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EPA/DOE/NSF/ONR 1998 JOINT PROGRAM ON BIOREMEDIATION

Interagency Announcement of Opportunity

Opening Date: December 8, 1997

Closing Date: February 27, 1998



Environmental Protection Agency



Department of Energy



National Science Foundation



Office of Naval Research

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BACKGROUND

In the past, the goal for cleanup of toxic and hazardous waste sites has been to clean up to levels that would meet all applicable, relevant or appropriate environmental standards, such as the MCL (maximum contaminant level) for drinking water. Clean-up to such levels through bioremediation has often required nearly complete mineralization of wastes to carbon dioxide, water, and inorganic materials. It has become clear, however, that in certain situations these clean-up levels may be unrealistic and unnecessary. There may be alternative endpoints that will protect ecosystems and human health when the bioavailability of contaminants is considered.

In fiscal years 1996 and 1997, the Department of Energy, Environmental Protection Agency, National Science Foundation, and Office of Naval Research collaborated to solicit research grant applications that would address some of the limitations to the use of bioremediation for clean-up of hazardous wastes. The interagency committee focused the previous solicitations on understanding the fundamental issue of the bioavailability of chemicals for bioremediation processes in complex mixtures under field situations. In the current competition, these emphases will continue.

PROGRAM DESCRIPTION

Research proposals are solicited that aim to further our fundamental understanding of the chemical, physical, and biological processes influencing the bioavailability and release of chemicals in soil, sediments, and groundwater under natural conditions. Research is also needed on the role of chemical contaminants which, when released from the medium and assimilated by living organisms, result in an adverse effect. The objective of the research should be to understand the commonality of processes and/or environmental effects involved in contaminant release, movement, and assimilation in order to determine broadly

applicable techniques for measuring the potential impacts of contaminants in complex matrices. Mechanistic and kinetic studies are encouraged. These data can then be used to construct models that increase our understanding of bioavailability.

Bioavailability, defined for the purpose of this solicitation as the availability of contaminants to an organism (including microbes, plants, and animals) that might degrade or otherwise transform it, is one of the principal factors controlling bioremediation processes. Research is urgently needed that examines:

- the chemical, physical, and biological processes (including weathering and aging) that determine bioavailability of contaminants in waste matrices, particularly metals and metal compounds in complex matrices;
- interactions between waste chemicals, organisms, and the environment to identify fundamental mechanisms controlling sorption and sequestration; and
- the potential for toxic effects of various intermediate metabolites that might be released during biodegradation of wastes.

The emphasis in proposed research projects should be on the behavior of mixtures of chemicals in field situations, for example, chemicals of disparate types found together in hazardous waste situations, like chlorinated solvents, PAHs, and metals. Research that includes on the influence of metals and their compounds in complex mixtures is particularly desired. Factors which limit interactions between contaminants and microorganisms (in situ bioremediation) and/or plants (phytoremediation) are emphasized. Interdisciplinary research is encouraged. While studies on chemicals that impact ecosystem and human health are desired, studies dealing simply with the toxicity of chemicals and their degradation products are not eligible. Similarly, studies focusing on pure cultures in the laboratory or bioreactors will not be considered to be responsive to this solicitation.

Studies conducted under field conditions are desired. Studies conducted entirely in the laboratory are not eligible for this competition. To avoid the high cost of establishing new field research sites, field studies should use well-instrumented, characterized, and documented sites. Some appropriate sites that are available for field research are listed below. The named individuals should be contacted to make logistical and financial arrangements for research that is proposed at the site.

- Various U.S. EPA sites
Contact: **Fran Kremer**, 513-569-7346
kremer.fran@epamail.epa.gov

- Various Department of Energy sites
Contact: **Paul Bayer**, 301-903-5324
paul.bayer@oer.doe.gov
- The U.S. Navy's Port Hueneme, CA, site
Contact: **Ernest Lory**, 805-982-1299
elory@nfesc.navy.mil
- McClelland Air Force Base, California
Contact: **Phil Mook**, 916-643-5443
mook.phil@sma1.mcclellan.af.mil
- Wurtsmith Air Force Base, Michigan
Contact: **Michael Barcelona**, 313-763-9666
mikebar@engin.umich.edu
- Dover Air Force Base, Delaware
Contact: **Charles Mikula**, 302-677-6845
FAX: 302-677-6837

Applicants must document where proposed field research will be conducted and must include a letter from the site management indicating commitment to participate in the research. Arrangements must be made in advance regarding the possible need for funding of activities at the field site. Do not presume that site management will be able to cover add-on research costs.

