LIST

## Organic

- A Halogenated volatiles
- B Halogenated semivolatiles
- C Nonhalogenated volatiles
- D Nonhalogenated semivolatiles
- E Organic pesticides/herbicides
- F Dioxins/furans
- G PCBs
- H Polynuclear aromatics (PNAs)
- I Solvents
- J Benzene-toluene-ethylbenzene-xylene (BTEX)
- K Organic cyanide
- L Organic corrosives

## Inorganic

- M Heavy metals
- N Nonmetallic toxic elements (As, F)
- O Radioactive metals
- P Asbestos
- Q Inorganic cyanides
- R Inorganic corrosives

## Miscellaneous

- S Explosives/propellants
- T Organometallic pesticides/herbicides

## Organic Contaminant Group

| CAS No. | | |
|---|---|---|
| 208968 | Acenaphthylene | D,H |
| 83329 | Acenaphthene | D,H |
| 75070 | Acetaldehyde | C |
| 67641 | Acetone | C,I |
| 75058 | Acetonitrile | C,K |
| 98862 | Acetophenone | D |
| 591082 | Acetyl-2-thiourea, 1 | D |
| 107028 | Acrolein | C |
| 79061 | Acrylamide | D |
| 79107 | Acrylic acid | CL |
| 107131 | Acrylonitrile | C |
| 124049 | Adipic acid | L |
| 116063 | Aldicarb | E |
| 309002 | Aldrin | E |
| 107186 | Allyl alcohol | E |
| 62533 | Aniline | D,I,L |
| 120127 | Anthracene | D,H |
| 1912249 | Atrazine | E |
| 2642719 | Azinphos-ethyl | E |
| 86500 | Azinphos-methyl | E |
| 151564 | Aziridine | C |
| 71432 | Benzene | C,I,J |
| 98884 | Benzene carbonyl chloride | B |
| 92875 | Benzidine | D |
| 205992 | Benzofluoranthene,3,4- | H |
| 65850 | Benzoic acid | D,L |
| 100470 | Benzonitrile | A,C,I |
| 95169 | Benzothiazole,1,2- | D,I |
| 50328 | Benzo (a) pyrene | D,H |
| 206440 | Benzo (j,k) fluorene | H |
| 207089 | Benzo (k) fluoranthene | D,H |
| 100447 | Benzyl chloride | A |
| 56553 | Benz (a) anthracene | D,H |
| 117817 | Bis (2-ethyl hexyl) phthalate | D |
| 111911 | Bis (2-chloroethoxy) methane | B |
| 111444 | Bis (2-chloroethyl) ether | B |
| 542881 | Bis (chloromethyl) ether | B |
| 75274 | Bromodichloromethane | A |
| 74964 | Bromomethane | A |
| 1689845 | Bromoxynil | E |
| 106990 | Butadiene, 1,3- | C |
| 71363 | Butanol | C |
| 85687 | Butlbenzyl phthalate | D |
| 94826 | Butyric acid, 4-2(2,4-dichlorop) | C,L |

| CAS No. | | |
|---|---|---|
| 133062 | Captan | B |
| 63252 | Carbaryl | E |
| 1563662 | Carbofuran | E,F |
| 75150 | Carbon disulfide | C |
| 56235 | Carbon tetrachloride | A |
| 78196 | Carbophenothion | E |
| 75876 | Chloral | A |
| 57749 | Chlordane | E |
| 106478 | Chloroaniline, p- | B |
| 108907 | Chlorobenzene | A |
| 67663 | Chloroform | A |
| 74873 | Chloromethane | A |
| 107302 | Chloromethyl methyl ether | A |
| 106898 | Chloromethyloxirane, 2- | E |
| 91587 | Chloronaphthalene, 2- | B |
| 95578 | Chlorophenol, 2- | B |
| 59507 | Chloro-3-methylphenol, 4- | B |
| 2921882 | Chloropyrifos | E |
| 218019 | Chrysene | D,H |
| 56724 | Coumaphos | E |
| 8021394 | Creosote | H |
| 108394 | Cresol, m- | D |
| 106445 | Cresol, p- | D |
| 98828 | Cumene | C,I |
| 21725462 | Cyanazine | E |
| 110827 | Cyclohexane | C,I |
| 108941 | Cyclohexanone | C |
| 72548 | DDD | E |
| 72559 | DDE | E |
| 50293 | DDT | E |
| 78488 | DEF | C,E |
| 333415 | Diazinon | E |
| 132649 | Dibenzofuran | D |
| 53703 | Dibenz (a,h) anthracene | D,H |
| 124481 | Dibromachloromethane | A |
| 106934 | Dibromoethane, 1,2- | A |
| 96128 | Dibromo-3-chloropropane, 1,2- | A |
| 1918009 | Dicamba | E |
| 95501 | Dichlorobenzene, 1,2- | B |
| 541731 | Dichlorobenzene, 1,3- | B |
| 106467 | Dichlorobenzene, 1,4- | B |
| 91941 | Dichlorobenzidine, 3,3- | B |
| 75718 | Dichlorodifluoromethane | A |
| 75343 | Dichloroethane, 1,1- | A |

| CAS No. | | |
|---|---|---|
| 107062 | Dichloroethane, 1,2- | A |
| 75354 | Dichloroethene, 1,1- | A |
| 156592 | Dichloroethylene, cis-1,2- | A |
| 156605 | Dichloroethylene, trans-1,2- | A |
| 120832 | Dichlorophenol, 2,4- | B |
| 94757 | Dichlorophenoxyacetic acid, 2- | L |
| 78875 | Dichloropropane, 1,2- | A |
| 542756 | Dichloropropene, 1,3- | A |
| 62737 | Dichlorvos | E |
| 115322 | Dicofol | E |
| 60571 | Dieldrin | E |
| 84662 | Diethyl phthalate | D |
| 111466 | Diethylene glycol | D,I |
| 1660942 | Diisopropylmethylphosphonate | D |
| 60515 | Dimethoate | E |
| 119904 | Dimethoxybenzidine, 3,3- | D |
| 105679 | Dimethyl phenol, 2,4- | D |
| 13113 | Dimethyl phthalate | D |
| 77781 | Dimethyl sulfate | C |
| 99650 | Dinitrobenzene, 1,3- | D |
| 51285 | Dinitrophenol, 2,4- | D |
| 121142 | Dinitrotoluene, 2,4- | D |
| 606202 | Dinitrotoluene, 2,6- | D |
| 88857 | Dinoseb | E |
| 123911 | Dioxane, 1,4 | C |
| 78342 | Dioxathion | E |
| 122667 | Diphenylhydrazine, 1,2- | D,H |
| 85007 | Diquat | E |
| 298044 | Disulfoton | C,E |
| 330541 | Diuron | E |
| 84742 | Di-n-butyl phthalate | D |
| 117840 | Di-n-octyl phthalate | D |
| 115297 | Endosulfan | E |
| 959988 | Endosulfan | I |
| 33212659 | Endosulfan II | E |
| 1031078 | Endolsulfan sulfate | E |
| 145733 | Endothall | E |
| 72208 | Endrin | E |
| 7421934 | Endrin aldehyde | E |
| 563122 | Ethion | E |
| 141786 | Ethyl acetate | C |
| 100414 | Ethyl benzene | C,J |
| 75003 | Ethyl chloride | A,I |
| 60297 | Ethyl ether | C |
| 107211 | Ethylene glycol | I |
| 110805 | Ethylene glycol monoethyl ether | C,I |
| 759944 | Ethylpropylthio carbomate, S- | E |

| CAS No. | | |
|---|---|---|
| 122145 | Fenitrothion | E |
| 86737 | Fluorene | D,H |
| 50000 | Formaldehyde | C |
| 64186 | Formic acid | L |
| 110009 | Furan | F |
| 98011 | Furfural | I,C |
| 765344 | Glycidyaldehyde | G |
| 76448 | Heptachlor | E |
| 1024573 | Heptachlor epoxide | E |
| 118741 | Hexachlorobenzene | B |
| 87683 | Hexachlorobutadieene | B |
| 60873 | Hexachlorocyclohexane, alpha- | E |
| 60873 | Hexachlorocyclohexane, beta- | E |
| 60873 | Hexachlorocyclohexane, delta- | E |
| 77474 | Hexachlorocyclopentadiene | B |
| 67721 | Hexachloroethane | B |
| 70304 | Hexachlorophene | B |
| 110543 | Hexane | C,I |
| 1689834 | Ioxynil | E |
| 78831 | Isobutanol | C |
| 78591 | Isophorone | D |
| 143500 | Kepone | E |
| 58899 | Lindane | E |
| 121755 | Malathion | C,E |
| 108316 | Maleic anhydride | E |
| 123331 | Maleric hydrazide | E |
| 126987 | Methacrylonitrile | C |
| 67561 | Methanol | C |
| 16752775 | Methomyl | E |
| 72435 | Methoxychlor | E |
| 79221 | Methyl chlorocarbonate | L |
| 78933 | Methyl ethyl ketone | C |
| 108101 | Methyl isobutyl ketone | C,I |
| 80626 | Methyl methacrylate | C |
| 101144 | Methylene bis (2-chloroaniline) | B |
| 75092 | Methylene chloride | A |
| 23855 | Mirex | E |
| 91203 | Naphthalene | D,H |
| 100016 | Nitroaniline, p- | D |
| 98953 | Nitrobenzene | D |
| 100027 | Nitrophenol, 4- | D |