Applicants specifically interested in research at Department of Energy sites should focus their applications on radioactive and heavy metal mixtures as outlined in the most recent (November 1996) solicitation for the Natural and Accelerated Bioremediation Research (NABIR) Program. Although the NABIR solicitation has closed, research that addresses the NABIR objectives will also be funded through this joint program solicitation. A copy of the closed November 1996 NABIR solicitation is available at the following internet web site:

<http://www.er.doe.gov/production/grants/fr97_04.html>
The DOE Biotransformation and Biodegradation, Biogeochemical Dynamics, Acceleration, and Assessment program elements are those most closely aligned with this EPA/NSF/DOE/ONR Joint Program on Bioremediation. Research that addresses long-term stability of microbial-sequestered metals and radionuclides, novel metal-sequestering agents, processes controlling behavior at solid/aqueous interfaces, and tools to assess bioavailability are particularly desired.

Research funded through this solicitation will be used to better understand the various factors that will impact the risk to ecosystem and human health of waste chemicals and their degradation products during the process of bioremediation, including phytoremediation and natural attenuation. The results of this research can then be considered within the regulatory framework to develop environmentally acceptable alternative endpoints for site remediation.

A more detailed statement of interagency interests and priorities in bioremediation research can be found in the Environmental Biotechnology chapter of the National Science and Technology Council (NSTC) report, *Biotechnology for the 21st Century: New Horizons* [<http://www.nalusda.gov/bic/bio21>].

WHO MAY SUBMIT

Academic and not-for-profit institutions located in the U.S., and state or local governments are eligible to apply. Profit-making firms are eligible only under certain laws, and then under restrictive conditions, including the absence of any profit from the project. Federal agencies and federal employees are not eligible to submit applications in this program. All potential applicants are encouraged to contact one of the agency representatives identified below before submitting a formal proposal.

AWARDS

Proposals may request funding for projects with a duration not to exceed three years and a total budget not to exceed \$500,000. Although proposals submitted in response to this Interagency Announcement will be sent to EPA, the participating agencies will jointly manage the review and administration of the program. Final selection of awardees by the agencies will be determined by the review panel's recommendations and programmatic considerations. Each award will be supported by a single agency. Overall estimated amount of funding up to \$5.0 M, depending on the availability of funds and the programmatic relevancy of recommended projects to the participating agencies. Each agency supporting an award will act as the sole administrative unit for that award. Principal Investigators recommended for funding may be requested to modify their budgets and work plans to comply with special requirements of the particular agency supporting their award.

THE APPLICATION

The initial application is made through the submission of the materials described below. It is essential that the application contain all the information requested and be submitted in the formats described. If it is not, the application may be rejected on administrative grounds. If an application is considered for award (i.e., after external peer review and internal review), additional forms and other information will be requested by the Project Officer in the

funding agency. **The application should not be bound or stapled in any way.** The Application contains the following:

A. Standard Form 424: The applicant must complete Standard Form 424 (see attached form and instructions). This form will act as a cover sheet for the application and **should be its first page.** Instructions for completion of the SF424 are included with the form. The form must contain the original signature of an authorized representative of the applying institution. Please note that both the Principal Investigator and an administrative contact should be identified in Section 5 of the SF424. Sorting Code **98-NCERQA-N1** must be entered in block 10 of the SF-424.

B. Key Contacts: The applicant must complete the Key Contacts Form (attached) as the second page of the submitted application.

C. Abstract: The abstract is a very important document. Prior to attending the peer review panel meetings, some of the panelists may read only the abstract. Therefore, it is critical that the abstract accurately describe the research being proposed and convey all the essential elements of the research. Also, in the event of an award, the abstracts will form the basis for an Annual Report of awards made under this program. The abstract should include the following information:

1. Sorting Code: Use the code that corresponds to this topic: **98-NCERQA-N1.**

2. Title: Use the exact title as it appears in the rest of the application.

3. Investigators: List the names and affiliations of each investigator who will significantly contribute to the project. Start with the Principal Investigator.

4. Project Summary: This should summarize: (a) the objectives of the study (including any hypotheses that will be tested), (b) the experimental **approach** to be used (which should give an accurate description of the project as described in the proposal), (c) the **expected results** of the project and how it addresses the research needs identified in the solicitation, and (d) the estimated improvement in risk assessment or risk management that will result from successful completion of the work proposed.

D. Project Description: This description must not exceed fifteen (15) consecutively numbered (center bottom), 8.5x11 inch pages of single-spaced standard

12-point type with 1 inch margins. The description must provide the following information:

1. Objectives: List the objectives of the proposed research and the hypotheses being tested during the project and briefly state why the intended research is important. This section can also include any background or introductory information that would help explain the objectives of the study (one to two pages recommended).

2. Approach: Outline the methods, approaches, and techniques that you intend to employ in meeting the objective stated above (five to 10 pages recommended).

3. Expected Results or Benefits: Describe the results you expect to achieve during the project and the benefits of success as they relate to the topic under which the proposal was submitted. This section should also discuss the utility of the research project proposed for addressing the environmental problems described in the solicitation (one to two pages recommended).

4. General Project Information: Discuss other information relevant to the potential success of the project. This should include facilities, personnel, project schedules, proposed management, interactions with other institutions, etc. (one to two pages recommended).

5. Important Attachments: Appendices and/or other information may be included but must remain within the 15 page limit. References are in addition to the 15 pages.

E. Resumes: The resumes of all principal investigators and important co-workers should be presented. Resumes must not exceed two consecutively numbered (bottom center), 8.5x11-inch pages of single-spaced standard 12-point type with 1-inch margins for each individual.

F. Current and Pending Support: The applicant must identify any current and pending financial resources that are intended to support research related to that included in the proposal or which would consume the time of principal investigators. Complete the appropriate form (see attachment) for each investigator and other senior personnel involved in the proposal. Failure to provide this information may delay consideration of your proposal.

- G. Budget:** The applicant must present a detailed, itemized budget for the entire project, including costs associated with field research sites utilized for the research. This budget must be in the format provided (see attachment) and not exceed two consecutively numbered (bottom center), 8.5x11-inch pages with 1-inch margins. Please note that institutional cost sharing is not required and, therefore, does not have to be included in the budget table. If desired, a brief statement concerning cost sharing can be added to the budget justification.
- H. Budget Justification:** This section should describe the basis for calculating the personnel, *fringe benefits*, *travel*, *equipment*, *supplies*, *contractual support*, *field site costs*, and *other* costs identified in the itemized budget and explain the basis for their calculation (special attention should be given to explaining the *travel*, *equipment*, and *other* categories). Include an explanation of how indirect costs were calculated. This justification should not exceed two consecutively numbered (bottom center), 8.5x11-inch pages of single-spaced standard 12-point type with 1-inch margins.
- I. Quality Assurance Narrative Statement:** For any project involving data collection or processing, conducting surveys, environmental measurements, and/or modeling, provide a statement on how quality processes or products will be assured. This statement should not exceed two consecutively numbered, 8.5x11 inch pages of single-spaced standard 12-point type with 1-inch margins. This is in addition to the 15 pages permitted for the Project Description. The Quality Assurance Narrative Statement should, for each item listed below, either present the required information or provide a justification as to why the item does not apply to the proposed research. For awards that involve environmentally related measurements or data generation, a quality system that complies with the requirements of ANSI/ASQC E4, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs," must be in place.
1. The activities to be performed or hypothesis to be tested (reference may be made to the specific page and paragraph number in the application where this information may be found); criteria for determining the acceptability of data quality in terms of precision, accuracy, representativeness, completeness, comparability.
 2. The study design including sample type and location requirements and any statistical analyses that were used to estimate the types and numbers of

samples required for physical samples or similar information for studies using survey and interview techniques.