## Organic Contaminant Group (continued)

| CAS No. | | |
|---|---|---|
| 1116547 | Nitrosodiethanolamine, n- | D |
| 55185 | Nitrosodiethylamine, n- | D |
| 62759 | Nitrosodimethylamine, n- | D |
| 86306 | Nitrosodiphenylamine, n- | D |
| 930552 | Nitrosopyrrolidine, n- | D |
| 924163 | Nitroso-di-n-butylamine, n- | D |
| 615532 | Nitroso-di-n-methylurethane, n- | D |
| 99990 | Nitrotoluene, 4- | D |
| 56382 | Parathion, ethyl- | E |
| 298000 | Parathion, methyl- | E |
| 1336363 | PCBs | G |
| 608935 | Pentachlorobenzene | B |
| 76017 | Pentachloroethane | B |
| 82688 | Pentachloronitrobenzene | B |
| 87865 | Pentachlorophenol | B |
| 85018 | Phenanthrene | D,H |
| 108952 | Phenol | D |
| 139662 | Phenyl sulfide | D |
| 62384 | Phenylmercurie acetate | E |
| 298022 | Phorate | C,E |
| 75445 | Phosgene | E |
| 13171216 | Phosphamidon | E |
| 7803512 | Phosphine | E |
| 85449 | Phthalic anhydride | D,E |
| 23950585 | Pronamide | D |
| 129000 | Pyrene | D,H |
| 110861 | Pyridine | C,I |
| 91225 | Quinoline | D,H |
| 108463 | Resorcinol | D |
| 299843 | Ronnel | E |
| 57249 | Strychnine | E,H |
| 100425 | Styrene | C |

| CAS No. | | |
|---|---|---|
| 746016 | TCDD | F |
| 95943 | Tetrachlorobenzene, 1,2,4,5- | B |
| 630206 | Tetrachloroethane, 1,1,1,2- | A,E,I |
| 79345 | Tetrachloroethane, 1,1,2,2- | A |
| 127184 | Tetrachloroethene | A |
| 58902 | Tetrachlorophenol, 2,3,4,6 | B |
| 3689245 | Tetraethyldithiopyrophosphate | E |
| 109999 | Tetrahydrofuran | F,I |
| 137268 | Thiram | E |
| 108883 | Toluene | C,J |
| 584849 | Toluene diisocyanate | D |
| 8001352 | Toxaphene | E |
| 93721 | TP, 2,4,5- | E |
| 75252 | Tribromomethane | A |
| 120821 | Trichlorobenzene, 1,2,4- | B |
| 71556 | Trichloroethane, 1,1,1- | A |
| 79005 | Trichloroethane, 1,1,2- | A |
| 79016 | Trichloroethylene | A |
| 75694 | Trichlorofluoromethane | A |
| 933788 | Trichlorophenol, 2,3,5- | B |
| 95954 | Trichlorophenol, 2,4,5- | B |
| 88062 | Trichlorophenol, 2,4,6- | B |
| 609198 | Trichlorophenol, 3,4,5- | B |
| 93765 | Trichlorophenoxyacetic acid, 2- | L |
| 933788 | Trichloro-1,2,2-trifluoroethane | A,I |
| 27323417 | Triethanolamine | E |
| 126727 | Tris (2,3-dibromopropyl) phosphate | B |
| 108054 | Vinyl acetate | C |
| 75014 | Vinyl chloride | A |
| 81812 | Warfarin | E |
| 108383 | Xylene, m- | C,J |
| 95476 | Xylene, o- | C,J |
| 106423 | Xylene, p- | C,J |

## Inorganic Contaminant Group

| CAS No. | | |
|---|---|---|
| 7429905 | Aluminum | M |
| 20859738 | Aluminum phosphide | M |
| 7440360 | Antimony | M |
| 7440382 | Arsenic | M |
| 1327533 | Arsenic trioxide | M |
| 1303339 | Arsenic trisulfide | M |
| 7440393 | Barium | M |
| 542621 | Barium cyanide | M,Q |
| 7440417 | Beryllium | M |
| 7440439 | Cadmium | M |
| 13765190 | Calcium chromate | M |
| 7778543 | Calcium hypochlorite | M |
| 1333820 | Chromic acid | M,R |
| 7440473 | Chromium | M |
| | Chromium (III) | M |
| | Chromium (VI) | M |
| 7440484 | Cobalt | M |
| 7440508 | Copper | M |
| 544923 | Copper cyanide | M,Q,e |
| 7720787 | Ferrous sulfate | M |
| 7439896 | Iron | M |
| 7439921 | Lead | M |
| 7439965 | Manganese | M |
| 7439976 | Mercury | M |
| 7440020 | Nickel | M |
| 7718549 | Nickel chloride | M |
| 10102440 | Nitrogen dioxide | R |
| 7789006 | Potassium chromate | M |
| 151508 | Potassium cyanide | M,Q |
| 506616 | Potassium silver cyanide | M,Q |
| 7783008 | Selenious acid | M,R |
| 7782492 | Selenium | M |
| 7440224 | Silver | M |
| 506649 | Silver cyanide | M,Q |
| 7440235 | Sodium | M |
| 26628228 | Sodium azide | M |
| 7681494 | Sodium fluoride | M |
| 7775113 | Sodium chromate | M |
| 143339 | Sodium cyanide | M,Q |
| 1310732 | Sodium hydroxide | M,R |
| 7440280 | Thallium | M |
| 1314325 | Thallic oxide | M |
| 563688 | Thallium acetate | M |
| 6533739 | Thallium carbonate | M |
| 7791120 | Thallium chloride | M |
| 10102451 | Thallium nitrate | M |
| 12039520 | Thallium selenide | M |
| 7446186 | Thallium (I) sulfate | M |
| 7440291 | Thorium | M |
| 1314621 | Vanadium pentoxide | M |
| 7440666 | Zinc | M |
| 557211 | Zinc cyanide | M,Q |
| 1314847 | Zinc phosphide | M |
| 7733020 | Zinc sulfate | M |

## Explosive/Propellants

| CAS No. | | |
|---|---|---|
| 7664417 | Ammonia | S |
| 131748 | Ammonium picrate | S |
| 7773060 | Ammonium sulfamate | S |
| 460195 | Cyanogen | S |
| 2691410 | Cyclotetramethylenetetranitramine | S |
| 302012 | Hydrazine | S |
| 55630 | Nitroglycerine | S |
| 99990 | Nitrotoluene, 4- | S |
| 26628228 | Sodium azide | M,S |
| 99354 | Trinitrobenzene, 1,3,5 | S |
| 118967 | Trinitrotoluene | S |

## Organometallic Compound

| CAS No. | | |
|---|---|---|
| 630104 | Selenourea | U |
| 78002 | Tetraethyl lead | U |

# UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
# VENDOR INFORMATION SYSTEM FOR INNOVATIVE TREATMENT TECHNOLOGIES

## APPENDIX E
## VENDOR INFORMATION FORM 3.0

*Blank Submittal Form*

***NOTE:*** You may submit data electronically instead of typing or writing responses on this Vendor Information Form. Each form is accompanied by one 3.5" IBM-compatible diskette. If you need additional diskettes, call the VISITT Hotline at 800/245-4505 or 703/883-8448.

# (VISITT)
# VENDOR INFORMATION FORM

**Please read instructions in Appendix A before proceeding**

## PART 1: GENERAL INFORMATION AND TECHNOLOGY OVERVIEW

1. Date Submitted _____/_____/_____

2a. Developer/Vendor Name _____

2b. Is this an update of a VISITT Version 2.0 technology? Yes ☐ No ☐

If yes, specify technology and vendor name that appear in VISITT 2.0 if different from the information in this update.

_____

**For VISITT Version 2.0 Vendors:** Questions 2c and 2d are intended to gather information on the use of VISITT in the remediation community.

2c. Please provide a rough estimate of the total number or frequency of inquiries your company has received through your inclusion in VISITT. _____

2d. Has your company performed work (either for a fee or free), such as a treatability study, pilot-scale study, or field demonstration, as a result of those inquiries. ☐ Yes ☐ No

Please provide details, if possible. _____

_____

_____

2e. Please list your primary SIC code(s) and check the appropriate business classification for each code.

SIC Code _____ ☐ Small ☐ Other Than Small ☐ Disadvantaged/Minority ☐ Women-owned

SIC Code _____ ☐ Small ☐ Other Than Small ☐ Disadvantaged/Minority ☐ Women-owned

SIC Code _____ ☐ Small ☐ Other Than Small ☐ Disadvantaged/Minority ☐ Women-owned

3. Street Address _____

_____

4. City _____ State/Province _____ Zip Code _____

5. Country _____

6. a. Contact Name _____

b. Contact Title _____

7. Contact Phone ( )_____-_____ 8. Fax Number ( )_____-_____

**Vendor Name** _____

**Technology Type** _____

## PART 1: GENERAL INFORMATION AND TECHNOLOGY OVERVIEW *(continued)*

9. **Technology Type.*** *Check one only.* Fill out a separate form for each additional technology.

- ☐ Acid Extraction
- ☐ Adsorption - In Situ
- ☐ Air Sparging - In Situ Ground Water
- ☐ Bioremediation - In Situ Ground Water
- ☐ Bioremediation - In Situ Lagoon
- ☐ Bioremediation - In Situ Soil
- ☐ Bioremediation - Not Otherwise Specified
- ☐ Bioremediation - Slurry Phase
- ☐ Bioremediation - Solid Phase
- ☐ Bioventing
- ☐ Chemical Treatment - Dechlorination
- ☐ Chemical Treatment - In Situ Ground Water
- ☐ Chemical Treatment - Other
- ☐ Delivery/Extraction Systems
- ☐ Electrical Separation
- ☐ Magnetic Separation
- ☐ Materials Handling/Physical Separation
- ☐ Off-Gas Treatment
- ☐ Pneumatic Fracturing
- ☐ Pyrolysis
- ☐ Slagging - Off-Gas Treated
- ☐ Soil Flushing - In Situ
- ☐ Soil Vapor Extraction
- ☐ Soil Washing
- ☐ Soil/Ground Water Multi-Phase Extraction
- ☐ Solvent Extraction
- ☐ Thermal Desorption - General
- ☐ Thermal Desorption - Off-Gas Treated
- ☐ Thermally Enhanced Recovery In Situ
- ☐ Vitrification - General
- ☐ Vitrification - Off-Gas Treated
- ☐ Other (specify) _____

* See Appendix C for definitions of technology types.

10a. **Technology Name Assigned By Vendor** *(if different than name listed in Question 9).*

_____

10b. Registered trademark? ☐ Yes ☐ No

11. Patents

a. Is technology patented? ☐ Yes ☐ No

b. Is patent pending? ☐ Yes ☐ No

12. **Superfund Innovative Technology Evaluation (SITE) Program.**

a. Is this technology being tested, or has this technology been tested, in EPA SITE **Emerging** Technology Program?

☐ Yes ☐ No

b. Is this technology being tested, or has this technology been tested, in EPA SITE **Demonstration** Program?

☐ Yes ☐ No

## PART 1: GENERAL INFORMATION AND TECHNOLOGY OVERVIEW *(continued)*

13. **Description of Technology**. In 300 words or less, describe treatment process, including scientific principle on which the technology is based; key treatment steps; unique and innovative features; whether full-scale system is/will be batch, continuous, or semicontinuous; and whether the technology is above ground or in situ. *Parts 2 and 3* allow more detail for full- and pilot-scale systems. Provide a flow chart of the treatment process, showing the equipment necessary for each step. Flowcharts might not be included in VISITT.

**EXAMPLE**

**Description of Technology**

ABC Corporation has developed an innovative solvent extraction technology (SUPER) that uses Super Chemical as the solvent. Super Chemical is a biodegradable solvent.

The key to success of this process is Super Chemical's property of inverse miscibility; below 65 degrees F, Super Chemical is soluble in water (hydrophilic) and above 65 degrees F, it is insoluble in water (hydrophobic). Therefore, cold Super Chemical can extract water and water-soluble compounds, and warm Super Chemical can extract organic contaminants, such as PCBs, pesticides, PAHs, SVOCs, and VOCs.

Within the unit, the soil is washed continuously with Super Chemical in a counter-current process. The contaminants dissolve in the solution and are removed from the soil by the counter-current flow. The contaminated solvents are reclaimed in a closed-loop circuit, eliminating the need for large volumes of solvent. The clean, washed soil is moved to a closed-loop dryer system, where any excess solvent is removed from the soil. When the soil exits the system, it is relatively free of organics and dry. The collected contaminant from the solvent washing is concentrated 1,000 to 10,000 times, reducing its volume and its associated disposal costs, and is pumped periodically from the system into labeled 55-gallon drums for conventional off-site disposal.

Emissions of organic vapors to air are controlled and treated by a carbon absorption system.

## PART 1: GENERAL INFORMATION AND TECHNOLOGY OVERVIEW *(continued)*

13. **Description of Technology** *(continued)*.

## PART 1: GENERAL INFORMATION AND TECHNOLOGY OVERVIEW *(continued)*

14. **Technology Highlights.** In 200 words or less, describe, in terms of contaminants treated, performance, implementation, or cost, the key marketable features of technology, such as treatment niche and advantages over other technologies.

**EXAMPLE**

**Technology Highlights**

The SUPER solvent extraction process can treat soils, sludges, and sediments contaminated with PCBs, carcinogenic PAHs, pesticides, and VOCs at 20% to 40% of incineration costs. Treated products from the SUPER process include: water suitable for discharge, oil for recycle as fuel, and solids that can be returned to the site as backfill. The process also can reduce the initial volume of contaminated material by as much as 90%.

The SUPER solvent extraction process operates at near ambient pressures and temperatures, uses off-the-shelf process equipment, and controls air emissions. The extraction efficiency (organic removal efficiency) achieved is as high as 99%.

Solvent recovery is also greater than 99%. The process can treat up to 300 tons per day of contaminated soil. This technology is well accepted by communities because air emissions are minimized.

## PART 1: GENERAL INFORMATION AND TECHNOLOGY OVERVIEW *(continued)*

15. **Technical Limitations.** In 200 words or less, describe technical limitations such as specific contaminants or contaminant combinations, temperature, moisture content, or chemical properties of the contaminant, that could adversely affect applicability or performance.

**EXAMPLE**

**Technology Limitations**

The SUPER process is not applicable for metal-only, (e.g., radioactive) or other inorganic wastes, but its performance is not affected by inorganics at low concentrations. This process may require screening or crushing to 0.25 inch, and other feed preparation operations, depending on the waste. The extraction efficiency of an organic contaminant will depend on its solubility in the solvent. The solvent used is best suited for PCBs and pesticides.

## PART 1: GENERAL INFORMATION AND TECHNOLOGY OVERVIEW *(continued)*

16. **Other Comments.** In 200 words or less, provide additional information about the technology, such as its history, status, capabilities, and experience and applicable permits obtained (for example, TSCA or RCRA). Also describe plans for future development of the technology, including diversification of media and/or contaminants treated.

**EXAMPLE**

**Other Comments**

The SUPER process has been demonstrated successfully at bench scale, pilot scale, and full scale. A full-scale SUPER unit was used to treat sludges contaminated with PCBs at the BAD Oil Refining Superfund site.