3. The procedures for the handling and custody of samples, including sample identification, preservation, transportation, and storage.
4. The methods that will be used to analyze samples or data collected, including a description of the sampling and/or analytical instruments required.
5. The procedures that will be used in the calibration and performance evaluation of the sampling and analytical methods used during the project.
6. The procedures for data reduction and reporting, including a description of statistical analyses to be used and of any computer models to be designed or utilized associated with verification and validation techniques.
7. The intended use of the data as they relate to the study objectives or hypotheses.
8. The quantitative and or qualitative procedures that will be used to evaluate the success of the project.
9. Any plans for peer or other reviews of the study design or analytical methods prior to data collection.

ANSI/ASQC E4, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs" is available for purchase from the American Society for Quality Control, phone 1-800-248-1946, item T55. Only in exceptional circumstances should it be necessary to consult this document.

- J. Postcard:** The Applicant must include with the application a self-addressed, stamped 3x5 inch post card. This will be used to acknowledge receipt of the application and to transmit other important information to the applicant.

PROPRIETARY INFORMATION

By submitting an application in response to this solicitation, the applicant grants permission to share the application with technical reviewers both within and outside of the Agencies. Applications containing proprietary or other types of confidential information will be returned to the applicant without review.

REVIEW AND SELECTION

All grant applications are initially reviewed by the participating agencies to determine their legal and administrative acceptability. Acceptable applications are then reviewed by an appropriate technical peer review group.

This review is designed to evaluate each proposal according to its scientific merit. In general, each review group is composed of scientists, engineers, social scientists, and/or economists who are experts in their respective disciplines and are proficient in the technical areas they are reviewing. The reviewers use the following criteria to help them in their reviews:

1. The originality and creativity of the proposed research, the potential contribution the proposed research could make to advance scientific knowledge in the environmental area, the appropriateness and adequacy of the research methods proposed, and the appropriateness and adequacy of the Quality Assurance Narrative Statement
2. The qualifications of the principal investigator(s) and other staff, including knowledge of pertinent literature, experience, and publication records as well as the probability that the proposed research will be successfully completed
3. The availability and/or adequacy of the facilities and equipment proposed for the project
4. The responsiveness of the proposal to the research needs set forth in the solicitation
5. Although budget information is not used by the reviewers as the basis for their evaluation of scientific merit, the reviewers are asked to provide their view on the appropriateness and/or adequacy of the proposed budget and its implications for the potential success of the proposed research. Input on requested equipment is of particular interest.

Applications that receive scores of "excellent" and "very good" from the peer reviewers are subjected to programmatic review within the Agencies, the object being to assure a balanced research portfolio. Scientists from the Agencies review these applications in relation to program priorities and recommend selections for award.

Copies of comments from the scientific review panel will be provided to each applicant. Funding decisions are the sole responsibility of the funding agency. Grants are selected on the basis of technical merit, relevancy to the research priorities outlined, program balance, and budget.

HOW TO APPLY

The original and ten (10) copies of the fully developed research grant application and five (5) additional copies of the abstract (15 in all), must be received (postmarked if sent by U.S. Mail) by the National Center for Environmental Research and Quality Assurance no later than 4:00 P.M. EST on the closing date: February 17, 1998.

The application and abstracts must be prepared in accordance with these instructions. Informal, incomplete, or unsigned proposals will not be considered. Completed applications should be sent via regular or express mail.

For regular mail applications, the following address must be used:

**U.S. Environmental Protection Agency
Peer Review Division (8703R)
Sorting Code: 98-NCERQA-N1
401 M Street, SW
Washington DC 20460**

For applications sent by express mail or courier services, the following address must be used:

**U. S. Environmental Protection Agency
Peer Review Division (8703R)
Sorting Code: 98-NCERQA-N1
1300 Pennsylvania Avenue, NW
Room B-10105
Washington, DC 20004**

Applications sent via express mail should have the following telephone number listed on the express mail label: (202) 564-6939

CONTACTS

EPA: Dr. Robert E. Menzer
menzer.robert@epamail.epa.gov
fax (202) 565-2444, voice (202) 564-6849

DOE: Mr. Paul Bayer
paul.bayer@oer.doe.gov
fax (301) 903-8519, voice (301) 903-5324

NSF: Dr. James Rodman
jrodman@nsf.gov
fax (703) 306-0367, voice (703) 306-1480 Ext. 6436