Two pilot-scale units have been built. One was operated under the SITE program to treat soils and sludges contaminated with PCBs.

Bench-scale treatability studies have been conducted on contaminated soils containing petrochemical compounds, pharmaceutical compounds, pesticides, PCBs, and wood preserving wastes containing PAHs.

## PART 1: GENERAL INFORMATION AND TECHNOLOGY OVERVIEW *(continued)*

17. **Technology Status.** *Check only one.* Using the following definitions, indicate the operational status of the technology.

a. ☐ **Full scale.** Available equipment is sized and commercially available for actual site remediation. (If you select full scale, you must fill out *Part 2*).

b. ☐ **Pilot scale.** Available equipment is of sufficient size to verify technology feasibility or establish the design and operating conditions for a full-scale system. However, it is not of the size typically used for a cleanup. (If you select pilot scale, you must fill out *Part 3*).

c. ☐ **Bench scale or emerging.** Technology has been shown to be feasible through the use of bench-top equipment in the laboratory. Data from these studies cannot be used to scale up the technology to full scale.

18. **Media treated.** Check "actual" for all media that have been treated by your technology. Check "potential" for all media to which technology may be applied in the future.

| Actual | Potential | |
|---|---|---|
| ☐ | ☐ | Soil (in situ) |
| ☐ | ☐ | Soil (ex situ) |
| ☐ | ☐ | Sludge (does not include municipal sewage sludge) |
| ☐ | ☐ | Solid (for example, slag) |
| ☐ | ☐ | Natural sediment (in situ) |
| ☐ | ☐ | Natural sediment (ex situ) |
| ☐ | ☐ | Ground water (in situ) [Includes treatment of ground water and/or saturated soil] |
| ☐ | ☐ | Off-gas generated from a primary innovative treatment technology |
| ☐ | ☐ | Dense nonaqueous phase liquids (DNAPL) [in situ] |
| ☐ | ☐ | Light nonaqueous phase liquids (LNAPL) [in situ] |

19. **Contaminants and Contaminant Groups Treated.** *Check all that may apply.* Check "actual" for all that have been treated by your technology (that is, data exist). Check "potential" for all that the technology may be applied to in the future. Data for actual contaminants treated should be included in *Part 5* (see Appendix D for key to contaminant groups). If your technology is materials handling/physical separation, delivery/extraction, or if you are an equipment vendor, this question may not apply.

| Actual | Potential | |
|---|---|---|
| ☐ | ☐ | Halogenated volatiles |
| ☐ | ☐ | Halogenated semivolatiles |
| ☐ | ☐ | Nonhalogenated volatiles |
| ☐ | ☐ | Nonhalogenated semivolatiles |
| ☐ | ☐ | Organic pesticides/herbicides |
| ☐ | ☐ | Dioxins/furans |
| ☐ | ☐ | PCBs |
| ☐ | ☐ | Polynuclear aromatics (PNA) |
| ☐ | ☐ | Solvents |
| ☐ | ☐ | Benzene-toluene-ethylbenzene-xylene (BTEX) |
| ☐ | ☐ | Acetonitrile (organic cyanide) |
| ☐ | ☐ | Organic acids |

| Actual | Potential | |
|---|---|---|
| ☐ | ☐ | Heavy metals |
| ☐ | ☐ | Nonmetallic toxic elements |
| ☐ | ☐ | Radioactive metals |
| ☐ | ☐ | Asbestos |
| ☐ | ☐ | Inorganic cyanides |
| ☐ | ☐ | Inorganic corrosives |
| | | Miscellaneous |
| ☐ | ☐ | Explosives/propellants |
| ☐ | ☐ | Organometallic pesticides/herbicides |
| ☐ | ☐ | Other (specify) _____ |

## PART 1: GENERAL INFORMATION AND TECHNOLOGY OVERVIEW *(continued)*

20. **Industrial Waste Sources or Site Types of Sites Treated.** *Check all that may apply.* Check "actual" for all that have been treated by your technology (that is, data exist). Check "potential" for all that the technology may be applied to in the future. Treatment data should be available for those sites for which "actual" is checked. See Table A for wastes typically associated with each industry.

| Actual | Potential | | Actual | Potential | |
|---|---|---|---|---|---|
| ☐ | ☐ | Agriculture | ☐ | ☐ | *Munitions Manufacturing* |
| ☐ | ☐ | Battery recycling/disposal | ☐ | ☐ | Paint/ink formulation |
| ☐ | ☐ | Chloro-alkali manufacturing | ☐ | ☐ | Pesticide manufacturing/use |
| ☐ | ☐ | Coal gasification | ☐ | ☐ | Petroleum refining and reuse |
| ☐ | ☐ | Dry cleaning | ☐ | ☐ | Photographic products |
| ☐ | ☐ | Electroplating | ☐ | ☐ | Plastics manufacturing |
| ☐ | ☐ | Gasoline service station/petroleum storage facility | ☐ | ☐ | Pulp and paper industry |
| ☐ | ☐ | Herbicide manufacturing/use | ☐ | ☐ | Other organic chemical manufacturing |
| ☐ | ☐ | Industrial landfills | ☐ | ☐ | Other inorganic chemical manufacturing |
| ☐ | ☐ | Inorganic/organic pigments | ☐ | ☐ | Semiconductor manufacturing |
| ☐ | ☐ | Machine shops | ☐ | ☐ | Rubber manufacturing |
| ☐ | ☐ | Metal ore mining and smelting | ☐ | ☐ | Wood preserving |
| ☐ | ☐ | Municipal Landfill | ☐ | ☐ | Uranium mining |
| | | | ☐ | ☐ | Others *(specify)* _____ |

_____

_____

21. **Vendor Services.** Check all that apply.

☐ Equipment manufacturer
☐ Subcontractor for cleanup services
☐ Prime contractor for full-service remediation
☐ Other *(specify)* _____

## PART 1: GENERAL INFORMATION AND TECHNOLOGY OVERVIEW *(continued)*

### Table A

**Contaminants/Wastes Associated With Industrial Waste Sources or Types of Sites**

| | | | |
|---|---|---|---|
| 1. | Chloro-alkali manufacturing | : | Chlorine compounds, mercury |
| 2. | Coal gasification | : | PAHs |
| 3. | Agriculture | : | Pesticides |
| 4. | Battery recycling/disposal | : | Lead (acid) |
| 5. | Dry cleaning | : | Solvents |
| 6. | Electroplating | : | Chrome, metals |
| 7. | Herbicide manufacturing/use | : | Pesticides |
| 8. | Industrial landfills | : | Wastes from Multiple Sources |
| 9. | Inorganic/organic pigments | : | Solvents, chrome, zinc |
| 10. | Machine shops | : | Metals, oils |
| 11. | Metal ore mining and smelting | : | Metals |
| 12. | Municipal landfills | : | Wastes from multiple sources |
| 13. | Munitions manufacturing | : | Explosives, lead |
| 14. | Paint/ink formulation | : | Solvents, some metals (chrome, zinc) |
| 15. | Pesticide manufacturing/use | : | Pesticides |
| 16. | Petroleum refining and reuse | : | Petroleum, hydrocarbons, BTEX |
| 17. | Photographic products | : | Silver, bromide, solvent |
| 18. | Plastics manufacturing | : | Polymers, phthalates |
| 19. | Pulp and paper industry | : | Chlorinated organics, dioxins |
| 20. | Other organic chemical manufacturing | : | Organics, metals (used as catalyst) |
| 21. | Other inorganic chemical manufacturing | : | Inorganics, metals |
| 22. | Semiconductor manufacturing | : | Degreasing agents (solvents), metals |
| 23. | Rubber manufacturing | : | Rubber, plastics, polymers, organics |
| 24. | Wood preserving | : | Creosote, PCP, arsenic, chrome, PAHs |
| 25. | Uranium mining | : | Uranium, radioactive metals |

## PART 2: FULL-SCALE EQUIPMENT/CAPABILITIES

You must complete this part if you checked Response 17a (that is, technology is at full scale). You also may complete this part if the technology is at pilot scale.

22. **Major Unit Processes.** In 300 words or less, describe the steps and operation of the full-scale system, including list of key components. Also describe any pre- and post-processing required by your technology. Provide more detail than you did in Question 13.

**EXAMPLE**

**Major Unit Processes**

**Preprocessing**

- Front-end loader and weight scale
- Shredder
- Radial stacker belt conveyor and surge hopper

1. Stockpiled soil is transported to a weigh scale by a front-end loader.

2. Soil is deposited directly on a power shredding device. Classified soil with a top size of less than 2 inches passes through the shredder into the feed conveyor.

3. The feed conveyor is an enclosed radial stacker belt conveyor that is 18 inches wide and 60 feet long. The conveyor discharges into the surge hopper located above the thermal processor. The soil is fed into the LT system at regular intervals to maintain the surge hopper seal.

**Processing**

- Thermal processor
- Induced draft (ID) fan for vapors
- Horizontal screw conveyor and ash conditioner

1. The thermal processor houses four intermeshed screw conveyors. The function of each screw conveyor is to move soil forward through the processor and to thoroughly mix the material, providing indirect contact between the heat transfer fluid and the soil. The shafts and flights of the screw conveyors and the processor jackets are hollow to allow circulation of a heat transfer fluid (that is, hot oil).

2. Vapors are driven off the soil and are drawn out of the thermal processor by an ID fan.

3. Soil is discharged from the thermal processor onto a horizontal screw conveyor and then an ash conditioner.

4. The conditioner is a ribbon flight screw conveyor. Water spray nozzles installed in the conditioner housing cool the discharge material and minimize fugitive dust emissions.

**Postprocessing**

- Stacker belt conveyor and dump truck

1. The conditioner discharges onto an inclined stacker belt. The stacker belt conveys the wetted processed soil from the conditioner to the dump truck.

## PART 2: FULL-SCALE EQUIPMENT/CAPABILITIES *(continued)*

22. **Major Unit Processes** *(continued)*.

## PART 2: FULL-SCALE EQUIPMENT/CAPABILITIES *(continued)*

23. **Full-Scale Facility** is *(check one only)*

❑ Transportable ❑ Fixed ❑ In situ

b. City _____ and State _____ of fixed facility

24. **Number of Full-Scale Systems.**

_____ Planned/in design _____ Under construction _____ Constructed

25. **Capacity Range per Hour.**

_____ to _____ _____ (units) ❑ Not applicable

26. **Estimated Price Range.** Provide a "ballpark" estimate per unit of waste treated. Include waste preprocessing and exclude excavation, permitting, and disposal of residues.

$_____ to $_____ per _____ (units)

27. **Factors Affecting Unit Price.** With "1" the highest, rank any of the following items that will have a significant effect on unit price. If technology is in situ, excavation and waste handling cannot affect price.

| | | | |
|---|---|---|---|
| _____ | Initial concentration of contaminant | _____ | Site preparation |
| _____ | Target concentration of contaminant | _____ | Waste handling/preprocessing |
| _____ | Quantity of waste | _____ | Amount of debris with waste |
| _____ | Depth of contamination | _____ | Characteristics of soil (classification, |
| _____ | Depth to ground water | | permeability) |
| _____ | Characteristics of residual waste | _____ | Utility/fuel rates |
| _____ | Moisture content of soil | _____ | Labor rates |

_____ Other (specify) _____

28. **Full-Scale Cleanups.**

a. If you are a subcontractor or prime contractor, give the number of full-scale cleanups using your technology that your firm has initiated or completed. Consider only those applications of your technology that were applied at petroleum/hazardous waste sites.

_____

b. If you are an equipment manufacturer, give the number of full-scale cleanups by other firms using your technology of which you are aware. Consider only those applications of your technology that were applied at petroleum/hazardous waste sites.

_____

## PART 3: PILOT-SCALE EQUIPMENT/CAPABILITIES

You must complete this part if you checked Response Question 17b. You also may complete this part if the technology is at full scale or bench scale.

29. **Major Unit Processes.** In 200 words or less, describe steps and operation of the pilot-scale treatment system, including list of key components. Also describe any pre- and post-processing required by your technology. Provide more detail than you did in Question 13.

**EXAMPLE**

**Major Unit Processes**

Pilot-scale testing involves processing the soils or bulk soils through various operations of reduced-size equipment that when set in series, would be similar to a full-scale operation. The equipment consists of:

1. A hopper and screen for feed preparation; removal of tramp material and sizing, if needed.
2. A mixing or attrition tank where the prepared feed is introduced to the liquids. In the most basic system, extraction of contaminant takes place at this stage.
3. A classification circuit, consisting of a sump, pump, and cyclone for separation of coarse sand, gravel, and organics from fine clays and silts.
4. If extraction of contaminant so requires, coarse material is subjected to a specific gravity (SG) separation through use of a vessel, cyclone, or hydrosizer. Contaminated smaller size material (low SG) is separated from the clean, coarse (high SG) material.
5. Clean, coarse material is dewatered with a screen, although in full-scale operation, additional dryers (centrifuges) may be employed.
6. Low SG organics containing contaminant are dewatered with a screen and collected for disposal or secondary treatment.
7. Clays and silts are flocculated in a reaction tank and gravity-concentrated in a thickener or clarifier.
8. Thickened clays and silts containing contaminant are dewatered in a belt press and sent for disposal or secondary processing.
9. Recycled liquid from the thickening and dewatering process is collected and, in some cases, treated before it is returned to the mixing/attrition tank.

## PART 3: PILOT-SCALE EQUIPMENT/CAPABILITIES *(continued)*

29. **Major Unit Processes** *(continued)*.

30. **Pilot-scale facility** is *(Check only one)*

☐ Transportable ☐ Fixed ☐ In Situ

b. City _____ and State _____ of fixed facility.

31. **Number of Pilot-Scale Systems**

_____ Planned/in design _____ Under construction _____ Constructed

32. How many times have you used this technology at your facility or at other locations to conduct pilot-scale studies on actual wastes? Count only once multiple studies pertaining to the same site, regardless of the number of different wastes or tests. Do not count tests on surrogate wastes.

_____

33. Can you conduct pilot-scale treatability studies on some types of waste at your location?

☐ Yes ☐ No At a contaminated site? ☐ Yes ☐ No

34. **Capacity Range Per Hour.** Prorate capacity of batch processes. This range should be consistent with your answer to Question 35 (the waste requirement for the pilot-scale treatability study).

_____ to _____ _____ (units) ☐ Not applicable

35. **Quantity of Waste Needed for Pilot-Scale Treatability Study**. Give estimated range of quantity of waste needed to test, at the pilot scale, the feasibility of this technology on a specific waste.

_____ to _____ _____ (units)

## PART 4: TREATABILITY STUDY CAPABILITIES (BENCH SCALE)

36. Can you conduct bench-scale treatability studies on some types of waste at your location?

☐ Yes ☐ No

37. **Number of Bench-Scale Studies Conducted.** Estimate total number of bench-scale studies conducted on actual waste from different sources or sites. Count only once multiple studies pertaining to the same site, regardless of the number of different wastes or tests. Do not count tests on surrogate wastes.

_____

38. **Description of Bench-Scale Testing Procedures.** In 200 words or less, describe the type of test that would be performed to determine feasibility of this technology for treating a specific waste.

**EXAMPLE**

**Description of Bench-Scale Testing Procedures**

In our feasibility assessment tests, we usually start with a sample of the soil to be treated and a knowledge of the nature and of each contaminant concentration and the effluent goals to be met. The following steps then are taken:

a. The optimal conditions for soil washing are studied, such as pH, time, and chelating agent and concentration.

b. Various likely adsorbents are studied on a batch basis to determine which are most effective at removing the metals of interest from the chelating agent in the washing water.

c. One or more selected media then are studied on columns to determine their ability to retain metals in a continuous-flow situation.

d. For the surviving adsorbent(s), the ion elution performance then is determined; after this step, one resin will have been selected as optimal for the particular task under study.

e. The selected adsorbent then is subjected to a number of charge and regeneration cycles to establish its ruggedness.

Vendor Name _____

Technology Type _____

## PART 5: REPRESENTATIVE APPLICATIONS, CLIENT REFERENCES, AND PERFORMANCE DATA

39. List as many as *five* representative projects that also can serve as references. List information for only one project per sheet. For projects that have more than one application, fill out a separate sheet for each application. Provide only the performance data that is specific to each project listed. Full- and pilot-scale projects are of most importance. EPA reserves the right to add information on projects conducted for the federal government of which EPA is aware.

a.