ONR: Dr. Anna Palmisano
palmisa@onr.navy.mil
fax (703) 696-1212 , voice (703) 696-1449

APPLICATION FOR FEDERAL ASSISTANCE

1. TYPE OF SUBMISSION Application ☐ Construction ☐ Non-Construction		Preapplication ☐ Construction ☐ Non-Construction		2. DATE SUBMITTED	Applicant Identifier	
3. DATE RECEIVED BY STATE		State Applicant Identifier				
4. DATE RECEIVED BY FEDERAL AGENCY		Federal Identifier				
5. APPLICANT INFORMATION IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? ☐ YES ☐ NO IF YES, LIST ACRONYM(S)						
Legal Name:				Organizational Unit:		
Address (give city, county, state, and zip code):				Name and telephone and E-mail number of the person to be contacted on matters involving this application (give area code) PI: ADMIN. CONTACT:		
6. EMPLOYER IDENTIFICATION NUMBER (EIN): 				7. TYPE OF APPLICANT: (enter appropriate letter in box) ☐		
8. TYPE OF APPLICATION: ☐ New ☐ Continuation ☐ Revision If Revision, enter appropriate letter(s) in box(es): ☐ ☐ A. Increase Award B. Decrease Award C. Increase Duration D. Decrease Duration Other (specify): _____				A. State H. Independent School Dist. B. County I. State Controlled Institution of Higher Learning C. Municipal J. Private University D. Township K. Indian Tribe E. Interstate L. Individual F. Intermunicipal M. Profit Organization G. Special District N. Other (Specify) _____		
10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: 6 6 • 5 0 0 TITLE: 98-NCERQA - _ _ _				9. NAME OF FEDERAL AGENCY: U.S. Environmental Protection Agency - ORD - NCERQA		
12. AREAS AFFECTED BY PROJECT (cities, counties, states, etc.):				11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:		
13. PROPOSED PROJECT:		14. CONGRESSIONAL DISTRICTS OF:				
Start Date	Ending Date	a. Applicant			b. Project	
15. ESTIMATED TOTAL PROJECT FUNDING:		16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?				
a. Federal	\$.00	a. YES. THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON: DATE _____				
b. Applicant	\$.00	b. NO. ☐ PROGRAM IS NOT COVERED BY E.O. 12372				
c. State	\$.00	☐ OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW				
d. Local	\$.00	17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT?				
e. Other	\$.00	☐ Yes If "Yes," attach an explanation. ☐ No				
f. Program Income	\$.00	18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT. THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.				
g. TOTAL	\$.00	a. Typed Name of Authorized Representative			b. Title	
d. Signature of Authorized Representative			c. Telephone number		e. Date Signed	

INSTRUCTIONS FOR THE SF 424

This is a standard form used by applicants as a required facesheet for preapplications and applications submitted for Federal Assistance. It will be used by Federal agencies to obtain applicant certification that States which have established a review and comment procedure in response to Executive Order 12372 and have selected the program to be included in their process, have been given an opportunity to review the applicant's submission.

- | Item: | Entry: | Item: | Entry: |
|-------|--|-------|---|
| 1. | Self-explanatory. | 12. | List only the largest political entities affected (e.g., State, counties, cities.) |
| 2. | Date application submitted to Federal agency (or State, if applicable) & applicant's control number (if applicable). | 13. | Self-explanatory. |
| 3. | State use only (if applicable). | 14. | List the applicant's Congressional Districts and any District(s) affected by the program or project. |
| 4. | If this application is to continue or revise an existing award, enter present Federal identifier number. If for a new project, leave blank. | 15. | Amount requested or to be contributed during the first funding/budget period by each contributor. Value of in-kind contributions should be included on appropriate lines as applicable. If the action will result in a dollar change to an existing award, include <u>only</u> the amount of the change. For decreases, enclose the amounts in parentheses. If both basic and supplemental amounts are included, show breakdown on an attached sheet. For multiple program funding, use totals and show breakdown using same categories as item 15. |
| 5. | Legal name of applicant, name of primary organizational unit which will undertake the assistance activity, complete address of the applicant, and name and telephone number of the person to contact on matters related to this application. | 16. | Applicants should contact the State Single Point of Contact (SPOC) for Federal Executive Order 12372 to determine whether the application is subject to the State intergovernmental review process. |
| 6. | Enter Employer Identification Number (EIN) as assigned by the Internal Revenue Service. | 17. | This question applies to the applicant organization, not the person who signs as the authorized representative. Categories of debt include delinquent audit allowances, loans and taxes. |
| 7. | Enter the appropriate letter in the space provided. | 18. | To be signed by the authorized representative of the applicant. A copy of the governing body's authorization for you to sign this application as official representative must be on file in the applicant's office. (Certain Federal agencies may require that this authorization be submitted as part of the application.) |
| 8. | Check appropriate box and enter appropriate letter(s) in the space(s) provided:

— "New" means a new assistance award.

— "Continuation" means an extension for an additional funding/budget period for a project with a projected completion date.

— "Revision" means any change in the Federal Government's financial obligation or contingent liability from an existing obligation. | | |
| 9. | Name of Federal agency from which assistance is being requested with this application. | | |
| 10. | Use the Catalog of Federal Domestic Assistance number and title of the program under which assistance is required. | | |
| 11. | Enter a brief descriptive title of the project. If more than one program is involved, you should append an explanation on a separate sheet. If appropriate (e.g., construction or real property projects), attach a map showing project location. For preapplications, use a separate sheet to provide a summary description of this project. | | |

KEY CONTACTS FORM

- **Authorized Representative:** *Original awards and amendments will be sent to this individual for review and acceptance, unless otherwise indicated.*

Name: _____
Title: _____
Complete Address: _____

Phone Number: _____

- **Payee:** *Individual authorized to accept payments.*

Name: _____
Title: _____
Complete Address: _____

Phone Number: _____

- **Administrative Contact:** *Individual from Sponsored Programs Office to contact concerning administrative matters (i.e., indirect cost rate computation, rebudgeting requests etc.)*

Name: _____
Title: _____
Complete Address: _____

Phone Number: _____
FAX Number: _____
E-Mail Number: _____

- **Principal Investigator:** *Individual responsible for the technical completion of the proposed work.*

Name: _____
Title: _____
Complete Address: _____

Phone Number: _____
FAX Number: _____
E-Mail Number: _____

EPA STAR Grant Abstract (*Example Format*)

Sorting Code: 98-NCERQA-XX (use the correct code that corresponds to the appropriate RFA topic)

Title: Use the exact title as it appears in the rest of the application.

Investigators: List the names and affiliations of each investigator who will significantly contribute to the project. Start with the Principal Investigator.

Institution: Name of university or other applicant.

Project Period: October 1, 1998--September 30, 2000, for example.

Research Category: Enter your research topic name.

Project Summary:

Objectives/Hypothesis: include a short statement on the context of the proposed research in relation to other environmental research in the particular area of work

Approach: outline the methods, approaches, and techniques you intend to employ in meeting the objectives

Expected Results:

including a brief description of the

Improvements in Risk Assessment or Risk Management

that will be realized if the expected results are achieved

Supplemental Keywords: see attached suggestions. Do not duplicate terms used in the text of the abstract.

SUGGESTED KEYWORDS

Media: (media, air, ambient air, atmosphere, ozone, water, drinking water, watersheds, groundwater, land, soil, sediments, acid deposition, global climate, indoor air, mobile sources, CASTNET, stratospheric ozone, tropospheric, marine, estuary, precipitation, leachate, adsorption, absorption, chemical transport)

Risk Assessment: (exposure, risk, risk assessment, effects, health effects, ecological effects, human health, bioavailability, metabolism, vulnerability, sensitive populations, dose-response, carcinogen, teratogen, mutagen, animal, mammalian, organism, cellular, population, enzymes, infants, children, elderly, stressor, age, race, diet, metabolism, genetic pre-disposition, genetic polymorphisms, sex, ethnic groups, susceptibility, cumulative effects)

Chemicals, toxics, toxic substances: (chemicals, toxics, particulates, ODS, VOC, CFC, PAH, PNA, PCB, dioxin, metals, heavy metals, solvents, oxidants, nitrogen oxides, sulfates, organics, DNAPL, NAPL, pathogens, viruses, bacteria, acid rain, effluent, discharge, dissolved solids, intermediates)