**Site Name or Industry Type if Client Identity is Confidential:** _____

**Site Type or Waste Source (Check all that apply)**

_____ Agriculture
_____ Battery recycling/disposal
_____ Chloro-alkali manufacturing
_____ Coal gasification
_____ Dry cleaning
_____ Electroplating
_____ Gasoline service station/petroleum storage facility
_____ Herbicide manufacturing/use
_____ Industrial landfills
_____ Inorganic/organic pigments
_____ Machine shops
_____ Metal ore mining and smelting
_____ Municipal Landfill
_____ Munitions Manufacturing
_____ Paint/ink formulation
_____ Pesticide manufacturing/use
_____ Petroleum refining and reuse
_____ Photographic products
_____ Plastics manufacturing
_____ Pulp and paper industry
_____ Other organic chemical manufacturing
_____ Other inorganic chemical manufacturing
_____ Semiconductor manufacturing
_____ Rubber manufacturing
_____ Wood preserving
_____ Uranium mining
_____ Others *(specify)* _____

**Location**

City _____

State/Province: _____

Country _____

**Project took place at site named**

_____ Yes

_____ No

**At another site (that is, a Test facility)**

_____ Yes

_____ No

**Regulation/Statute/Organization (Check all that apply)**

_____ *RCRA corrective action*
_____ *CERCLA*
_____ *TSCA*
_____ *Safe Drinking Water Act*
_____ *UST corrective action*
_____ *State (specify)* _____
_____ *DOD*
_____ *DOE*
_____ *Other (Specify)* _____
_____ *Not Applicable*

**Application or Project Type *(Check all that apply)***

_____ *Full-scale cleanup*
_____ *Field demonstration*
_____ *Pilot-scale treatability study*
_____ *Bench-scale treatability study*
_____ *RCRA Research, Development, and Demonstration*
_____ *TSCA National Demonstration*
_____ *TSCA Research and Development*
_____ *EPA SITE Demonstration Program*
_____ *EPA SITE Emerging Technology Program*
_____ *Research*
_____ *Other (specify)* _____

**Media Treated *(Check all that apply)***

_____ Soil (in situ)
_____ Soil (ex situ)
_____ Sludge
_____ Solid
_____ Natural sediment (in situ)
_____ Natural sediment (ex situ)
_____ Ground water in situ
_____ Off-gas from a primary treatment technology
_____ Dense nonaqueous phase liquids (DNAPL) [in situ]
_____ Light nonaqueous phase liquids (LNAPL) [in situ]

**Volume/Quantity Treated**

_____ _____ (Units)

**Area treated (for in situ projects)**

_____ _____ (Units)

**Depth treated (for in situ projects)**

_____ _____ (Units)

**Equipment Scale *(Check one only)***

_____ **Bench**

_____ **Pilot**

_____ **Full**

**Project Status**

**Contracted**

Month _____ Year _____

**In cleanup** Yes ____ No ____

**Completed**

Month _____ Year _____

## PART 5: REPRESENTATIVE APPLICATIONS, CLIENT REFERENCES, AND PERFORMANCE DATA (continued)

### a. (continued)

*Note:* (1) List one specific contaminant per line. Do not list such entire contaminant groups as VOCs or solvents. TPH, which can be analyzed using a specific test method, can be listed as an individual contaminant.

(2) and (3) Indicate the appropriate units; for concentrations that were non-detect write N.D.; treated concentration should be lower than untreated concentration unless the technology is dewatering or some other volume reduction method. If a concentration range cannot be given, provide an average and note it as such.

(4) Specify the cleanup standard or goal, if known, for the individual contaminant for this project. For example, if the project was part of a Superfund remedial action, the cleanup goal is specified in the record of decision (ROD) for that site.

**Performance Data**

| (1) Contaminant or Pollutant Parameter | (2) Untreated Concentration Range (Min to Max) | (3) Units | (2) Treated Concentration Range (Min to Max) | (3) Units | (4) Cleanup Standard or Goal | (3) Units |
|---|---|---|---|---|---|---|
| (Example) Benzene | 50 - 150 | ppm | 25 - 50 | ppm | 50 | ppm |
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**Cost Information**

**Estimated or actual total and/or unit cost for this project**

$ _____ per _____ (unit)

$ _____ (total)

What items or activities are included in these cost(s) (e.g., mobilization, demobilization, excavation, waste handling)?

_____

_____

_____

**Person outside of company familiar with project (optional)**

**Name** _____ **Company** _____

**Address** _____

_____

**Is Literature Available on this Project? (You may wish to include these citations in *Part 6*)**

___ **Yes** ___ **No**

Additional project information site conditions, mode of operation, and other pertinent information). _____

_____

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## PART 5: REPRESENTATIVE APPLICATIONS, CLIENT REFERENCES, AND PERFORMANCE DATA (continued)

b.

**Site Name or Industry Type if Client Identity is Confidential:** _____

**Site Type or Waste Source (Check all that apply)**

- ____ Agriculture
- ____ Battery recycling/disposal
- ____ Chloro-alkali manufacturing
- ____ Coal gasification
- ____ Dry cleaning
- ____ Electroplating
- ____ Gasoline service station/petroleum storage facility
- ____ Herbicide manufacturing/use
- ____ Industrial landfills
- ____ Inorganic/organic pigments
- ____ Machine shops
- ____ Metal ore mining and smelting
- ____ Municipal Landfill
- ____ Munitions Manufacturing
- ____ Paint/ink formulation
- ____ Pesticide manufacturing/use
- ____ Petroleum refining and reuse
- ____ Photographic products
- ____ Plastics manufacturing
- ____ Pulp and paper industry
- ____ Other organic chemical manufacturing
- ____ Other inorganic chemical manufacturing
- ____ Semiconductor manufacturing
- ____ Rubber manufacturing
- ____ Wood preserving
- ____ Uranium mining
- ____ Others *(specify)* _____

**Location**

City _____

State/Province: _____

Country _____

**Project took place at site named**

____ Yes

____ No

**At another site (that is, a Test facility)**

____ Yes

____ No

**Regulation/Statute/Organization (Check all that apply)**

- ____ *RCRA corrective action*
- ____ *CERCLA*
- ____ *TSCA*
- ____ *Safe Drinking Water Act*
- ____ *UST corrective action*
- ____ *State (specify)* _____
- ____ *DOD*
- ____ *DOE*
- ____ *Other (Specify)* _____
- ____ *Not Applicable*

**Application or Project Type *(Check all that apply)***

- ____ *Full-scale cleanup*
- ____ *Field demonstration*
- ____ *Pilot-scale treatability study*
- ____ *Bench-scale treatability study*
- ____ *RCRA Research, Development, and Demonstration*
- ____ *TSCA National Demonstration*
- ____ *TSCA Research and Development*
- ____ *EPA SITE Demonstration Program*
- ____ *EPA SITE Emerging Technology Program*
- ____ *Research*
- ____ *Other (specify)* _____

**Media Treated *(Check all that apply)***

- ____ Soil (in situ)
- ____ Soil (ex situ)
- ____ Sludge
- ____ Solid
- ____ Natural sediment (in situ)
- ____ Natural sediment (ex situ)
- ____ Ground water in situ
- ____ Off-gas from a primary treatment technology
- ____ Dense nonaqueous phase liquids (DNAPL) [in situ]
- ____ Light nonaqueous phase liquids (LNAPL) [in situ]

**Volume/Quantity Treated**

____ ____ (Units)

**Area treated (for in situ projects)**

____ ____ (Units)

**Depth treated (for in situ projects)**

____ ____ (Units)

**Equipment Scale *(Check one only)***

____ **Bench**

____ **Pilot**

____ **Full**

**Project Status**

**Contracted**

Month _____ Year _____

**In cleanup** Yes ____ No ____

**Completed**

Month _____ Year _____

Vendor Name _____

Technology Type _____

## PART 5: REPRESENTATIVE APPLICATIONS, CLIENT REFERENCES, AND PERFORMANCE DATA (continued)

### b. (continued)

***Note:*** (1) List one specific contaminant per line. Do not list such entire contaminant groups as VOCs or solvents. TPH, which can be analyzed using a specific test method, can be listed as an individual contaminant.

(2) and (3) Indicate the appropriate units; for concentrations that were non-detect write N.D.; treated concentration should be lower than untreated concentration unless the technology is dewatering or some other volume reduction method. If a concentration range cannot be given, provide an average and note it as such.