Ecosystem Protection: (ecosystem, indicators, restoration, regionalization, scaling, terrestrial, aquatic, habitat, integrated assessment)

Risk Management: pollution prevention (green chemistry, life-cycle analysis, alternatives, sustainable development, clean technologies, innovative technology, renewable, waste reduction, waste minimization, environmentally conscious manufacturing); treatment (remediation, bioremediation, cleanup, incineration, disinfection, oxidation, restoration)

Public Policy: (public policy, decision making, community-based, cost-benefit, conjoint analysis, observation, non-market valuation, contingent valuation, survey, psychological, preferences, public good, Bayesian, socio-economic, willingness-to-pay, compensation, conservation, environmental assets, sociological)

Scientific Disciplines: (environmental chemistry, marine science, biology, physics, engineering, social science, ecology, hydrology, geology, histology, epidemiology, genetics, pathology, mathematics, limnology, entomology, zoology)

Methods/Techniques: (EMAP, modeling, monitoring, analytical, surveys, measurement methods, general circulation models, climate models, satellite, landsat, remote sensing)

Geographic Areas: (Northeast, central, Northwest, Chesapeake Bay, Great Lakes, Midwest, Mid-Atlantic, states: {use both full name and two letter abbreviation}, EPA Regions 1 through 10)

Sectors: (agriculture, business, transportation, industry {petroleum, electronics, printing, etc}:{identify 4 digit SIC codes}, service industry, food processing, etc)

BIOGRAPHICAL SKETCH

Provide the following information for the senior personnel on the project. Begin with the Principal Investigator/Project Director (PI/PD).

DO NOT EXCEED 2 PAGES PER PERSON

- A. Vitae, listing professional and academic essentials and mailing address.
- B. List up to 5 publications most closely related to the proposed project and up to 5 other significant publications, including those accepted for publication. Patents, copyrights or software systems developed may be substituted for publications. Do not include additional lists of publications, invited lectures, etc. Only the list of up to 10 will be used in merit review.
- C. A list of persons (including their organizational affiliations) who have collaborated on a project or a book, article, report or paper within the last 48 months, including collaborators on this proposal. If there are no other collaborators, this should be indicated.
- D. A list of the names of persons (including their organizational affiliations) over the past five years, with whom this individual has had an association as thesis advisor and postdoctoral scholar sponsor. Also include a summary of the total number of graduate students advised and postdoctoral scholars sponsored.
- E. The names and institutions of this individual's own graduate and postgraduate advisors.

The information in C, D, and E is used to help identify potential conflicts or bias in the selection of reviewers.

Current and Pending Support

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator:	Other agencies (including NSF) to which this proposal has been/will be submitted.		
Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ Transfer of Support Project/Proposal Title:			
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:			
Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ Transfer of Support Project/Proposal Title:			
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:			
Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ Transfer of Support Project/Proposal Title:			
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:			
Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ Transfer of Support Project/Proposal Title:			
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:			
Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ Transfer of Support Project/Proposal Title:			
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:			

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Itemized Budget for EPA STAR Grant Applications (*Example Format*)

CATEGORIES	YEAR ONE	YEAR TWO	YEAR THREE	TOTAL PROJECT
a. Personnel Principal Investigator Co-PI Research Scientists Postdoctoral Scientists Other Personnel				
TOTAL PERSONNEL COSTS				
b. Fringe Benefits _____ % of _____				
c. Travel Trip 1 Trip 1 Trip 1 ...etc.				
TOTAL TRAVEL COSTS				
d. Equipment Item 1 Item 2 Item 3 ...etc.				
TOTAL EQUIPMENT COSTS				
e. Supplies Item 1 Item 2 Item 3 ...etc.				
TOTAL SUPPLY COSTS				
f. Contracts 1 2 3 ...etc.				
TOTAL CONTRACTUAL COSTS				
g. Other Item 1 Item 2 Item 3 ...etc.				
TOTAL OTHER COSTS				
h. TOTAL DIRECT COSTS (sum of a-g)				
i. Indirect Costs/Charges _____ % of _____ (base)				
j. TOTAL PROJECT COSTS (sum of h & i)				
k. TOTAL REQUESTED FROM EPA				