(4) Specify the cleanup standard or goal, if known, for the individual contaminant for this project. For example, if the project was part of a Superfund remedial action, the cleanup goal is specified in the record of decision (ROD) for that site.

**Performance Data**

| (1) Contaminant or Pollutant Parameter | (2) Untreated Concentration Range (Min to Max) | (3) Units | (2) Treated Concentration Range (Min to Max) | (3) Units | (4) Cleanup Standard or Goal | (3) Units |
|---|---|---|---|---|---|---|
| (Example) Benzene | 50 - 150 | ppm | 25 - 50 | ppm | 50 | ppm |
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**Cost Information**

**Estimated or actual total and/or unit cost for this project**

$ _____ per _____ (unit)

$ _____ (total)

What items or activities are included in these cost(s) (e.g., mobilization, demobilization, excavation, waste handling)?

_____

_____

_____

**Person outside of company familiar with project (optional)**

**Name** _____ **Company** _____

**Address** _____

_____

**Is Literature Available on this Project? (You may wish to include these citations in *Part 6*)**

___ **Yes** ___ **No**

Additional project information site conditions, mode of operation, and other pertinent information). _____

_____

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## PART 5: REPRESENTATIVE APPLICATIONS, CLIENT REFERENCES, AND PERFORMANCE DATA (continued)

c.

**Site Name or Industry Type if Client Identity is Confidential:** _____

**Site Type or Waste Source (Check all that apply)**

- ____ Agriculture
- ____ Battery recycling/disposal
- ____ Chloro-alkali manufacturing
- ____ Coal gasification
- ____ Dry cleaning
- ____ Electroplating
- ____ Gasoline service station/petroleum storage facility
- ____ Herbicide manufacturing/use
- ____ Industrial landfills
- ____ Inorganic/organic pigments
- ____ Machine shops
- ____ Metal ore mining and smelting
- ____ Municipal Landfill
- ____ Munitions Manufacturing
- ____ Paint/ink formulation
- ____ Pesticide manufacturing/use
- ____ Petroleum refining and reuse
- ____ Photographic products
- ____ Plastics manufacturing
- ____ Pulp and paper industry
- ____ Other organic chemical manufacturing
- ____ Other inorganic chemical manufacturing
- ____ Semiconductor manufacturing
- ____ Rubber manufacturing
- ____ Wood preserving
- ____ Uranium mining
- ____ Others *(specify)* _____

**Location**

City _____

State/Province: _____

Country _____

**Project took place at site named**

_____ Yes

_____ No

**At another site (that is, a Test facility)**

_____ Yes

_____ No

**Regulation/Statute/Organization (Check all that apply)**

- _____ *RCRA corrective action*
- _____ *CERCLA*
- _____ *TSCA*
- _____ *Safe Drinking Water Act*
- _____ *UST corrective action*
- _____ *State (specify)* _____
- _____ *DOD*
- _____ *DOE*
- _____ *Other (Specify)* _____
- _____ *Not Applicable*

**Application or Project Type *(Check all that apply)***

- _____ *Full-scale cleanup*
- _____ *Field demonstration*
- _____ *Pilot-scale treatability study*
- _____ *Bench-scale treatability study*
- _____ *RCRA Research, Development, and Demonstration*
- _____ *TSCA National Demonstration*
- _____ *TSCA Research and Development*
- _____ *EPA SITE Demonstration Program*
- _____ *EPA SITE Emerging Technology Program*
- _____ *Research*
- _____ *Other (specify)* _____

**Media Treated *(Check all that apply)***

- _____ Soil (in situ)
- _____ Soil (ex situ)
- _____ Sludge
- _____ Solid
- _____ Natural sediment (in situ)
- _____ Natural sediment (ex situ)
- _____ Ground water in situ
- _____ Off-gas from a primary treatment technology
- _____ Dense nonaqueous phase liquids (DNAPL) [in situ]
- _____ Light nonaqueous phase liquids (LNAPL) [in situ]

**Volume/Quantity Treated**

_____ _____ (Units)

**Area treated (for in situ projects)**

_____ _____ (Units)

**Depth treated (for in situ projects)**

_____ _____ (Units)

**Equipment Scale *(Check one only)***

_____ **Bench**

_____ **Pilot**

_____ **Full**

**Project Status**

**Contracted**

Month _____ Year _____

**In cleanup** Yes ____ No ____

**Completed**

Month _____ Year _____

## PART 5: REPRESENTATIVE APPLICATIONS, CLIENT REFERENCES, AND PERFORMANCE DATA (continued)

### c. (continued)

***Note:*** (1) List one specific contaminant per line. Do not list such entire contaminant groups as VOCs or solvents. TPH, which can be analyzed using a specific test method, can be listed as an individual contaminant.

(2) and (3) Indicate the appropriate units; for concentrations that were non-detect write N.D.; treated concentration should be lower than untreated concentration unless the technology is dewatering or some other volume reduction method. If a concentration range cannot be given, provide an average and note it as such.

(4) Specify the cleanup standard or goal, if known, for the individual contaminant for this project. For example, if the project was part of a Superfund remedial action, the cleanup goal is specified in the record of decision (ROD) for that site.

**Performance Data**

| (1) Contaminant or Pollutant Parameter | (2) Untreated Concentration Range (Min to Max) | (3) Units | (2) Treated Concentration Range (Min to Max) | (3) Units | (4) Cleanup Standard or Goal | (3) Units |
|---|---|---|---|---|---|---|
| (Example) Benzene | 50 - 150 | ppm | 25 - 50 | ppm | 50 | ppm |
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**Cost Information**

**Estimated or actual total and/or unit cost for this project**

$ _____ per _____ (unit)

$ _____ (total)

What items or activities are included in these cost(s) (e.g., mobilization, demobilization, excavation, waste handling)?

_____

_____

_____

**Person outside of company familiar with project (optional)**

**Name** _____ **Company** _____

**Address** _____

_____

**Is Literature Available on this Project? (You may wish to include these citations in *Part 6*)**

___ **Yes** ___ **No**

Additional project information site conditions, mode of operation, and other pertinent information). _____

_____

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## PART 5: REPRESENTATIVE APPLICATIONS, CLIENT REFERENCES, AND PERFORMANCE DATA (continued)

**d.**

**Site Name or Industry Type if Client Identity is Confidential:** _____

**Site Type or Waste Source (Check all that apply)**

_____ Agriculture
_____ Battery recycling/disposal
_____ Chloro-alkali manufacturing
_____ Coal gasification
_____ Dry cleaning
_____ Electroplating
_____ Gasoline service station/petroleum storage facility
_____ Herbicide manufacturing/use
_____ Industrial landfills
_____ Inorganic/organic pigments
_____ Machine shops
_____ Metal ore mining and smelting
_____ Municipal Landfill
_____ Munitions Manufacturing
_____ Paint/ink formulation
_____ Pesticide manufacturing/use
_____ Petroleum refining and reuse
_____ Photographic products
_____ Plastics manufacturing
_____ Pulp and paper industry
_____ Other organic chemical manufacturing
_____ Other inorganic chemical manufacturing
_____ Semiconductor manufacturing
_____ Rubber manufacturing
_____ Wood preserving
_____ Uranium mining
_____ Others *(specify)* _____

**Location**

City _____

State/Province: _____

Country _____

**Project took place at site named**

_____ Yes

_____ No

**At another site (that is, a Test facility)**

_____ Yes

_____ No

**Regulation/Statute/Organization (Check all that apply)**

_____ *RCRA corrective action*
_____ *CERCLA*
_____ *TSCA*
_____ *Safe Drinking Water Act*
_____ *UST corrective action*
_____ *State (specify)* _____
_____ *DOD*
_____ *DOE*
_____ *Other (Specify)* _____
_____ *Not Applicable*

**Application or Project Type *(Check all that apply)***

_____ *Full-scale cleanup*
_____ *Field demonstration*
_____ *Pilot-scale treatability study*
_____ *Bench-scale treatability study*
_____ *RCRA Research, Development, and Demonstration*
_____ *TSCA National Demonstration*
_____ *TSCA Research and Development*
_____ *EPA SITE Demonstration Program*
_____ *EPA SITE Emerging Technology Program*
_____ *Research*
_____ *Other (specify)* _____

**Media Treated *(Check all that apply)***

_____ Soil (in situ)
_____ Soil (ex situ)
_____ Sludge
_____ Solid
_____ Natural sediment (in situ)
_____ Natural sediment (ex situ)
_____ Ground water in situ
_____ Off-gas from a primary treatment technology
_____ Dense nonaqueous phase liquids (DNAPL) [in situ]
_____ Light nonaqueous phase liquids (LNAPL) [in situ]

**Volume/Quantity Treated**

_____ _____ (Units)

**Area treated (for in situ projects)**

_____ _____ (Units)

**Depth treated (for in situ projects)**

_____ _____ (Units)

**Equipment Scale *(Check one only)***

_____ **Bench**

_____ **Pilot**

_____ **Full**

**Project Status**

**Contracted**

Month _____ Year _____

**In cleanup** Yes ____ No ____

**Completed**

Month _____ Year _____

## PART 5: REPRESENTATIVE APPLICATIONS, CLIENT REFERENCES, AND PERFORMANCE DATA (continued)

### d. (continued)

***Note:*** (1) List one specific contaminant per line. Do not list such entire contaminant groups as VOCs or solvents. TPH, which can be analyzed using a specific test method, can be listed as an individual contaminant.

(2) and (3) Indicate the appropriate units; for concentrations that were non-detect write N.D.; treated concentration should be lower than untreated concentration unless the technology is dewatering or some other volume reduction method. If a concentration range cannot be given, provide an average and note it as such.

(4) Specify the cleanup standard or goal, if known, for the individual contaminant for this project. For example, if the project was part of a Superfund remedial action, the cleanup goal is specified in the record of decision (ROD) for that site.

**Performance Data**

| (1) Contaminant or Pollutant Parameter | (2) Untreated Concentration Range (Min to Max) | (3) Units | (2) Treated Concentration Range (Min to Max) | (3) Units | (4) Cleanup Standard or Goal | (3) Units |
|---|---|---|---|---|---|---|
| (Example) Benzene | 50 - 150 | ppm | 25 - 50 | ppm | 50 | ppm |
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**Cost Information**

**Estimated or actual total and/or unit cost for this project**

$ _____ per _____ (unit)

$ _____ (total)

What items or activities are included in these cost(s) (e.g., mobilization, demobilization, excavation, waste handling)?

_____

_____

_____

**Person outside of company familiar with project (optional)**

**Name** _____ **Company** _____

**Address** _____

_____

**Is Literature Available on this Project? (You may wish to include these citations in *Part 6*)**

___ **Yes** ___ **No**

Additional project information site conditions, mode of operation, and other pertinent information). _____

_____

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## PART 5: REPRESENTATIVE APPLICATIONS, CLIENT REFERENCES, AND PERFORMANCE DATA (continued)

e.

**Site Name or Industry Type if Client Identity is Confidential:** _____

**Site Type or Waste Source (Check all that apply)**

_____ Agriculture
_____ Battery recycling/disposal
_____ Chloro-alkali manufacturing
_____ Coal gasification
_____ Dry cleaning
_____ Electroplating
_____ Gasoline service station/petroleum storage facility
_____ Herbicide manufacturing/use
_____ Industrial landfills
_____ Inorganic/organic pigments
_____ Machine shops
_____ Metal ore mining and smelting
_____ Municipal Landfill
_____ Munitions Manufacturing
_____ Paint/ink formulation
_____ Pesticide manufacturing/use
_____ Petroleum refining and reuse
_____ Photographic products
_____ Plastics manufacturing
_____ Pulp and paper industry
_____ Other organic chemical manufacturing
_____ Other inorganic chemical manufacturing
_____ Semiconductor manufacturing
_____ Rubber manufacturing
_____ Wood preserving
_____ Uranium mining
_____ Others *(specify)* _____

**Location**

City _____

State/Province: _____

Country _____

**Project took place at site named**

_____ Yes

_____ No

**At another site (that is, a Test facility)**

_____ Yes

_____ No

**Regulation/Statute/Organization (Check all that apply)**

_____ *RCRA corrective action*
_____ *CERCLA*
_____ *TSCA*
_____ *Safe Drinking Water Act*
_____ *UST corrective action*
_____ *State (specify)* _____
_____ *DOD*
_____ *DOE*
_____ *Other (Specify)* _____
_____ *Not Applicable*

**Application or Project Type *(Check all that apply)***

_____ *Full-scale cleanup*
_____ *Field demonstration*
_____ *Pilot-scale treatability study*
_____ *Bench-scale treatability study*
_____ *RCRA Research, Development, and Demonstration*
_____ *TSCA National Demonstration*
_____ *TSCA Research and Development*
_____ *EPA SITE Demonstration Program*
_____ *EPA SITE Emerging Technology Program*
_____ *Research*
_____ *Other (specify)* _____

**Media Treated *(Check all that apply)***

_____ Soil (in situ)
_____ Soil (ex situ)
_____ Sludge
_____ Solid
_____ Natural sediment (in situ)
_____ Natural sediment (ex situ)
_____ Ground water in situ
_____ Off-gas from a primary treatment technology
_____ Dense nonaqueous phase liquids (DNAPL) [in situ]
_____ Light nonaqueous phase liquids (LNAPL) [in situ]

**Volume/Quantity Treated**

_____ _____ (Units)

**Area treated (for in situ projects)**

_____ _____ (Units)

**Depth treated (for in situ projects)**

_____ _____ (Units)

**Equipment Scale *(Check one only)***

_____ **Bench**

_____ **Pilot**

_____ **Full**

**Project Status**

**Contracted**

Month _____ Year _____

**In cleanup** Yes ____ No ____

**Completed**

Month _____ Year _____

## PART 5: REPRESENTATIVE APPLICATIONS, CLIENT REFERENCES, AND PERFORMANCE DATA (continued)

### e. (continued)

***Note:*** (1) List one specific contaminant per line. Do not list such entire contaminant groups as VOCs or solvents. TPH, which can be analyzed using a specific test method, can be listed as an individual contaminant.

(2) and (3) Indicate the appropriate units; for concentrations that were non-detect write N.D.; treated concentration should be lower than untreated concentration unless the technology is dewatering or some other volume reduction method. If a concentration range cannot be given, provide an average and note it as such.

(4) Specify the cleanup standard or goal, if known, for the individual contaminant for this project. For example, if the project was part of a Superfund remedial action, the cleanup goal is specified in the record of decision (ROD) for that site.

**Performance Data**

| (1) Contaminant or Pollutant Parameter | (2) Untreated Concentration Range (Min to Max) | (3) Units | (2) Treated Concentration Range (Min to Max) | (3) Units | (4) Cleanup Standard or Goal | (3) Units |
|---|---|---|---|---|---|---|
| (Example) Benzene | 50 - 150 | ppm | 25 - 50 | ppm | 50 | ppm |
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**Cost Information**

**Estimated or actual total and/or unit cost for this project**

$ _____ per _____ (unit)

$ _____ (total)

What items or activities are included in these cost(s) (e.g., mobilization, demobilization, excavation, waste handling)?

_____

_____

_____

**Person outside of company familiar with project (optional)**

**Name** _____ **Company** _____

**Address** _____

_____

**Is Literature Available on this Project? (You may wish to include these citations in *Part 6*)**

___ **Yes** ___ **No**

Additional project information site conditions, mode of operation, and other pertinent information). _____

_____

_____

_____

_____

_____

Vendor Name _____

Technology Type _____

## PART 6: LITERATURE AND TECHNICAL REFERENCES

40. List and attach available documentation (for example, journal articles, conference papers, patents) that best describes technology and vendor capabilities. References that contain performance and cost data are of particular interest. **Do not include personal references.** EPA reserves the right to add to the list other publicly available references.

Author(s) _____

Title _____

_____

Journal/Conference _____

Date _____ NTIS/EPA Document Number(s) _____

Author(s) _____

Title _____

_____

Journal/Conference _____

Date _____ NTIS/EPA Document Number(s) _____

Author(s) _____

Title _____

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Journal/Conference _____

Date _____ NTIS/EPA Document Number(s) _____

Author(s) _____

Title _____

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Journal/Conference _____

Date _____ NTIS/EPA Document Number(s) _____

Author(s) _____

Title _____

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Journal/Conference _____

Date _____ NTIS/EPA Document Number(s) _____